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Multiple sclerosis: assessment of disability and disability scales

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Abstract Attempting to measure the impact of multiple sclerosis (MS) on the individuals patients has become a major issue stimulated by both the emergence of new therapeutic agents and the increasing demand to incorporate the patient's perspective. Disability has been the main focus. Recently, new disability scales have been developed and generic scales evaluated in an attempt to replace or complement the constantly used and much criticized Expanded Disability Status Scale (EDSS). There is, however, the growing realization that it is important to incorporate broader aspects of disease input such as are contained within the concepts of health-related quality of life. Current scales in this area are limited in either their scientific soundness and/or clinical usefulness, and it may be appropriate to consider the development of a new MS-specific measure of disease impact for use in clinical trials.

Key words Multiple sclerosis (MS) · Outcomes · Measurement · Disability · Psychometrics

Introduction

Recent therapeutic trials have highlighted the importance of measuring clinical outcome while at the same time illustrating the limitations and inadequacies of the measures that are currently being used [27]. The need for rigorous outcome measurement is becoming more acute with the increasing number of new pharmaceutical agents, their high cost and the possibility that benefit may be marginal [63].

In this paper, the following are discussed:

1. Disability – what it is, why and how it should be measured.
2. The impact of multiple sclerosis (MS) on the patient.
3. Currently available disability scales.
4. The essential requirements of scales.
5. How current scales match these requirements.
6. The future – is disability the right thing to measure? Does it cover the impact of the disease?
7. How might an appropriate scale be developed?

1 Disability

What is it?

Disability is described within the structure of the World Health Organisation International Classification of Impairments, Disabilities and Handicaps (WHO ICIDH) [73] as 'any restriction or lack (resulting from an impairment) of ability to perform an activity within the range considered normal for a human being'. In other words, it concerns the ability of an individual to carry out tasks. This definition separates disability conceptually from impairment (any abnormality of structure or function of/or affecting the whole body) and handicap (any alteration in a patient's status in society, i.e. social consequences). For example, an impairment might be a spastic paraparesis, the disability would be difficulty in undertaking such tasks as walking/climbing stairs, and the handicap would depend on the home and work environment (bungalow versus top-floor flat; desk versus mobile employment).

Why is it important to measure disability?

Disabilities are a consequence of disease that are thought to be of practical importance to patients. Disabilities are also important to health services as they define the care an individual needs to function, and important to society as they define an individual's ability to work. As the example obove illustrates, disability could be considered as the common pathway for the disparate consequences of complex diseases and the consequences of different diseases [68].

How to measure disability

Disability can be measured using disability scales. These may be usefully divided into those which are generic and those which are disease-specific, e.g. relating to Parkinson's, MS. Within this classification, instruments can be further considered as focal, site- or symptom-specific, measuring mobility, upper limb function, fatique, etc. Generic measures are designed for use across a wide range of conditions and therefore allow comparison of different conditions. However, as they are not focused on a specific disease, they may not be as sensitive to particular problems within that conditions [51].

The impact of MS on the patient

Multiple sclerosis has a major and widespread effect on the patient. It tends to affect young adults at a crucial stage in their lives when they are establishing their careers, setting up home and having a family. The variable and unpredictable maifestations of MS tend to result in progressive disability over time without significantly affecting longevity. All parts of the central nervous system can be affected by MS, and it commonly results in difficulty with mobility and upper limb function, bladder, bowel and sexual dysfunction. speech and swallowing, vision and cognition. In addition, there may be servere fatigue and acute and chronic pain. Many of these disabilities interact. In relation to loss of mibility, it is estamated that at 15 years, 50% of patients require assistance to walk 100 m [55]. Twenty-seven per cent of all patients are admitted to hospital at least once a year. Multiple sclerosis places major strain on relationships and is associated with a high level of divorce. It is also associated with high levels of unemployment, depression and an increased suicide rate [56].

The impact of this condition on the patient, carer and health services can also be seen in harsh financial terms. It is estimated that a patient in the USA costs between $17,769 and $22,875 per annum [22] and up to £1.2 billion is required for the 87,000 patients in the UK, two-thirds of which is made up from lost earnings (patient/carer) and social support [31].

While these factors underline the importance of developing improved treatments in MS, they also highlight some of the difficulties inherent in treatment trials in this condition [26]. The variability, unpredictability and tendency to spontaneous recovery in particular accentuate the absolute necessity of randomized, placebo-controlled trials that are truly double-blind. Even under such stringent conditions and with large numbers of patients, the goal of detecting an effect over a 2- to 3-year period in a condition that continues over many decades, is not easily achieved and depends to a great extent on the outcome measure used.

Measuring outcome in MS – disability scales

Identifying appropriate clinical outcome measures in MS is far from straightforward. Mortality is clearly not appropriate, as MS has little effect on longevity, and while the relapse rate has been used in many pivotal trials [32, 34], this is not without problems, particularly in respect of definition and quantification [42]. Disability has been the main focus in recent years, as it is felt by many investigators to be the most important factor as far as the patient is concerned [33].

Available disability measures have recently been reviewed [59], and while some have been in existence for over a decade, other have only recently been developed. Under the broad heading of disease-specific scales, one can include Kurtzke's Expanded Disability Status Scale (EDSS) [39]; SCRIPPS Scale [60]; the Troiano Scale [6]; the Cambridge MS Basic Score (CAMBS) [47]; Guy's Neurological Disability Scale [58]; the Minimum Record of Disability (MRD), which incorporates the Incapacity Status Scale (disability) and the Environmental Status Scale (handicap) [11]; and the Illness Severity Scale [46].

Generic measures that have been used occasionally to measure disability in MS include the Barthel Index [43], the Functional Independence Measure [18] and the Functional Independence Measure/Functional Assesment Measure [21]. More focal measures of lower limb function include the Ambulation Index (AI) [24], the Rivermead Mobility Scale [5] and the Ten-Metre Timed Walk. Upper limb scales include the Nine-Hole Peg Test [45], the Box and Block Test [44] and the Jebsen Test of Hand Function. Before discussing these scales in any detail it would be instructive to consider the essential requirement for sound measurement.

Essential requirements of measurement instruments

Whatever is being measured, be it weight, height or disability, investigators must be confident that the measurment process is reliable and valid. For height and weight this is easy, rulers and weighing scales in standardized units exist. Measuring disability is less easy because

disability is not an explicit attribute. Fortunately, a methodology exists that allows us to determine whether our disability measurement is reliable and valid. This science is called psychometrics (psychological measurement), and it was developed from the need to measure attributes such as intelligence, which, like disability, are not explicit. In the field of health measurement, these technique are applicable to the measurement of desability, handicap, health status and quality of life. In essence, this ensures that measures are scientifically sound and clinically usefull [28, 57].

Reliability

Reliability concerns the extent to which scores produced by a scale are free from measurement error [49]. Measurement error refers to variable errors arising from chance inaccuracies, i.e. random error, and all measurements are subject to it. However, the extent of random error is usually much greater for behavioural than for physical characteristics. The effects of poor instrument reliability are profound [10].

There are many sources of random error that can affect a scale, and the aim of reliability assessment is to quantify the most important of these [62]. There are many methods of determining reliability (types of reliability), but no one method will account for all types of error associated with a measurement instrument. Consequently, an assessment of the 'reliability' of an instrument usually involves measuring multiple types of reliability [1].

Reliable instruments produce reproducible scores unter the same conditions [50]. This is the methodological explanation for test-retest, intra-rater and inter-rater reliability studies, where the agreement between scores on the same patient at two different points in time (test-retest and intra-rater) and from different observers (inter-rater) are determined, respectively. These studies determine the effect of external influences on scale scores.

When scores are produced by summing the individual scores of multiple items [41], reliability studies need to assess the consistency of performance on these items [25]. For example, a score of 15 on the Barthel Index (range 0–20) can result from many permutations of scores from the ten items. Whilst this total score may be highly reproducible on repeated measurement, if the item scores are inconsistent, the istrument is unreliable. Therefore, the internal consistency of the items within a test cannot be deduced from test-retest, intra-rater or inter-rater reliability studies. Internal sources of measurement error are normally measured using Cronbach's alpha, which determines the extent to which item scores covary [7]. The higher the consistency of performance among items, the higher their convariance and the higher their reliability.

Validity

Whilst reliability assesses whether a test is measuring in a reproducible fashion, it says nothing about what is being measured. Validity concerns the extent to which an instrument is measuring what was intended. For example, does a disability scale actually measure disability?

As with reliability, methods of determining test validity can be considered as internal and external [2]. Internal measures of validity examine scale scores and provid theoretical (rather than empirical) evidence that disability is being measured. External measures of validity examine correlations between the instrument under evaluation and other instruments measuring the same, similar and dissimilar with health entities to provide empirical evidence that disability, and not another entity, is being measured [36]. Many validity studies in the literature only assess external validity by examining correlations with another disability measure. The absence of widely accepted gold standard disability measures highlights the limitations of this methodology and the importance of evidence for both internal and external validity.

Responsiveness

Reliability and validity are fundamental requirements for measurement instruments [19]. However, the field of health measurement is primarily concerned with changes in disability produced by our interventions. This adds another essential dimension to the requirements of our disability measures: can they detect clinical change in the attribute being measured even if that change is small? This property is termed 'responsiveness' [20]. Clearly, the use of poorly responsive instruments in clinical trials will threaten the detection of a treatment effect and may not detect small differences between different treatments. It is perhaps surprising that responsiveness data are rarely reported for commonly used measurement instruments. To add consistency to the above discussion on reliability and validity, we will consider the assessment of responsiveness as internal and external. This is for illustrative purposes rather than by consensus.

Analysis of change scores between two points in time, preferably before and after an intervention of known efficacy, is a common method of assessing responsiveness. We shall term this 'internal responsiveness'. Meaningless raw score changes can be standardized by a number of methods [8]; one of the most fovoured is to divide them by the standard deviation of the baseline scores (time 1) to produce an effect size [35]. In this way, different instruments with different rating scales can be directly compared. Whilst the analysis of change scores in a common method of determining responsiveness, and the larger the effect size the greater the change undergone, it fails to incorporate a clinical perspective. Comparison with an external criterion of change, 'external responsiveness', adds

this missing clinical perspective. One method is to ask patients or raters to quantify the degree of change undergone on a transition question (e.g. mild, moderate or marked) [9]. Change scores can then be equated with this external assesssment to add a clinical perspective to an instrument's responsiveness.

Clinical usefulness

In parallel with these essential components, which contribute to scientific soundness, it is equally important that a scale is clinically useful, i.e. short, easy to understand, quick to administer and easy to interpret.

Many of these points are contained within the recently published recommendations of the National Multiple Sclerosis Society (NMSS) Task Force on Outcome Measures, established following an international meeting in Charleston in 1994 [71]. These state that outcome measures should:

A. Reflect the extent of the MS disease process
B. Be multidimensional to reflect the principal ways in which MS affects an individual
C. Be scientifically sound
D. Be capable of measuring change over time [53]

How do our current scales match up to these requirements?

In any review of scales in MS, it is important to begin with the most frequently used (and most frequently criticized), Kurtzke's EDSS [16, 48, 72], sometimes rather harshly described as the 'tarnished gold standard'. This scale was developed from the Disability Status Scale [38] and is observer- (usually neurologist-) rated. It addresses impairment in ist lower levels and mobility in the higher ones and is of limited reliability and poor responsiveness [53]. The poor inter-rater reliability has lead people to suggest that it is necessary to see quite a large change on the scale (most observers would suggest an entire point) to be convinced that the change is meaningful. As the EDSS is not a linear scale, patients spend more time at some levels than at others. This is the reason used to support a change of 0.5 EDSS points at a level of 5.5 or greater being considered as clinically important, whilst a change of 1 EDSS point is required at EDSS Scores below 5.0.

An important question is whether or not short-term EDSS changes usefully predict long-term disability. Weinshenker et al. [70] suggest that the probability of EDSS change after ramdomization within a limited period of follow-up was most closely correlated with the EDSS at enrolement and that this was a key issue in determining sample size and power calculations.

In more practical terms, although the EDSS has been used as the primary outcome measure in anumber of major studies, the interpretation of the instructions of its use have differed slightly, which may limit comparison across studies. Each study has attempted to address the major issue of interpreting the instructions for use of the EDSS in a slightly different way, which, at least in theory, limits comparison across studies. Despite these criticisms, Kurtzke's EDSS has become a useful shorthand in describing a patient population, and it is fair so say that this was the main reason for ist development almost 40 years ago. Kurtzke himself, in an article in defence of his scale, wryly concludes that the EDSS could be likened to democracy, which has been called the worst form of government – except for all others [40]! As we review the alternatives currently available, you will see that this may well be the case.

Of the other disease-specific scales, the one that has been most commonly used, SCRIPPS Neurological Rating Scale, was developed by Sipe in 1984 [60]. This is better described as an impairment scale, as it is based on the standard neurological examination with an extra category for bladder, bowel and sexual dysfunction. There is a somewhat arbitrary weighting system with high scores for visual, motor, sensory and cerebellar function and low scores for mentation, mood, reflexes and plantar response. Clear guidelines are not available, and although some encouraging reliability data have been reported, there has been little validity and no responsiveness data. A recent paper by the authors comparing it to the EDSS found that the two scales were not well correlated and advised that further psychometric evaluation was necessary [37]. Of the other scales, the Troiano Functional Scale, the Illness Severity Scale and the Incapacity Status Scale are rarely used, and CAMBS, which incorporates four indices: disability, relapse, progression and handicap, is essentially a shorthand description of the patient and was not designed to be an outcome measure [47].

A measure of disability, the Guy's Neurological Disability Scale [59], has recently been developed and has some reliability and validity evaluation. This scale includes 12 areas rated 1–7, which are felt by the neurologists involved to be relevant to the patient with MS. Its responsiveness to change has yet to be evaluated.

The generic scales that are available may be subdivided into those that address specific functions, e.g. upper limb/lower limb; those which address specific symptoms, e.g. fatigue/pain; and those that are more generalized. As far as lower limb measures are concerned, the AI is one of the most commonly used in MS trials. Similar to the EDSS, it is a more precise measure of ambulation for those within the levels 4–6. There is a reasonable inter-rater reliability with a kappa of 0.5–0.7. Another mobility measure is the Ten-Metre Timed Walk, which has been used in a small number of studies, though it is of course limited to ambulant patients. It has, however, considerable test-re-test variability (20±8%). It has recently been compared with the AI, EDSS and the Rivermead Mobility Index [64]. Of all these scales, the Rivermead Mobility Index, which covers many aspects of mobility, including bed

Table 1 Relative responsiveness of disability measures

	Effect size
Functional Independence Measure (FIM)	0.87
FIM+Functional Assessment Measure	0.83
Barthel	0.86
Expanded Disability Status Scale (EDSS)	0.12

Table 2 Extent of patient involvement in a range of scales (*CAMBS* Cambridge Multiple Sclerosis Basis Score, *NDS* Neurological Disability Score, *MSQoL* Multiple Sclerosis Quality of Life, *FAMS* Functional Assessment of Multiple Sclerosis Quality of Life)

Instrument	Patient-driven	Self-report
EDSS	–	–
Scripps	–	–
Troiano	–	–
CAMBS	–	–
Guy's NDS	–	–
MSQoL-54	–/+	+
FAMS	–/+	+

mobility, lying to sitting transfer and gait, was found to be the most responsive and identified change in 39% of the population studied (200 MS patients attending for rehabilitation) as compared with 18% for the AI and 7.5% for the EDSS.

Tests of upper limb function have been used in response to the observation that the EDSS does not adequately evaluate this area. Several tests, including Box and Block and Nine-Hole Peg Test have been used, and it has been suggested by Goodkin et al. [15] that they are more sensitive than the EDSS. Goodkin has gone a step further and developed a multidimensional measure that includes EDSS, AI, Box and Block or Nine-Hole Pegv Test and new or enlarging magnetic resonance imaging (MRI) lesions [17]. There are obvious difficulties in validating such an instrument and in determining how best to combine the results in a clinically meaningful way. More recently, the NMSS Task Force has also proposed a composite measure after a detailed evaluation of the placebo data from the majority of recent therapeutic trials. This is essentially impairment-based and will involve a measure of gait [timed 25-foot (7.6-m) walk], upper limb function (Nine-Hole Peg Test), cognitive function (PASAT 3) and visual function. This composite has not yet been evaluated [54].

Generic measures such as the Barthel Index and Functional Independence Measure have only occasionally been used in stdies in MS and usually in the context of interventions such as therapy input and rehabilitation [14, 54]. The Barthel Index has the particular advantages of having more validity than competing instruments and being simple and easy to use [13]. Wade'92 however, concerns about ist failure to address cognitive function and communication resulted in the development of the Functional Independence Measure [18] and, finally, the Functional Independence/Functional Assessment Measure. Recent studies have been carried out comparing these measures. Surprisingly, they have found that the more comprehensive scales are not more valid, reliable or responsive than the Barthel Index, though all are considerably more responsive than the EDSS (Table 1) [29].

The future

Problems with disability measurement

The definition of disability, whilst beguilingly simple, does not contain a consensus as to which tasks should be considered. Consequently, the term 'disability scale' covers a multitude of different instruments containing different tasks. As the definition of disability is 'loose' disability measures, as we have seen, have also intruded into different concepts such as impairment, handicap and quality of life.

A second and somewhat related issue is whether or not disability is the most appropriate clinical outcome and whether it is perhaps too narrow, ignoring many of the other effects of the disease process on the patient, i.e. limited measure of the impact of the disease. Disability will fail to capture the difficulties with coping and the stigma of disease and will not include the effect of the disease on relationships, family, carers or employment. Many of these aspects are contained within the concepts of health-related quality of life, which, by definition, involve the perspective of the patient.

This raises another important issue. Should the views of patients be taken into account, or should we rely on the well-intentioned, though perhaps somewhat different, perspective of the experienced neurologist. There is a library of evidence to demonstrate that there are fundamental differences between the perspectives of the patient and the physician [52, 61]. A number of neurologists have expressed their views recently in the literature. These range from protecting the patient from the natural history of MS to the prevention of disability [23]. The latter did not receive a favourable response from the MS Society, who protested that the views of patients were not being asked and that neurologists can be somewhat patronizing in their presumption that they know what is best [3]. It would therefore seem appropriate that when developing outcome measure in the future, we attempt to incorporate the views of patients.

In this area, one of the most commonly used scales has been the Medical Outcome Study Short Form 36 Health Survey (SF-36), which has undergone extensive psychometric evaluation and has been found to be both reliable and valid [69]. This scale measures health status in eight dimensions, including physical function, pain, general health, vitality and social functioning. Whilst the SF-36

might provide a superb example of scientifically sound health measurement instrument development, it is important not to assume that ist usefulness is ubiquitous. There is limited information on its application in MS, but there is some concern that it may not be specific enough for this condition, and it has also demonstrated marked floor effects [12] when applied to patients in the higher levels of the EDSS undergoing rehabilitation. The SF-36 has been adapted in an attempt to make it MS-specific by adding 18 items to constitute the Multiple Sclerosis Quality of Life Instrument (MS Qual 54) [65]. Cella and colleagues have developed a new scale, the Functional Assessment of MS Quality of Life Instrument (FAMS) [4] based on a scale used in oncology. The contribution of generic and disease-specific quality-of-life measures has recently been reviewed [66].

Ideally, outcome measure should not only be clinically usefull and scientiically sound but also incorporate the impact of the disease on the patient as seen from the patient's perspective. If we review some of the scales we have been discussing, there is unfortunately very little evidence of patient involvement either in development or completion (Table 2).

Scale development

There is, therefore, a requirement for an outcome measure that is both scientifically sound, clinically useful and incorporates the patient's perspective. In very simple terms, the development of scales to incorporate these essential requirements would involve:

1. Developing a conceptual model: the rationale for and description of the concepts that the measures are intended to address.
2. Item generation: from patient interviews, expert consensus opinion, literature review and review of existing instruments.
3. Item reduction and scale formation: removal of items with poor response rates, very high or low endorsement frequencies, and those which duplicate. The remaining items are then grouped into the most scientifically appropriate combinations to create scales.
4. Instrument evaluation: evaluation of scaling assumptions, reliability, validity and responsiveness.

Conclusion

It is acknowledged that current outcome measures addressing the impact of MS are inadequate. There is growing realization of the need to incorporate the view of the person with MS, both in scale development and in the identification of areas that need to be measured. It is highly unlikely that one measurement instrument will suffice. In parallel, there is an increasing understanding of the fundamental input of psychometric evaluation in order to produce scales that are valid, reliable and responsive. Strict adherence to these criteria should result in outcome instruments that reflect the true impact of the disease on the patient and as a consequence are invaluable tools in the evaluation of future therapeutic intervention.

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Functional Disability Assessment

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The widespread introduction of computers into clinical settings has increased the feasibility of conducting comprehensive functional disability assessment. The Functional Status Questionnaire (FSQ) is a brief, self-administered questionnaire designed to facilitate clinical assessment of functional disability. The FSQ items can be scored by computer using a simple algorithm and summarized into disability index scores. These scales have alpha reliability coefficients of .64 to .82 and substantial convergent validity when used with primary care patients. Disability assessment tools like the FSQ can be adapted easily for clinical use by physical therapists.

Key Words: *Disability evaluation; Physical therapy; Tests and measurements, general.*

The restoration of disabled individuals to their highest level of physical, mental, social, and vocational function and the prevention of disability are important treatment goals for physical therapists. These goals reflect our profession's dual emphasis on impairment-centered treatment, with its focus on repairing the diseased or injured body part and maximizing the function of the impaired individual. Physical therapists are devoting increasing attention to the functional problems of disabled individuals in their physical and social environments. Although physical therapists always have recognized that even after adequately treating an impaired organ or body system some individuals continue to function inadequately but others do well, therapists have not understood precisely why this occurs. Consequently, physical therapists have focused increasing clinical and research interest in this area, highlighting the need for better methods of assessing and monitoring a broad range of patients' physical, emotional, and social or role functions.[1]

The term *function*, as used in this article, refers to the normal or characteristic performance of an individual.[2,3] Functional disability represents aberrations in an individual's usual performance. The focus in functional disability assessment is on the person's behavior rather than on the performance of body parts or organ systems. Function represents one important aspect of the individual's overall health.[4]

To define further the concept of function for clinical or research use, we divided it into three distinct categories or dimensions. The term *physical function* represents the individual's sensorimotor performance. Physical function is the dimension of function that receives the most attention from physical therapists. Walking, climbing stairs, performing housework, shopping, and preparing meals are all examples of physical function. Tasks concerned with fundamental daily activities, such as self-care or basic mobility, usually are defined as "basic" activities of daily living. More complex tasks such as housekeeping are called "instrumental" ADL.[1] A person's affect and effectiveness in coping with life's stresses represent the *emotional function* category. Level of anxiety, life satisfaction, and happiness are all components of emotional function. *Social function*, the final category, encompasses an individual's social interactions and performance of social roles or obligations. Parenting or being employed outside the home are two of the many examples of an individual's function in social roles. The term *handicap* is used sometimes to mean a disruption in an individual's ability to perform accepted social roles.[5]

Functional disability refers to deviations from the normal or customary function of an individual within any of the three dimensions just described. A functional disability may be physical (eg, difficulty with walking or inability to walk), emotional (eg, anxiety or depression), or social (eg, not performing one's occupation). *Disability* refers to a loss in function or performance of the individual and can be differentiated clearly from impairments that are aberrations in organs or body systems.

Three common reasons for assessing functional disability are[6]

1. **Description.** Descriptive data usually are used to establish baseline standards that can be used for determining community needs, setting goals for patient treatment, or establishing benchmarks against which to test hypotheses about the effectiveness of specific health interventions.
2. **Screening and assessment.** Screening and assessment refers to a detailed review of data on function to guide decisions about the nature of the problem and specific treatment plans. A measure designed for screening and assessing functional disability must be more detailed than one designed to describe the phenomenon. The clinical significance of different scores usually should be specified in screening and assessment instruments.
3. **Monitoring.** Monitoring involves repeated measurement to detect change in phenomena over time. Monitoring functional disability seldom requires the same level of detail as assessment, provided that the variables expected to change can be identified. Monitoring instruments must be sufficiently sensitive, however, to detect the level or degree of change that is of interest. Monitoring instruments frequently are used to test hy-

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potheses about the effects of treatments on functional disability.

COMPREHENSIVE FUNCTIONAL ASSESSMENT

The computer is being relied on increasingly for the storage, integration, and easy retrieval of complex clinical information.[7] The computer can be extremely useful for a variety of tasks. Physical therapists, for example, must be able not only to review information about a patient's functional disability at a particular point in time (a task easily accomplished with most existing medical record systems) but also to place the findings from a particular assessment in the context of their previous assessments in addition to other professionals' assessments. The computer is equipped ideally to facilitate this process. The computer easily can display trends in function permitting the therapist to compare a patient's function with past functional data to detect improvement, deterioration, or lack of change. This feature is extremely useful when monitoring large patient caseloads. The computer also can be used to integrate complex patient assessment data from many different sources to facilitate interdisciplinary and interagency communication.

This article describes one approach to functional disability assessment that was developed as a practical clinical tool for primary care physicians and nurses interested in screening for and monitoring change in a patient's functional disability. This type of approach can be adapted readily and can be expanded for use by physical therapists working in a wide range of clinical settings.

FUNCTIONAL STATUS QUESTIONNAIRE

The Functional Status Questionnaire (FSQ) is a brief, self-administered questionnaire developed by researchers from the Beth Israel Hospital in Boston, Mass, and from the University of California at Los Angeles (UCLA).[8] Adapted from existing functional assessment instruments, the FSQ provides a comprehensive assessment of physical, psychological, and social or role functions for mentally competent ambulatory patients.[9-11] The FSQ was designed as a clinical tool to screen for functional disability and to monitor change in function. The FSQ can be administered in a clinical setting or in a patient's home and can be completed in about 15 minutes.

Summary Report

Using a simple algorithm, the FSQ's 34 core items are scored by computer to produce six summary scale scores and six single-item scores (Appendix 1).

Each scale score is derived as follows:

$$SS = \frac{\sum_{i=1}^{n} (yi) - n}{n} \times \frac{100}{k}$$

where SS is the transformed FSQ scale score, yi is the individual questionnaire response score, n is the number of questions in the scale for which valid information is available, and k is the maximum minus the minimum valid response score.

Valid information consists of nonzero response values. A zero value or missing information represents invalid data for that item. Transformed scale values range from 0 to 100, with a score of 100 indicating the absence of any functional disability (ie, maximum function). The one-page report presents each transformed score on a visual analog scale along with single-item scores (Appendix 2).

A "warning zone," devised to help clinicians interpret individual FSQ scores, appears under each visual analog scale as a series of asterisks. Scale scores that fall within the warning zone represent important functional disabilities. The patient whose FSQ report is illustrated in Appendix 2, for example, achieved a score of 56 on performance of basic ADL. This score is within the warning range and represents a problem in eating, dressing, and bathing.

Warning zones for all except one of the FSQ scales were determined through consultation with a panel of experienced physicians from the Beth Israel Hospital, the UCLA, and the research teams. Panel members examined items comprising each scale singly and in combination and reached a consensus on specific responses of potential clinical concern. These responses then were translated into warning zones for each scale. The mental health warning zone was based on population norms developed in the Rand Health Insurance Experiment.[12]

The FSQ report concludes with a computer-generated summary that indicates the patient's warning zone status on each scale. Specific functional disabilities are listed for each scale score that falls within the warning zone, thus enabling the clinician to identity specific problem areas. The patient whose FSQ report is illustrated in Appendix 2, for example, reported problems in nine specific functional activities. We present data below from an earlier study in which we used the FSQ to assess and monitor primary care patients.[8]

Study Example

Subjects. Between May 1, 1983, and March 31, 1984, we administered the FSQ to 1,153 ambulatory primary care patients. Of this total, 497 patients were regular users of an internal medicine group practice of faculty and staff at the Beth Israel Hospital, and 656 patients were regular users of 76 community-based internal medicine practices in Los Angeles, Calif. Patients were eligible for inclusion in the sample if they 1) reported some difficulty on one or more of the 12 activities included in the basic ADL, intermediate ADL, or social activity scales on the FSQ; 2) had made two or more visits to the practices in the preceding year; 3) were aged 18 years or older; 4) could be reached by telephone; 5) could speak and read English; and 6) had no significant temporal or spacial disorientation.

Participants' ages ranged from 19 to 96 years; over 60% of the sample were 60 years of age or older. Almost 75% of the participants were female; 70% were Caucasian. Eleven percent reported an elementary school education or less, but 30% had attended college. Forty-five percent were married, and 30% were employed. Almost 60% had earned less than $16,000 during the preceding calendar year.

Reliability of questionnaire. Although some degree of measurement error is inevitable in any measure, high reliability of FSQ information is essential if it is to be used clinically. Reliability is the extent to which variation in scores reflects real differences rather than random fluctuation. One way to assess the reliability of a scale is to measure its internal consistency. We examined the internal consistency of the six FSQ scales using the alpha coefficient, which ranges from 0 to 1 where 1 equals perfect consistency.

Internal consistencies for the six FSQ scale scores ranged from .64 to .82 (Tab. 1). The basic ADL, intermediate ADL, and mental health scales achieved the highest reliabilities. Work performance, social activity, and quality of interaction scales were less reliable for participants

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65 years of age and older; reliability of other scale scores did not decrease with advancing age. We found no sex differences in internal consistency reliability.

Correlation results. As an indicator of convergent validity, we hypothesized that FSQ indexes of similar content would display substantial positive correlations with each other (eg, basic ADL and instrumental ADL) and that those with less similar content (eg, basic ADL and mental health) would be less positively correlated in this sample. Table 2 displays the correlations among the six FSQ indexes. Observed correlations are positive and display the hypothesized pattern. Highly correlated inter-index relationships are evident among the three areas that require substantial physical ability—basic ADL, instrumental ADL, and social activity. As anticipated, the more affective areas—quality of interaction and mental health—also are highly related. Correlations across indexes of dissimilar content are substantially lower. Evidence of the FSQ's construct validity based on predicted relationships with measures of independent health-related variables are presented elsewhere.[8]

TABLE 1
Internal Consistency Reliability Estimates for Functional Status Questionnaire Scales

Scale	n	No. of Items	Internal Consistency[a]
Basic ADL	1,101	3	.79
Intermediate ADL	1,047	6	.82
Mental health	1,087	5	.81
Work performance	322	6	.65
Social activity	1,047	3	.65
Quality of interaction	1,088	5	.64

[a] Alpha coefficient.

TABLE 2
Correlation[a] Among Functional Status Questionnaire Indexes

Scale	Basic ADL	Instrumental ADL	Mental Health	Work Performance	Social Activity	Quality of Interaction
Basic ADL	1.0	.68	.24	.28	.62	.17
Instrumental ADL		1.0	.24	.40	.75	.14
Mental health			1.0	.20	.28	.58
Work performance				1.0	.23	.16
Social activity					1.0	.18
Quality of interaction						1.0

[a] Pearson product-moment correlation coefficient.

DISCUSSION

The FSQ is a functional assessment instrument designed specifically for clinical use. By summarizing scores in a one-page, computer-generated report, the FSQ presents a comprehensive view of a patient's function in a format that can be interpreted quickly and easily. This feature substantially increases the feasibility of using the questionnaire in busy clinical settings. In the Beth Israel Hospital's Ambulatory Care Practice, for instance, clinicians can request that a patient complete an FSQ in the waiting area before the examination. In just a few minutes, a clerk can enter the data and produce the FSQ report. Used in this manner, the report form is available to the health care provider when seeing the patient.

Primary care clinicians use the report form as both a screening and monitoring device. The scale scores highlight areas of potential functional limitation at a glance. The clinician can either explore these areas in detail with the patient or refer the patient to another health care professional for more detailed assessment and treatment. Considerable time can be saved by quickly focusing the clinician's attention on particular trouble areas. A patient's progress or deterioration can be monitored by comparing current scale scores with past FSQ report forms available in the patient's medical record. Similar approaches could be developed easily for use by the physical therapist.

The data presented in the study example demonstrate that the FSQ produces reliable subscales. The FSQ's properties, however, can be improved. Highest reliability is achieved in the basic ADL, intermediate ADL, and mental health scales. This finding is not surprising because the dimensions of physical and psychological function are more homogeneous and have received the most attention in previous research.[6] In contrast, the concepts of social and role function are less homogeneous, and consensus about how to measure them has not been obtained. That the work performance, social activity, and quality of interaction scales achieved a lower level of reliability, therefore, is not surprising.

The reliability of all six FSQ scales was above .60, an acceptable range for group comparisons with self-administered instruments of this nature.[13] Moreover, these measures achieved reliabilities similar to those estimated for measures with similar content and numbers of items. An alpha coefficient of .82 was achieved for a five-item mental health scale used in a recent telephone interview survey of a national sample of persons aged 18 years and older.[14] Reliability estimates for the Sickness Impact Profile were .62 for the ambulation-locomotion subscale, .52 for the mobility-confinement subscale, and .82 for the body movement scale.[15]

For comparisons across individual patients, however, higher reliability would be desirable. The current FSQ scales fall short of the accepted level of reliability for use in individual comparisons chiefly because of the relatively small number of items in each subscale. Most clinicians, however, probably will use these measures to screen or monitor functional disability in the same patient or across groups of patients, rather than for comparisons between individual patients.

A comprehensive functional assessment requires thorough and careful inquiry. Acquiring this information as part of an initial evaluation and history takes time and may not always be feasible. Standardized instruments for measuring functional disability are an attractive alternative, and many are readily available.[16–25] Most existing instruments for measuring functional disability, however, were developed for inpatient rehabilitation settings or for specific research projects. Although these tools are quite detailed, they are often narrow in scope, frequently focusing only on basic ADL. More comprehensive instruments than the FSQ are available.[10,26–29] Most, however, require considerable time to administer and, therefore, are not ideal for use in many

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APPENDIX 1
Functional Status Questionnaire[a]

Category	Item
PHYSICAL FUNCTION	During the past month have you had difficulty:
Basic Activities of Daily Living	taking care of yourself, that is, eating, dressing, or bathing?
	moving in and out of a bed or chair?
	walking indoors, such as around your home?
Intermediate Activities of Daily Living	walking several blocks?
	walking one block or climbing one flight of stairs?
	doing work around the house, such as cleaning, light yard work, home maintenance?
	doing errands, such as grocery shopping?
	driving a car or using public transportation?
	doing vigorous activities, such as running, lifting heavy objects, or participating in strenuous sports?
Responses: usually did with no difficulty (4), usually did with some difficulty (3), usually did with much difficulty (2), usually did not do because of health (1), usually did not do for other reasons (0).	
PSYCHOLOGICAL FUNCTION	During the past month:
Mental Health	have you been a very nervous person?
	have you felt calm and peaceful?*
	have you felt downhearted and blue?
	were you a happy person?*
	did you feel so "down in the dumps" that nothing could cheer you up?
Responses: all of the time (1), most of the time (2), a good bit of the time (3), some of the time (4), a little of the time (5), none of the time (6).	
SOCIAL-ROLE FUNCTION	During the past month have you:
Work Performance (for those employed during the previous month)	done as much work as others in similar jobs?*
	worked for short periods of time or taken frequent rests because of your health?
	worked your regular number of hours?*
	done your job as carefully and accurately as others with similar jobs?*
	worked at your usual job, but with some changes because of your health?
	feared losing your job because of your health?
Responses: all of the time (1), most of the time (2), some of the time (3), none of the time (4).	
Social Activity	During the past month have you had difficulty:
	visiting with relatives or friends?
	participating in community activities, such as religious services, social activities, or volunteer work?
	taking care of other people, such as family members?
Responses: usually did with no difficulty (4), usually did with some difficulty (3), usually did with much difficulty (2), usually did not do because of health (1), usually did not do for other reasons (0).	
Quality of Interaction	During the past month did you:
	isolate yourself from people around you?
	act affectionate toward others?*
	act irritable toward those around you?
	make unreasonable demands on your family and friends?
	get along well with other people?*
Responses: all of the time (1), most of the time (2), a good bit of the time (3), some of the time (4), a little of the time (5), none of the time (6).	

Single-item questions:

Which of the following statements best describes your work situation during the past month? Responses: working full-time, working part-time, unemployed, looking for work, unemployed because of my health, retired because of my health, retired for some other reason.

During the past month, how many days did illness or injury keep you in bed all or most of the day? Response: 0–31 days.

During the past month, how many days did you cut down on the things you usually do for one-half day or more because of your illness or injury? Response: 0–31 days.

During the past month, how satisfied were you with your sexual relationships? Responses: very satisfied, satisfied, not sure, dissatisfied, very dissatisfied, did not have any sexual relationships.

How do you feel about your own health? Responses: very satisfied, satisfied, not sure, dissatisfied, very dissatisfied.

During the past month, about how often did you socialize with friends or relatives, that is, go out together, visit in each other's homes, or talk on the telephone? Responses: every day, several times a week, about once a week, two or three times a month, about once a month, not at all.

[a] Asterisk indicates that scores are reversed.

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APPENDIX 2
Sample Functional Status Report

PHYSICAL FUNCTION	WARNING ZONE = *********
1. Basic Activities of Daily Living	0 . . . . . 56----------100 **********
2. Intermediate Activities of Daily Living	0 . . . 7----------100 **********
PSYCHOLOGICAL FUNCTION	
1. Mental Health	0 . . . . . 36----------100 **********
ROLE FUNCTION	
1. Employment Status	RETIRED BECAUSE OF HEALTH
2. Work Performance	Not Applicable
SOCIAL FUNCTION	
1. Social Activity	0 ----------100 **********
2. Quality of Interaction	0 . . . . . 56----------100 **********
3. Frequency of Contact	EVERY DAY
BED REST DAYS	0
RESTRICTED DAYS	31
SEXUAL RELATIONSHIPS	DID NOT HAVE ANY SEXUAL RELATIONSHIPS
FEELING ABOUT HEALTH	VERY DISSATISFIED

SUMMARY

THE PATIENT SCORED IN THE ACCEPTABLE RANGE OF THE FOLLOWING SCALES: NONE.
RESPONSES TO THE FUNCTIONAL STATUS QUESTIONNAIRE REVEAL THE FOLLOWING GENERAL AREAS OF CONCERN: BASIC ADL, INTERMEDIATE ADL, MENTAL HEALTH, SOCIAL ACTIVITY, QUALITY OF INTERACTION.
THE PATIENT REPORTED SIGNIFICANT PROBLEMS WITH THE FOLLOWING ACTIVITIES: EATING, DRESSING, BATHING, WALKING ONE BLOCK, WORKING AROUND HOUSE, DOING ERRANDS, DRIVING A CAR, VISITING RELATIVES OR FRIENDS, PARTICIPATING IN COMMUNITY ACTIVITIES, TAKING CARE OF OTHER PEOPLE, DOING VIGOROUS ACTIVITIES.

clinical settings. Although most existing functional assessment instruments can be modified for computer scoring, we know of few instances where a revision actually has occurred.[29]

Upgrading the quality of functional disability data and making such data readily accessible to the practicing physical therapist represents a considerable challenge. Fortunately, functional disability information is particularly amenable to structured assessment and computer processing. The variables are specific and can be well defined. The findings for these variables generally fall into discrete responses, such as "independent in dressing" or "unable to walk." Functional disability data typically are not recorded in long narrative discourses.

Numerous issues need to be addressed to enhance the FSQ's usefulness as a screening assessment or monitoring tool for physical therapists. The FSQ may not be sufficiently specific and sensitive to meet the needs of physical therapists. The number of items, for instance, may need to be expanded to provide a richer, detailed assessment of the patient's physical function for specific conditions. Also, by expanding the number of items in each scale, the index can be made more reliable. This change will enhance the clinician's ability to use the FSQ for both individual and group comparisons. The time frame also may need to be shortened. Data on the test-retest reliability of FSQ scores over time in the absence of change in function should be examined as well. Its validity in other settings and with different types of patients should be examined.

CONCLUSION

The widespread introduction of the computer into clinical practice is enabling comprehensive functional assessments without sacrificing the clinician's ability to summarize and interpret the data quickly. Improving clinical assessment of functional disability and making such data readily accessible to the physical therapist not only will enhance the physical therapist's ability to maximize a patient's functional abilities but also will facilitate clinical investigation of this important concept.

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Sport-Specificity of Knee Scoring Systems to Assess Disability in Anterior Cruciate Ligament–Deficient Athletes

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We compared the outcome measures of three knee scoring systems currently used to measure disability in anterior cruciate ligament (ACL)–deficient athletes. Twenty-nine ACL-deficient athletes completed three scoring systems (the Lysholm Knee Scoring System, a modified version of the Cincinnati Knee Scoring System, and the Knee Outcome Survey). Results demonstrate statistically significant mean differences and linear relationships between the outcome measures for the three scoring systems. The Knee Outcome Survey appears to provide valid measures of disability and indicates that our subjects functioned well with activities of daily living but became symptomatic and functionally limited with sports. The outcome measures also indicate that the Lysholm system is more specific to activities of daily living, while the modified Cincinnati is more specific to sports. We recommend that standard scoring systems be developed to provide measures of functional disability in athletes who experience knee injuries.

The use of self-administered knee scoring systems is becoming more widespread in the reporting process for the functional outcome of anterior cruciate ligament (ACL) tears both before and after reconstructive surgery (4–13). The knee scoring systems are used to numerically rate symptoms such as pain, swelling, instability, and other related functional limitations during both sports and activities of daily living. The knee scoring systems provide an initial measurement of disability and may be used temporally throughout the rehabilitation process, providing a time–series comparison of symptomatic resolution and functional progression (2, 4). In addition, with the advent of managed care, the outcome measure may also be used by insurance companies to monitor progress and justify reimbursement privileges for athletes undergoing rehabilitation.

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Original knee scoring systems used binary point scoring systems for measuring disability (8), while more current models use cumulative point scoring systems (4, 6, 9–11, 13). The Lysholm Knee Scoring System (LKS) and the Cincinnati Knee Scoring System (CKS) are used widely, whereas the Knee Outcome Survey (KOS) is a relatively new scoring system developed at the University of Pittsburgh (4, 6). Scoring systems function as questionnaires, and each question is numerically graded with more points allotted for less symptoms and greater function. The outcome measure for these scoring systems provides a measure of disability for the ACL-deficient limb. Clinicians then use this measure to categorize the limb as excellent (91–100 points), good (82–90 points), fair (60–81 points), and poor (≤59 points) (7, 13). Comparisons between types of scoring systems have revealed discrepancies in measures with ACL-deficient athletes (1). These discrepancies have created considerable difficulty when researchers attempt to categorize outcome measures (1). The purpose of this retrospective clinical investigation was to compare and correlate the outcome measures of three knee scoring systems currently used to measure functional disability in ACL-deficient athletes. We hypothesized that the outcome measures of the three knee scoring systems would demonstrate statistically significant mean differences and linear relationships.

Materials and Methods

Subjects

Sample size was determined a priori using a power analysis for a projected alpha of .05 and medium effect size. A sample size of 30 subjects was found to be adequate to attain a power of .80; however, 1 subject was discounted due to a misdiagnosis of an ACL tear. Twenty-nine ACL-deficient athletes (15 males, 14 females) participated in this investigation. Prior to their injury, 21 of the subjects were recreational athletes (72%), whereas 8 (28%) participated competitively. The subjects ranged in age from 18 to 50 years (mean 28.7 ± 1.7 years) and were tested at an average of 41.7 ± 11.7 months (3.5 ± 1.0 years) after injury. Subjects spent an average of 2.4 ± 0.33 months in postinjury rehabilitation. Twenty-four subjects (83%) indicated that they had significantly decreased their level of sport activity as a result of the injury, although Tegner activity ratings indicated that the sample remained physically active (Levels 0–3 activities of daily living, $n = 12$; Levels 4–6 recreational sports, $n = 13$; Levels 7–10 competitive sports, $n = 4$).

Objective measures of knee status were assessed prior to completion of the knee scoring systems by a certified athletic trainer. These data are listed in Table 1. Objective tests included anterior laxity, thigh atrophy, strength, function, and episodes of instability. The bilateral difference for anterior laxity was measured using

Table 1 Descriptive Data for Subjects

Objective measure			Value
Anterior laxity (bilateral difference, mm)			5.6 ± 2.7
Thigh girth (bilateral difference, cm)			0.87 ± 1.3
Strength index (%)			87 ± 18
Hop index (%)			84 ± 14
Episodes of instability			
0 episodes	1–5 episodes	6–15 episodes	> 15 episodes
9 (31%)	8 (28%)	5 (17%)	7 (24%)

the Stryker Knee Laxity Tester (Stryker, Kalamazoo, MI). Quadriceps strength was assessed isometrically as peak force generation (foot-pounds) using a dynamometer (Cybex II dynamometer, Lumex, Inc., Ronkonkoma, NY). The measure was recorded as the quotient between ACL-deficient and uninjured limbs and will be referred to as the strength index. Function was assessed using the one-legged hop for distance test. The measure was recorded as the quotient between the ACL-deficient and uninjured limbs and is referred to as the hop index. Episodes of instability were measured as the absolute number of times the knee gave way after sustaining the initial injury. All ACL tears were sport related. Nine (31%) subjects underwent arthroscopic exploratory surgery; 5 (17%) had a partial medial meniscectomy, and 2 had a Grade III medial collateral ligament (MCL) tear, with one of these tears being repaired.

The initial clinical diagnosis of ACL deficiency in each athlete was made by an orthopedic surgeon who used contemporary diagnostic procedures. The subjects were tested in the postacute stage after the initial injury and were then completing or had completed a consistent rehabilitation protocol for ACL deficiency emphasizing hamstring strengthening with functional progression. The postacute stage was characterized by the subject having no acute symptoms of inflammation, pain, or limitations in range of motion. Subjects reviewed and signed a consent form approved by the Human Subjects Committee.

Knee Scoring Systems

The scoring systems used in this study were self-administered, and each patient randomly completed three separate knee scoring systems with standardized instructions provided. The scoring systems used in this study were the Lysholm Knee Scoring System (LKS), a modified version of the Cincinnati Knee Scoring System (CKS), and the Knee Outcome Survey (KOS), which consists of two separate scoring systems: the Activities of Daily Living Scale (ADLS) and the Sports Activity Scale (SAS). The cumulative score (mean ± *SD*) for each system provides a measure of disability or indicates the functional outcome for the ACL-deficient limb, comparing the status of the limb prior to injury or surgery to the current status of the limb. Higher mean scores indicate a lower level of disability.

Lysholm Knee Scoring System (LKS). The LKS is a popular scoring system used following knee injury and/or surgery (Figure 1). The system consists of eight items related to common symptoms and functional limitations experienced by individuals who sustain a knee ligament injury (7, 12, 13).

Modified Cincinnati Knee Scoring System (CKS). The modified CKS is a questionnaire that measures the patient's level of activity (intensity and frequency) as well as symptoms and functional limitations associated with both sports and activities of daily living (Figure 2) (9–11).

Limp	None	5	Pain	None	25
(5 points)	Slight or periodical	3	(25 points)	Inconstant and slight during heavy exertion	20
	Severe and constant	0		Marked during heavy exertion	15
Support	None	5		Marked on or after walking more than 2 km	10
(5 points)	Cane or crutch	2		Marked on or after walking less than 2 km	5
	Weight-bearing impossible	0		Constant	0
Locking	No locking or no catching sensations	15	Swelling	None	10
(15 points)	Catching sensations but no locking	10	(10 points)	On heavy exertion	6
	Occasional locking	6		On normal exertion	2
	Frequently	2		Constant	0
	Locked on exam.	0	Stair-climbing	No problems	10
			(10 points)	Slightly impaired	6
Instability	No giving way	25		One step at a time	2
(25 points)	Rarely, during sports or heavy exertion	20		Impossible	0
	Frequently, during sports or heavy exertion	15	Squatting (5 points)	No problems	5
				Slightly impaired	4
				Not beyond 90°	2
	Occasionally in daily activities	10		Impossible	0
	Often in daily activities	5			
	At every step	0			

Figure 1 — Lysholm Knee Scoring System. From "Ratings Systems in the Evaluation of Knee Ligament Injuries" by Y. Tegner and J. Lysholm, 1985, *Clinical Orthopaedics*, 198, pp. 43-49. Permission granted by Lippincott-Raven Publishers, Philadelphia.

SPORTS ACTIVITY

Last name _____ SS# _____

Please check the boxes that indicate your level of sports activity before and after your injury, your highest level after surgery, and your current level of sports activity.

Before Injury	After Injury	Highest Post-op	Current Level	
				Level 1 (4-7 days/week)
100 ☐	100 ☐	100 ☐	100 ☐	Jumping, hard pivoting, cutting
95 ☐	95 ☐	95 ☐	95 ☐	Running, twisting, turning
90 ☐	90 ☐	90 ☐	90 ☐	No running, twisting, jumping
				Level 2 (1-3 days/week)
85 ☐	85 ☐	85 ☐	85 ☐	Jumping, hard pivoting, cutting
80 ☐	80 ☐	80 ☐	80 ☐	Running, twisting, turning
75 ☐	75 ☐	75 ☐	75 ☐	No running, twisting, jumping
				Level 3 (1-3 times/month)
65 ☐	65 ☐	65 ☐	65 ☐	Jumping, hard pivoting, cutting
60 ☐	60 ☐	60 ☐	60 ☐	Running, twisting, turning
55 ☐	55 ☐	55 ☐	55 ☐	No running, twisting, jumping
				Level 4 (no sports)
40 ☐	40 ☐	40 ☐	40 ☐	Jumping, hard pivoting, cutting
20 ☐	20 ☐	20 ☐	20 ☐	Running, twisting, turning
0 ☐	0 ☐	0 ☐	0 ☐	No running, twisting, jumping ☐

Note on activity levels
Jumping, hard pivoting, cutting includes basketball, football, gymnastics, soccer.
Running, twisting, turning includes tennis, hockey, skiing, wrestling.
No running, twisting, jumping includes cycling, swimming, golf.

If your level of sports activity now is less than that before your injury, is this because of your knee? ☐ Yes ☐ No

Do you currently wear a knee brace when participating in sports? ☐ Yes ☐ No

Figure 2 — Modified Cincinnati Knee Scoring System. From "A Rationale for Assessing Sports Activity Levels and Limitations in Knee Disorders" by F.R. Noyes, S.D. Barber, and L.A. Mooar, 1989, *Clinical Orthopaedics and Related Research*, 264, pp. 238-249. Permission granted by Lippinott-Raven Publishers, Philadelphia. The original Cincinnati Knee Scoring System was published in "Functional Disability in the Anterior Cruciate Insufficient Knee Syndrome: Review of Rating Systems and Projected Risk Factors in Determining Treatment" by F.R. Noyes, G.H. McGinniss, and L.A. Mooar, 1984, *Sports Medicine*, 1, 278-302.

SPORTS FUNCTION

Please indicate any difficulty you have during

Straight running	Jumping/landing on leg	Hard twists/cuts/pivots
☐ Fully competitive	☐ Fully competitive	☐ Fully competitive
☐ Some limitations	☐ Some limitations	☐ Some limitations
☐ Definite limitations	☐ Definite limitations	☐ Definite limitations
☐ Unable to perform	☐ Unable to perform	☐ Unable to perform
☐	☐	☐ ☐

SYMPTOMS

Last name _____ SS# _____

Directions: Using the key (at right), check the appropriate boxes on the scales below which indicate the highest level you can reach without having symptoms.

Key Scale	Description
10	Normal knee, no limitations
8	Able to do moderate activities with running, turning, or jumping; symptoms with strenuous activities
6	Able to do light activities with no running, turning, or jumping; symptoms with moderate activities
4	Able to do activities of daily living; symptoms with light activities
2	Moderate symptoms (frequent, limiting) with activities of daily living
0	Severe symptoms (constant) with activities of daily living

Pain

10 8 6 4 2 0 ☐

Swelling (actual fluid in knee; obvious puffiness)

10 8 6 4 2 0 ☐

Partial giving way (no fall to the ground)

10 8 6 4 2 0 ☐

Full giving way (knee collapses and you fall to the ground)

10 8 6 4 2 0 ☐

Figure 2 — (continued).

Following my last visit to the doctor, I am

☐ Making good progress ☐ Slowly progressing
☐ Staying the same ☐ Having worse symptoms ☐ Does not apply

On a scale of 1 to 100, I would rate my knee as a _____.

Would you be willing to undergo this procedure again? ☐ Yes ☐ No

Name _____ SS# _____

Date of exam _____

Sports activity (20 points)	_____ /5		_____
Sports function (30 points)			
Straight running	_____		
Jumping/landing on leg	_____		
Hard twists/cuts/pivots	_____		_____
Symptoms (50 points)			
Pain	_____	_____	
Swelling	_____	_____	
Partial giving way	_____ × 1.5	_____	
Full giving way	_____ × 1.5	_____	_____
Subjective knee rating			/100
Personal rating			/100

Figure 2 — (continued).

The Knee Outcome Survey (KOS). The Knee Outcome Survey (KOS) is a self-report instrument consisting of two separate scales to assess disability during activities of daily living and sports. The scales are separated in an attempt to delineate between symptoms and functional limitations that occur during sports and activities of daily living.

The KOS—Activities of Daily Living Scale. The Activities of Daily Living Scale (ADLS) includes items related to symptoms and functional limitations during activities of daily living that are a direct result of an individual's knee injury (Figure 3) (4, 6). Symptoms on the scale include pain, crepitus, stiffness, swelling, instability, and weakness. Responses for each item are graduated in terms of

Knee Outcome Survey—Activities of Daily Living Scale

The following questionnaire is designed to determine the symptoms and limitations that you experience because of your knee while you perform your usual *daily activities*. Please answer each question by *checking the one statement that best describes you over the last 1 to 2 days*. For a given question, more than one of the statements may describe you, but please mark only the statement that best describes you during your usual daily activities.

Symptoms:

1. To what degree does pain in your knee affect your daily activity level?
   — I never have pain in my knee.
   — I have pain in my knee but it does not affect my daily activity.
   — Pain affects my activity slightly.
   — Pain affects my activity moderately.
   — Pain affects my activity severely.
   — Pain in my knee prevents me from performing all daily activities.
2. To what degree does grinding or grating of your knee affect your daily activity level?
   — I never have grinding or grating in my knee.
   — I have grinding or grating in my knee, but it does not affect my daily activity.
   — Grinding or grating affects my activity slightly.
   — Grinding or grating affects my activity moderately.
   — Grinding or grating affects my activity severely.
   — Grinding or grating in my knee prevents me from performing all daily activities.
3. To what degree does stiffness in your knee affect your daily activity level?
   — I never have stiffness in my knee.
   — I have stiffness in my knee, but it does not affect my daily activity.
   — Stiffness affects my activity slightly.
   — Stiffness affects my activity moderately.
   — Stiffness affects my activity severely.
   — Stiffness in my knee prevents me from performing all daily activities.
4. To what degree does swelling in your knee affect your daily activity level?
   — I never have swelling in my knee.
   — I have swelling in my knee, but it does not affect my daily activity.
   — Swelling affects my activity slightly.
   — Swelling affects my activity moderately.
   — Swelling affects my activity severely.
   — Swelling in my knee prevents me from performing all daily activities.
5. To what degree does slipping of your knee affect your daily activity level?
   — I never have slipping of my knee.
   — I have slipping of my knee, but it does not affect my daily activity.
   — Slipping of my knee affects my activity slightly.
   — Slipping of my knee affects my activity moderately.
   — Slipping of my knee affects my activity severely.
   — Slipping of my knee in my knee prevents me from performing all daily activities.

Figure 3 — Knee Outcome Survey: Activities of Daily Living Scale. From "The Knee: Ligamentous and Meniscal Injuries" by J.J. Irrgang, M.R. Safran, and F.H. Fu, in *Athletic Injuries and Rehabilitation* (pp. 623-692) by J.E. Zachazewski, D.J. Magee, and W.S. Quillen (Eds.), 1996, Philadelphia: W.B. Saunders Co.

6. To what degree does buckling in your knee affect your daily activity level?
   - I never have buckling in my knee.
   - I have buckling in my knee, but it does not affect my daily activity.
   - Buckling in my knee affects my activity slightly.
   - Buckling in my knee affects my activity moderately.
   - Buckling in my knee affects my activity severely.
   - Buckling in my knee prevents me from performing all daily activities.

7. To what degree does weakness or lack of strength of your leg affect your daily activity level?
   - My leg never feels weak.
   - My leg feels weak, but it does not affect my daily activity.
   - Weakness affects my activity slightly.
   - Weakness affects my activity moderately.
   - Weakness affects my activity severely.
   - Weakness of my leg prevents me from performing all daily activities.

Functional Disability with Activities of Daily Living

8. How does your knee affect your ability to walk?
   - My knee does not affect my ability to walk.
   - I have pain in my knee when walking, but it does not limit my ability to walk.
   - My knee prevents me from walking more than 1 mile.
   - My knee prevents me from walking more than 1/2 mile.
   - My knee prevents me from walking more than 1 block.
   - My knee prevents me from walking.

9. Because of your knee, do you walk with crutches or a cane?
   - I can walk without crutches or a cane.
   - My knee causes me to walk with one crutch or a cane.
   - My knee causes me to walk with two crutches.
   - Because of my knee, I cannot walk, even with crutches.

10. Does your knee cause you to limp when you walk?
    - I can walk without a limp.
    - Sometimes my knee causes me to walk with a limp.
    - Because of my knee, I cannot walk without a limp.

11. How does your knee affect your ability to go up stairs?
    - My knee does not affect my ability to go up stairs.
    - I have pain in my knee when going up stairs, but it does not limit my ability to go up stairs.
    - I am able to go up stairs normally, but I need to rely on use of a railing.
    - I am able to go up stairs one step at a time with the use of a railing.
    - I have to use crutches or a cane to go up stairs.
    - I cannot go up stairs.

12. How does your knee affect your ability to go down stairs?
    - My knee does not affect my ability to go down stairs.
    - I have pain in my knee when going down stairs, but it does not limit my ability to go down stairs.
    - I am able to go down stairs normally, but I need to rely on use of a railing.
    - I am able to go down stairs one step at a time with the use of a railing.
    - I have to use crutches or a cane to go down stairs.
    - I cannot go down stairs.

Figure 3 — (continued).

13. How does your knee affect your ability to stand?
    - My knee does not affect my ability to stand. I can stand for unlimited amounts of time.
    - I have pain in my knee when standing, but it does not limit my ability to stand.
    - Because of my knee, I cannot stand for more than 1 hour.
    - Because of my knee, I cannot stand for more than 1/2 hour.
    - Because of my knee, I cannot stand for more than 10 minutes.
    - I cannot stand because of my knee.

14. How does your knee affect your ability to kneel on the front of your knee?
    - My knee does not affect my ability to kneel on the front of the knee. I can kneel for unlimited amounts of time.
    - I have pain when kneeling on the front of my knee, but it does not limit my ability to stand.
    - I cannot kneel on the front of my knee for more than 1 hour.
    - I cannot kneel on the front of my knee for more than 1/2 hour.
    - I cannot kneel on the front of my knee for more than 10 minutes.
    - I cannot kneel on the front of my knee.

15. How does your knee affect your ability to squat?
    - My knee does not affect my ability to squat. I can squat all the way down.
    - I have pain when squatting, but I can still squat all the way down.
    - I cannot squat more than 3/4 of the way down.
    - I cannot squat more than halfway down.
    - I cannot squat more than 1/4 of the way down.
    - I cannot squat at all.

16. How does your knee affect your ability to sit with your knee bent?
    - My knee does not affect my ability to sit with my knee bent. I can sit for unlimited amounts of time.
    - I have pain in my knee when sitting with my knee bent, but it does not limit my ability to sit.
    - I cannot sit with my knee bent for more than 1 hour.
    - I cannot sit with my knee bent for more than 1/2 hour.
    - I cannot sit with my knee bent for more than 10 minutes.
    - I cannot sit with my knee bent.

17. How does your knee affect your ability to rise from a chair?
    - My knee does not affect my ability to rise from a chair.
    - I have pain when rising from the seated position, but it does not affect my ability to rise from the seated position.
    - Because of my knee, I can only rise from a chair if I use my hands and arms to assist.
    - Because of my knee, I cannot rise from a chair.

18. How would you rate your current level of knee function during your *usual daily activities* on a scale from 0 to 100, with 100 being your level of knee function prior to your injury?

    _____

19. How would you rate the *overall function* of your knee during your *usual daily activities*?
    - _____ normal
    - _____ nearly normal
    - _____ abnormal
    - _____ severely abnormal

Figure 3 (continued).

20. As a result of your knee injury, how would you rate your *current level of daily activity*?
    - _____ normal
    - _____ nearly normal
    - _____ abnormal
    - _____ severely abnormal

21. Since initiation of treatment for your knee, how would you describe your progress?
    - _____ greatly improved
    - _____ somewhat improved
    - _____ neither improved/worsened
    - _____ somewhat worse
    - _____ greatly worse

Changes in Daily Activity Level

Please use the following scale to answer questions A–C below.

1 = I was able to perform *unlimited physical work*, which included lifting and climbing.
2 = I was able to perform *limited physical work*, which included lifting and climbing.
3 = I was able to perform *unlimited light activities*, which included walking on level surfaces and stairs.
4 = I was able to perform *limited light activities*, which included walking on level surfaces and stairs.
5 = I was *unable to perform light activities*, which included walking on level surfaces and stairs.

A. _____ *Prior to your knee injury*, how would you describe your usual daily activity? Please indicate only the HIGHEST level of activity that described you before your knee injury.

B. _____ *Prior to surgery or treatment* of your knee, how would you describe your usual daily activity? Please indicate only the HIGHEST level of activity that described you prior to surgery or treatment to your knee.

C. _____ How would you describe your *current level* of daily activity? Please indicate only the HIGHEST level of activity that describes you over the last 1 to 2 days.

Figure 3 — (continued).

the functional limitations that each symptom imposes upon the individual during activities of daily living. Functional limitations on the scale include difficulty with walking on level ground, ascending and descending stairs, standing, kneeling, squatting, sitting, and rising from sitting. Alternatives for each item are graduated from no limitation in performing the activity to the inability to perform the activity.

The KOS—Sports Activity Scale. The Sports Activity Scale (SAS) consists of items related to symptoms and functional limitations during sports (Figure 4) (4, 6). The same symptoms included on the ADLS are included on the SAS; however, the responses are graduated in terms of limitations imposed during sports activities. Functional limitations on the SAS include running, stopping, starting, jumping, landing, cutting, and pivoting. Responses for each item are graduated from no limitation in performing the activity to the inability to perform the activity.

The ADLS and SAS were scored by summing the point value associated with an individual's response for each item on the scale. The sum of the points

Knee Outcome Survey—Sports Activities Scale

The following questionnaire is designed to determine the symptoms and limitations that you experience because of your knee while you perform your usual sports activities. Please answer each question by *checking the one statement that best describes you over the last 1 to 2 days*. For a given question, more than one of the statements may describe you, but please mark ONLY the statement that best describes you when you participate in sports activities.

Symptoms:

1. To what degree does pain in your knee affect your sports activity level?
   - — I never have pain in my knee.
   - — Knee pain does not affect my daily activity.
   - — Slightly.
   - — Moderately.
   - — Severely.
   - — Prevents me from performing all sports activities.

2. To what degree does grinding or grating of your knee affect your sports activity level?
   - — I never have grinding or grating in my knee.
   - — Grinding/grating does not affect my activity.
   - — Slightly.
   - — Moderately.
   - — Severely.
   - — Prevents me from performing all sports activities.

3. To what degree does stiffness of your knee affect your sports activity level?
   - — I never have stiffness in my knee.
   - — Knee stiffness does not affect my activity.
   - — Slightly.
   - — Moderately.
   - — Severely.
   - — Prevents me from performing all sports activities.

4. To what degree does swelling in your knee affect your sports activity level?
   - — I never have swelling in my knee.
   - — Knee swelling does not affect my activity.
   - — Slightly.
   - — Moderately.
   - — Severely.
   - — Prevents me from performing all sports activities.

5. To what degree does partial giving way or slipping of your knee affect your sports activity level?
   - — I never have partial giving way or slipping of my knee.
   - — Partial giving way does not affect my activity.
   - — Slightly.
   - — Moderately.
   - — Severely.
   - — Prevents me from performing all sports activities.

Figure 4 — Knee Outcome Survey: Sports Activity Scale. From "The Knee: Ligamentous and Meniscal Injuries" by J.J. Irrgang, M.R. Safran, and F.H. Fu, in *Athletic Injuries and Rehabilitation* (pp. 623-692) by J.E. Zachazewski, D.J. Magee, and W.S. Quillen (Eds.), 1996, Philadelphia: W.B. Saunders Co.

6. To what degree does complete giving way or buckling of your knee affect your sports activity level?
   — I never have complete giving way or buckling in my knee.
   — Knee buckling does not affect my daily activity.
   — Slightly.
   — Moderately.
   — Severely.
   — Prevents me from performing all sports activities.

Functional Disability with Sports Activities

1. How does your knee affect your ability to run straight ahead?
   — I am able to run straight ahead full speed without limitations.
   — I have pain in my knee but it does not affect my ability.
   — Slightly.
   — Moderately.
   — Severely.
   — Prevents me from running.

2. How does your knee affect your ability to jump and land on your involved leg?
   — I am able to jump and land on my involved leg without limitations.
   — I have pain in my knee but it does not affect my ability.
   — Slightly.
   — Moderately.
   — Severely.
   — Prevents me from jumping and landing.

3. How does your knee affect your ability to stop and start quickly?
   — I am able to start and stop quickly without limitations.
   — I have pain in my knee but it does not affect my ability.
   — Slightly.
   — Moderately.
   — Severely.
   — Prevents me from stopping and starting quickly.

4. How does your knee affect your ability to cut and pivot on your involved leg?
   — I am able to cut and pivot on my involved leg without limitations.
   — I have pain in my knee but it does not affect my ability.
   — Slightly.
   — Moderately.
   — Severely.
   — Prevents me from cutting and pivoting.

Figure 4 — (continued).

associated with the individual's responses was divided by the total possible points for all of the items on the scale. We multiplied the number by 100 to express it as a percentage. Higher scores are associated with lower levels of disability.

Data Analysis

An analysis of variance (ANOVA) was used to compare mean values for the three knee scoring systems, and a Scheffé post hoc analysis was used to identify statistically significant differences in the presence of significant main effects. Pearson

product moment correlation coefficients were used to identify statistically significant relationships between the three scoring systems. The level of statistical significance was set at .05. All data were reduced and analyzed using Statview® 4.02 statistical software for the Macintosh (Abascus Concepts, Inc., Berkeley, CA).

Results and Discussion

ANOVA demonstrated statistically significant mean differences between the scoring systems, $F(3, 112) = 10.2$, $p < .0001$ (Figure 5). Post hoc analysis revealed statistically significant mean differences in the presence of significant main effects (Table 2). Pearson product correlations revealed significant relationships between all scoring systems (Table 3).

The results of this study demonstrated statistically significant differences in outcome measures between the three scoring systems. We hypothesize that these differences are attributable to inconsistencies of items presented within the questionnaire portion of the scoring systems. The items include level of sport activity (type, intensity, and frequency of activity), symptoms such as pain and instability, and functional limitations such as stair climbing and running. The LKS and CKS vary concerning the relative allocation of points for each item. For example, the LKS allocates 25 points each to the symptoms of instability and pain. This accounts for 50% of the total points of the system. In contrast, the modified CKS allocates 10% of points to

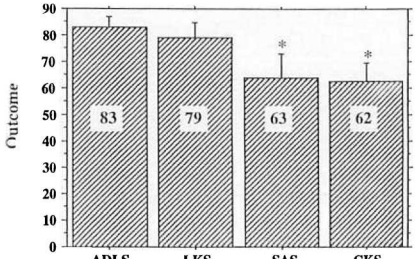

Figure 5 — Mean (±*SD*) differences for the outcome measures for the four knee scoring systems. *Significantly different from ADLS and LKS ($p < .01$).

Table 2 Mean Differences and p Values Between the Four Knee Scoring Systems

	Mean difference	p value
ADLS vs. LKS	4.10	.852
ADLS vs. SAS	19.31	.001**
ADLS vs. CKS	20.48	<.001**
LKS vs. SAS	15.21	.015*
LKS vs. CKS	16.38	.008**
SAS vs. CKS	1.17	.996

*$p < .05$ level. **$p < .01$ level.

Table 3 Correlation Matrix for the Four Knee Scoring Systems

	ADLS	SAS	LKS	CKS
ADLS		.67**	.83**	.73**
SAS			.67**	.87**
LKS				.66*
CKS				

*$p < .01$. **$p < .001$

pain and 30% to instability. Furthermore, scoring systems are greatly influenced by the patient's level of activity (3, 4, 9, 10). The CKS allocates 20% of total points for identifying activity level, while the LKS and KOS do not allocate points for this item.

The degree to which symptoms and functional limitations affect the athlete daily is a reflection of whether the athlete is taking part in activities of daily living or sports activities. Neither the LKS nor the CKS delineates between symptoms and functional limitations that arise due to activities of daily living or sports activity. Sports activity imposes more rigorous functional demands on the ACL-deficient limb than activities of daily living and therefore should be measured separately. For example, using the CKS to rate a nonathletic individual would provide an invalid measure of disability. For this reason, the KOS was designed to measure disability that is specific to the athlete's activities of daily living or sports activities.

Preliminary research indicates that the KOS is a valid measure of disability following knee injury (4, 6). The outcome measures for the ADLS and SAS indicate that our patient population functioned well with activities of daily living (ADLS = 83) but became symptomatic and functionally limited when participating in sports activities (SAS = 64). The ADLS mean outcome measure of 83 was comparable and demonstrated a moderately high relationship with the LKS = 79, while the SAS mean outcome measure of 64 was comparable and demonstrated a moderately high relationship with the CKS = 63. Due to the close proximity in mean outcome measures and statistically significant relationships between the ADLS and the LKS and between the SAS and CKS, we conclude that the LKS is more related to activities of daily living and the CKS is more related to sports.

Bollen and Seedhom were the first to recognize this quandary by demonstrating that patients consistently scored higher on the LKS than the CKS (1). They reported a 13-point median difference between the two systems, which is similar to our findings of a 16-point mean difference between the LKS and the CKS (Table 2). Bollen and Seedhom suggested that the disparity in outcome measures was due to a greater emphasis placed on functional disability by the CKS (1). This is evident by the number of questions directly related to function between the two scoring systems. Each system has eight total items with six (30% of total points) in the CKS pertaining to function and only three (20% of total points) in the LKS pertaining to function (1). These findings question the content validity of the LKS and CKS when disability is indiscriminately assessed without direct reference to activities of daily living or sports.

It is our contention that the items within the questionnaires should be specific to those symptoms and functional limitations that result from activities of daily living and those symptoms and functional limitations that result from sports. This delineation permits a more accurate assessment of disability that is specific to and reflects those symptoms and functional limitations experienced during activities of daily living and/or sports. The Knee Outcome Survey appears to provide a practical alternative to measuring disability in athletes who sustain knee ligament injuries.

Conclusion

The results of this study indicate that statistically significant mean differences in outcome measures exist between the three knee scoring systems. The ADLS and SAS appear to provide valid measures of disability and indicate that our sample functioned well with activities of daily living but became symptomatic and functionally limited with sports. The outcome measures indicate that the LKS is more specific to activities of daily living, while the CKS is more specific to sports. We recommend that standard scoring systems be developed that can be used to provide patient-reported measures of functional disability in patients who experience knee injuries. The standard scoring systems should delineate between activities of daily living and sports. Therefore, we recommend the use of the KOS as a viable alternative to other scoring systems.

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Author Notes

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Pain Disability Index

Pain Disability Index: The rating scales below are designed to measure the degree to which aspects of your life are disrupted by chronic pain. In other words, we would like to know how much pain is preventing you from doing what you would normally do or from doing it as well as you normally would. Respond to each category indicating the overall impact of pain in your life, not just when pain is at its worst.

For each of the 7 categories of life activity listed, please circle the number on the scale that describes the level of disability you typically experience. A score of 0 means no disability at all, and a score of 10 signifies that all of the activities in which you would normally be involved have been totally disrupted or prevented by your pain.

Family/Home Responsibilities: This category refers to activities of the home or family. It includes chores or duties performed around the house (e.g. yard work) and errands or favors for other family members (e.g. driving the children to school).
No Disability 0__. 1__. 2__. 3__. 4__. 5__. 6__. 7 __. 8__. 9__. 10__. Worst Disability

Recreation: This disability includes hobbies, sports, and other similar leisure time activities.
No Disability 0__. 1__. 2__. 3__. 4__. 5__. 6__. 7 __. 8__. 9__. 10__. Worst Disability

Social Activity: This category refers to activities, which involve participation with friends and acquaintances other than family members. It includes parties, theater, concerts, dining out, and other social functions.
No Disability 0__. 1__. 2__. 3__. 4__. 5__. 6__. 7 __. 8__. 9__. 10__. Worst Disability

Occupation: This category refers to activities that are part of or directly related to one's job. This includes non-paying jobs as well, such as that of a housewife or volunteer.
No Disability 0__. 1__. 2__. 3__. 4__. 5__. 6__. 7 __. 8__. 9__. 10__. Worst Disability

Sexual Behavior: This category refers to the frequency and quality of one's sex life.
No Disability 0__. 1__. 2__. 3__. 4__. 5__. 6__. 7 __. 8__. 9__. 10__. Worst Disability

Self Care: This category includes activities, which involve personal maintenance and independent daily living (e.g. taking a shower, driving, getting dressed, etc.)
No Disability 0__. 1__. 2__. 3__. 4__. 5__. 6__. 7 __. 8__. 9__. 10__. Worst Disability

Life-Support Activities: This category refers to basic life supporting behaviors such as eating, sleeping and breathing.
No Disability 0__. 1__. 2__. 3__. 4__. 5__. 6__. 7 __. 8__. 9__. 10__. Worst Disability

Signature_____ Please Print_____

Date _____

The Pain Disability Index (PDI)

Overview: The Pain Disability Index (PDI) a simple and rapid instrument for measuring the impact that pain has on the ability of a person to participate in essential life activities. This can be used to evaluate patients initially to monitor them over time and to judge the effectiveness of interventions. The index was developed at St. Louis University Medical Center.

Measures of disability related to pain:

(1) family and home responsibilities: activities related to home and family

(2) recreation: hobbies sports and other leisure time activities

(3) social activity: participation with friends and acquaintances other than family members

(4) occupation: activities partly or directly related to working including housework or volunteering

(5) sexual behavior: frequency and quality of sex life

(6) self care: personal maintenance and independent daily living (bathing dressing etc.)

(7) life-support activity: basic life-supporting behaviors (eating sleeping breathing etc.)

Level of Disability	Points	My Terms (not from paper)
none	0	
	1	
	2	mild
	3	
	4	
	5	moderate
	6	
	7	
	8	severe
	9	
total	10	

pain disability index =

= SUM(points for all 7 parameters)

Interpretation:

• minimal index: 0

• maximal index: 70

• The higher the index the greater the person's disability due to pain.

Performance:

• modest test-retest reliability

• discriminates between patients with low and high levels of disability

References:

Chibnall JT Tait RC. The Pain Disability Index: Factor Structure and Normative Data. Arch Phys Med Rehabil. 1994; 75: 1082-1086.

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DISABILITY

(PERMANENT PHYSICAL IMPAIRMENT)

ASSESSMENT

AND

CERTIFICATION

GUIDELINES & EXPLANATIONS BY DR RATNESH KUMAR, DIRECTOR, NIOH, KOLKATA

BASED ON
GUIDELINES & GAZETTE NOTIFICATION
(Committee under chairmanship of DGHS, GOI) issued by
Ministry of Social Justice & Empowerment, GOI,
Regd No. DL33004/99 (Extraordinary) Part II, Sec. 1, June 13, 2001

PUBLISHED & PRINTED BY
NATIONAL INSTITUTE FOR THE ORTHOPAEDICALLY HANDICAPPED
B. T. ROAD, BON-HOOGHLY, KOLKATA-700 090
(In the interest of persons with disability, to sensitize medical doctors.)

Introduction

In order to review the guidelines for evaluation of various disabilities and procedure for certification (Ministry of Welfare, Govt. of India, 1986) and to recommend appropriate modification/alterations keeping in view the Persons with Disabilities (Equal opportunities, Protection of rights and Full participation) Act 1995, a committee was set up in 1988 by the Government of India , Ministry of Social Justice & Empowerment under the Chairmanship, DGHS, GOI with subcommittee, one each in the area of Mental Retardation, Locomotor/Orthopaedic, Visual and Speech & Hearing disability.

After considering the reports of committee, guidelines for evaluation of following disabilities and procedure for certification was notified vide no. 'The Gazette of India, Extra ordinary Part-II Section 1, Dated 13, June 2001'.

1. Visual Impairment
2. Locomotor / Orthopedic Disability
3. Speech and Hearing Disability
4. Mental Retardation
5. Multiple Disabilities

In the guidelines, the functional (permanent physical impairment) due to congenital, post disease or trauma have been evaluated. This is commonly interpreted as disability which is not so, in strict terms. In case of loco motor conditions, broadly, the body has been divided into upper limb, lower limb & trunk. In principle, the function of one part cannot be replaced by other, therefore each functional part in itself is 100% and thus loss of function/ PPI of that part is taken as 100%.

On the other hand, the whole body value cannot exceed 100%. Thus in case the impairment is seen in more than one function or body part, the mathematical sum may exceed 100 but total of body/individual cannot exceed 100%. Thus a total of one or all segments of body cannot exceed 100% in any situation.

Because of the UN proclamation in 1981, subsequent declaration of Decade for Disabled and the Biwako Millenium Framework of Actions in 2003, extended further from 2003-2012,to which India is a signatory, it is binding on the member countries to protect the rights, provide equal opportunities and empower persons with disability. The PWD Act 1995 and recent National Policy for disabled persons are initiatives by the Ministry of Social Justice &Empowerment, Govt. of India, to fulfill national & international commitments.

What is the need of and percentage in disability certificate? In view of the various constraints, physical & financial, the 40% disability has been taken as cutoff to avail various facilities & concession earmarked by government. The guidelines notified, are for assessment of disability in the respective area/body part (function) and to quantify in terms of percentage of disability, to avail facilities & concessions viz. Reservation in job, Travel concession, soft loan for entrepreneurship development, Scholarship, Income Tax / Custom rebate, Age relaxation in employment etc.

As per the Act, authorities to give a disability certificate will be a medical board duly constituted by the central and state government. The medical board should consist of at least three members, out of which one shall be a specialist in the concerned disability subject. The standard guidelines and tools mentioned in the notification have to be used in evaluation of disability for proper certificate.

The certificate would be valid for a period of five years for those, whose disability is temporary, which means that PPI may change to some extent, but in no way does this mean that disability will be cured. For example after traumatic amputation the percentage may change due to improvement in additional factors as pain, neuroma, scar infection etc. For those who acquire permanent disability, the validity can be shown as permanent.

A committee for evaluation, assessment of multiple disabilities and categorization, extent of disability and procedure for certification was also constituted in 1999.

The mental illnesses have also been included in the disability and the guideline for evaluation & assessment of mental illness and procedure for certification were issued by notification no 16-18/97-NI.I dated 18th February 2002 (Annexed).

The guidelines and clarifications submitted in subsequent paragraph are an attempt to clarify doubts being raised, based on guidelines and as per law of the land without having scope of personal opinion. These are neither final nor ultimate, thus having scope to amend in future. The efforts to develop a consensus on disability certification and simplification are going on.

For any clarification or details, feel free to contact us, e-mail: director,nioh.@vsnl.net. or visit web: www.niohonline.org.

Dr. Ratnesh Kumar
Director, NIOH

THE GUIDELINES

The Universal guidelines for assessment and certification of the following Disabilities were finalized by group of experts and were notified by the Ministry of Social Justice & Empowerment, GOI in June 2001.

1. Visual Impairment
2. Locomotor Disability
3. Speech & Hearing
4. Mental Retardation
5. Multiple Disabilities.

Guidelines for certification were framed.

According to the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Rules, 1996 notified on 31.12.1995 by the Central Government in exercise of the powers conferred by sub-section (1) and (2) of section 73 of the Persons with Disabilities Act, 1995, the empowered persons to give disability certificate, will be a Medical Board, consisting of at least three members, out of which **at least one shall be a specialist in the particular field for assessing loco motor/visual including low vision/ hearing & speech disability, mental retardation and leprosy cured as the case may be,** duly constituted by the Central and State Government. Specified tests as indicated in guidelines should be conducted by the medical board and **recorded** before a certificate is given. The certificate would be valid for a period of five years for those whose disability is temporary, while in permanent disability the validity is life long.

The Director General of Health Services, Ministry of Health & Family Welfare will be the final authority, should there arise any controversy/doubt regarding the interpretation of the definitions/classifications/evaluations/tests etc.

The minimum degree of disability should be 40% in order to be eligible for any concession/benefit.

As per PWD Act and in its compliance, various benefits & concessions are to be provided to the 'persons with disability'

'Person with disability' means a person suffering from not less than forty per cent of any disability as certified by a medical authority;

"Medical authority" means any hospital or institution specified for the purposes of this Act by notification by the appropriate Government.
The 'disability' under PWD act means -

i. Blindness,
ii. Low vision,
iii.Leprosy-cured,
iv. Hearing impairment,
v. Locomotor disability,
vi.Mental retardation,
vii. Mental illness.

Broad Principles of Disability Assessment

Following guiding principles to assess disabiity, required before issue of disability certificate, should be known to doctors/members of board with additional inputs related to disability of their concerned specialty. The specialist from the ares of locomotor, vision, speech & hearing and mental retardation should also have broad knowledge on multiple disability.

Functional Loss: It is assessment of functional loss based on some uniform test, resulting from permanent physical impairment caused due to congenital or acquired conditions (traumatic or post disease). In case of amputees, the percentage is calculated directly depending on the level of the part that is lost and additional weightage.

Individual Function requirement: The functions assessed are in relation to standard desired fuctions of anatomical part irrespective of individuals age, sex, nature of work, job, social status, requirement of specific part to him/her.

Personal opinion: There is no scope of personal opinion or to refer tests other than mentioned in guidelines notified.

Where to decide percentage on extent of function/activity – Wherever a limit to percentage disability (like each activity of ten activities to coordination in upper limb, nine activities to test stability and additional weightage, a certain percentage limit may be given, the specialist need to use his conscience with full satisfaction. It is advised to be uniform and unbiased, such range may be divided into three group as

a. No loss – activity can be performed normally without assistance
b. Partial loss – activity can performed partly or with assistance
c. Total Loss - activity can not be performed even with assistance

Trick Movement: In case where specialist feel that particular group of muscle/ part required to perform the function and said function should be performed in the event of involvement, despite this the individual is able to perform function due to trick movement or some part synergistic to it, this should be taken as function performed and percentage of PPI be calculated accordingly.

Authority: As per the act, authorities to give disability certificate will be a Medical Board duly constituted by the Central and State Government. The Medical Board should consist of at least three members. Out of which one shall be a specialist in the concerned disability subject**.**

Testing Tools and Guidelines: The standard guidelines and tools mentioned in the notification have to be used in evaluation of disability for proper certificate.

When to Assess: For purpose of certification, disability should be assessed when the specialist is satisfied that further medical treatment/intervention is not like to reduce the extent of impairment. Normally, a period of six months is considered in such medical conditions.

Certification in condition of deformity, which is likely to be modified by surgery: In cases of conditions which can be corrected by surgical procedures, no strict mention is given. Ideally the assessment should be done only after best possible correction but the benefit is also given in favour of individual.

Validity of certificate: The certificate would be valid for a period of five years in case of temporary disability means that PPI may change to some extent, but no way it means that disability will be cured or significantly reduced. For example after traumatic amputation the percentage may change due to improvement in additional factors as pain, neuroma, scar infection etc. For permanent disability, certificate once issued is permanent and life long.

If disability percentage is changed after surgery: before issue of permanent disability certificate, the board ensures that improvement in medical condition has reached to its maximum and not likely to improve further. In case if an individual get his disability due to deformity get corrected by surgery, the percentage of disability if assessed in changed condition may vary. For example in case of Polio with contracture if get himself operated, contracture relieved and function improvement occurred due to tendon transfer, the percentage of disability will be less in post operated as compared to pre-operated stage. Can he use his earlier disability certificate to avail benefit/concession? Whether certificate issuing doctor be responsible?

Ideally, before issue of disability certificate all options to reduce/correct disability should have been tried but in view of practical difficulty and resource constraints and taking a holistic view, certificate can not be denied for want of medical intervention suggested. The percentage disability in the certificate was based on the condition on the day of assessment, when there were no chances of improvement by usual treatment. In case where further specific medical/surgical intervention done afterward, the percentage disability mentioned in the certificate, earlier shall not be valid. Such note may be mentioned if issuing authority apprehend, case to case basis.

Appeal- In case of controversy arises on percentage of disability given by a board, the individual can appeal to the same board to reassess his/her disability. The board is authorized to consider and reassess the individual and modify its certificate with reasons. In case of further controversy, the individual can approach to higher state government medical authority to get reassessed by board/designated authority. The Director General Health Services, Govt.of India shall be final appellate authority.

Disability

'Locomotor Disability' means disability of the bones, joints or muscles leading to substantial restriction of the movement of the limbs or any form of cerebral palsy;

'Cerebral Palsy' means a group of non-progressive conditions of a person characterised by abnormal motor control posture resulting from brain insult or injuries occurring in the pre-natal, peri-natal or infant period of development;

'Leprosy cured person' means any person who has been cured of leprosy but is suffering from -

i. loss of sensation in hands or feet as well as loss of sensation and paresis in the eye and eye-lid but with no manifest deformity;
ii. manifest deformity and paresis but having sufficient mobility in their hands and feet to enable them to engage in normal economic activity;
iii. extreme physical deformity as well as advanced age which prevents him from undertaking any gainful occupation, and the expression "leprosy cured" shall be construed accordingly;

'Blindness' refers to a condition where a person suffers from any of the following conditions, namely:-

iv. total absence of sight; or
v. visual acuity not exceeding 6/60 or 20/200 (snellen) in the better eye with correcting lenses; or
vi. Limitation of the field of vision subtending an angle of 20 degree or worse;

'Person with low vision' means a person with impairment of visual functioning even after treatment or standard refractive correction but who uses or is potentially capable of using vision for the planning or execution of a task with appropriate assistive device;

'Hearing Impairment' means loss of sixty decibels or more in the better ear in the conversational range of frequencies;

'Mental Illness' means any mental disorder other than mental retardation;

'Mental Retardation' means a condition of arrested or incomplete development of mind of a person which is specially characterised by sub-normality of intelligence;

'Rehabilitation' refers to a process aimed at enabling persons with disabilities to reach and maintain their optimal physical, sensory, intellectual, psychiatric or social functional levels;

Multiple Disabilities :(In case of more than one disability)

Multiple disabilities means a combination of two or more disabilities as defined in Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995, namely-

I. Loco motor disability including leprosy cured
II. Blindness/Low vision
III. Speech & Hearing Impairment
IV. Mental Retardation
V. Mental Illness.

A specialist, authorized to make assessment of disability in a disabled individual and issue disability certificate through duly constituted medical board (disability), need to understand how to add disabilities assessed by him/her, or the disabilities given by other experts in the concerned area/areas. The final certificate is sum of various disabilities, as per guidelines, using a telescopic sum formula.

In assessing disability (PPI) and giving percentage of disability, there is hardly any scope of personal opinion, individual's, age, sex, profession, nature of work, race, religion or importance of function impaired for that individual or society. But there is scope to bring such instances into notice and to be get clarifications/considerations, whenever review/modification of existing guidelines is made in future.

In case of multiple disabilities, the subject specialist from the area with higher percentage may sign the final certificate.

In case two areas are having the same percentage, either of specialists may sign the certificate.

2. Guidelines for Evaluation: -

In order to evaluate the multiple disability, the same guidelines shall be used as have been developed by the respective sub-committees of various single disability, viz Mental retardation, Loco motor Disability, Visual Disability, and Speech & Hearing disability, and recommended in the meeting held on 29.2.2000 under the Chairmanship of Dr. S.P. Agarwal, Director General of Health Services, Government of India, with reference to Order No. 16-18/96-NI.I, dated 28th August, 1998 and communicated to Ministry of Social Justice & Empowerment, Government of India, vide letter No. S-13020/4/98-MH, dated 16th March, 2000.

However, in order to arrive at the total percentage of multiple disability the combining formula $a + \frac{b\,(90 - a)}{90}$, as given in the "Manual for Doctors to Evaluate Permanent Physical Impairment developed by Expert Group meeting on Disability Evaluation", shall be used, where

"a" will be the higher score and

"b" will be the lower score.

However, the maximum total percentage of multiple disabilities shall not exceed 100%.

3. Procedure for Certification of Multiple Disabilities:

The procedure will remain the same as has been developed by the respective sub-committees on various single disabilities and finalized in a meeting under the Chairpersonship of Dr. S.P. Agarwal held on 29.2.2000. The final disability certificate for multiple disability will be issued by Disability Board which has given higher score of disability by combining the score of different disabilities using the combining format, i.e.,

$$a + \frac{b\,(90 - a)}{90}$$

In case where two scores of disability are equal, the final certificate of multiple disabilities will be issued by any one of them as decided by local authority.

STANDARD FORMAT OF THE CERTIFICATE

(for OH/ VH/ Sp & Hg)

(NAME & ADDRESS OF THE INSTITUTE/HOSPITAL: (ISSUING THE CERTIFICATE)

Certificate No. Date

CERTIFICATE FOR THE PERSONS WITH DISABILITIES

This is to certify that Shri/Smt./Kum/---------- Son/wife/daughter of Shri _____ Age _____ yrs old male/ female, Registration No. _____ is a case of physically disabled/ visual disabled/ speech & hearing disabled and has _____ % (_____percent) permanent (physical impairment/ visual impairment/ speech& hearing impairment) in relation to his/her _____

Note: -

1. This condition is progressive/non-progressive/likely to improve/not likely to improve.*****
2. Re-assessment is not recommended/recommended after a period of _____ months/years**.***

***Strike out which is not applicable**.

Sd/-	Sd/-	Sd/-
(Doctor)	(DOCTOR)	(DOCTOR)
Seal	Seal	Seal

Signature/Thumb impression
of the patient –

Countersigned by the
Medical Superintendent/CMO/Head
of Hospital (with seal)

Recent Attested
Photograph
showing the disability
Affixed here.

LOCOMOTOR DISABILITY

1. Definition:-

1. **Impairment**: Impairment is any loss or abnormality of psychological, physiological or anatomical structure or function in a human being.

2 Functional **Limitations**: Impairment may cause functional limitations which are partial or total inability to perform those activities necessary for motor, sensory or mental function within the range or manner of which a human being is normally capable.

3. **Disability**: A disability is any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being.

4. **Loco motor Disability**: Loco motor disability is defined as a person's inability to execute distinctive activities associated with moving both himself and objects, from place to place and such inability resulting from affection of musculo-skeletal and/or nervous system.

2. Categories of Loco motor Disability

The categories of loco motor disabilities are enclosed in subsequent paragraph.

3. Process of Certification

A disability certificate shall be issued by a Medical Board of three members duly constituted by the Central and State Government Out of which, at least, one member shall be a specialist from either field of Physical Medicine& Rehabilitation or Orthopaedics.

Two specimen copies of the disability certificate for mental retardation and others (visual disability, speech and hearing disability and loco motor disability) are enclosed at Annexure.

It was also decided that whenever required the Chairman of the Board may co-opt other experts including that of the members constituted for the purpose by the Central and the State Government.

On representation by the applicant, the Medical Board may review its decision having regard to all the facts and circumstances of the case and pass such order in the matter as it thinks fit.

Variables-in assessing loco motor disability (PPI)

In Loco motor Disability following variables need to be taken in to consideration while assessing function loss resulting permanent physical impairment (disability)

1. Strength of Muscle (MRC scale)
2. Range of Joint Motion
3. Coordination
4. Stability
5. Limb length discrepancy
5. Hand Functions (prehension, sensation &strength)
6. Sensation
7. Deformity etc
8. Complications like pain, infection etc.
9. Extremity dominant or non-dominant.

The PPI (disability) due to amputation/congenital loss of limb, neurological conditions, post stroke (mono, hemi & quadric-paresis) & shortness(dwarfism) have been categorized separately.

GUIDELINES FOR EVALUATION OF PERMANENT PHYSICAL IMPAIRMENT (PPI)

1.1 Guidelines for Evaluation of Permanent Physical Impairment of Upper Limb.

1. The estimation of permanent impairment depends upon the measurement of functional impairment and not expression of a personal opinion.
2. The estimation and measurement should be made when the clinical condition has reached the stage of maximum improvement from the medical treatment. Normally the time period is to be decided by the medical doctor who is evaluating the case for issuing the PPI certificate as per standard format of the certificate.
3. The upper limb is divided into two components; the Arm Component and 'Hand Component'.
4. Measurement of the loss of function of 'Arm Component' consists of measuring the loss of Motion, Muscle Strength and Co-ordinate Activities.
5. Measurement of loss of function of Hand Component consists of determining the Prehension, Sensation and Strength. For estimation of prehension– opposition, lateral pinch cylindrical grasp, spherical grasp and hook grasp have to be assessed as shown in Hand Component of Form-A (Assessment Performa for Upper Extremity).
6. The impairment of the entire extremity depends on the combination of the functional impairments of both components.

1.2 ARM COMPONENT

Total value of Arm Component is 90%.

1.2.1 Principles of evaluation of '**Range of Motion' (ROM) of joints**

1. The value of maximum ROM in the Arm Component is 90%
2. Each of the three joints of the Arm is weighed equally (30%)

Example:

The intra-articular fractures of the bones of right shoulder joint may affect Range of Motion even after healing. The loss of ROM should be calculated the each arc of Motion as envisaged in the Assessment Form - A (Assessment Performa for Upper Extremity).

Arc of ROM	Normal Value	Active ROM	Loss of ROM
Shoulder Flexion-	0-220	110	50%
Rotation	0-180	90	50%
Abduction-Adduction	0-180	90	50%

Hence the mean loss of ROM of shoulder will be (50 + 50 + 50) /3 = 50%

Shoulder movements constitute 30% of the Motion of the Arm Component; therefore the loss of Motion for Arm Component will be 50 × 0.30 = 15%. If more

than one joint of the Arm is involved the loss of percentage in each joint is calculated separately as above and then added together.

1.2.2 Principles of evaluation of **Strength of Muscles:**

1. Strength of muscles can be tested by manual method and graded from 0-5 as advocated by Medical Research Council (MRC) of Great Britain depending upon the Strength of the muscles.
2. Loss of muscle power can be given percentages as follows:

Manual muscle Strength grading	Loss of Strength in percentage
0	100%
1	80%
2	60%
3	40%
4	20%
5	0%

3. The mean percentage of loss of muscle strength around a joint is multiplied by 0.30.
4. If loss of muscle strength involves more than one joint the mean loss of percentage in each joint is calculated separately and then added together as has been described for loss of Motion.

1.2.3 Principles of evaluation of Coordinated Activities:

1. The total value for coordinated activities is 90%
2. Ten different coordinated activities should be tested as given in **Form A.**
3. Each activity has a value of 9%

1.2.3 Combining values for the Arm Component:

The total value of loss of function of 'Arm Component' is obtained by combining the value of loss of ROM, muscle Strength and coordinated activities, using the combing formula.

$$= a + \frac{b \times (90-a)}{90}$$

Where a =higher value, b = lower value

Example

Let us assume that an individual with an intra articular fracture of bones of shoulder joint in addition to 16.5% loss of Motion in Arm has 8.3% loss of Strength of muscles and 5% loss of coordination. These values should be combined as follows:

a. Loss of Strength of muscles-8.3% ,

b.Loss of ROM-16.5%

c. Loss of coordination-5%

d.To add above (a & b) = $16.5 + \frac{8.3 \times (90-16.5)}{90}$

= 23.33%

e. Now to add loss of coordination (d & c) $= 23.3 + \frac{5\ (90-23.3)}{90}$

= 27.0%

So total value of loss of functions in Arm Component 27.0%

1.3 HAND COMPONENT:

1. Total value of Hand Component is 90%
2. The functional impairment of Hand is expressed as loss of Prehension, loss of Sensation and loss of Strength.

1.3.1 Principles of evaluation of Prehension:

1. Total value of Prehension is 30%. It includes:

a) **Opposition** 8%

Tested against	-Index finger	2%
	-Middle finger	2%
	-Ring finger	2%
	-Little finger	2%

b) **Lateral pinch** 5%
(Tested by asking patient to hold a key between thumb & lateral side of Index finger)

c) **Cylindrical grasp** 6%
tested for

i)	Large object of 4" size (diameter)	3%
ii)	Small object of 1" size (diameter)	3%

d) **Spherical grasp** 6%
tested for

i)	Large object of 4 inches size	3%
ii)	Small object of 1 inch size	3%

e) **Hook grasp** 5%
tested by asking the patient to lift a bag

1.3.2.Principles of Evaluation of Sensation:

1. Total value of Sensation in Hand is 30%
2. It should be assessed according to distribution as below:

i) Complete loss of Sensation

Thumb ray	9%
Index finger	6%
Middle finger	5%
Ring finger	5%
Little finger	5%

ii) Partial loss of Sensation: Assessment should be made according to percentage of loss of Sensation in thumb/finger (s)

1.3.3.Principles of Evaluation of Strength

1. Total value of Strength 30%
2. It includes:
   - i) Grip Strength 20%
   - ii) Pinch Strength 10%

Strength of Hand should be tested with 'Hand Dynamo-meter' or by clinical method (grip method).

Additional weight age-A total of 10% additional weightage can be given to following accompanying factors, if they are continuous and persistent despite treatment.

1. Pain
2. Infection
3. Deformity
4. Mal-alignment
5. Contractures
6. Cosmetic disfiguration
7. Dominant extremity-4%
8. Shortening of upper limb - First 1″ no weightage, for each 1″ beyond first 1″ -2% disability.

The extra points should not exceed 10% of the total Arm Component and total PPI should not exceed 100% in any case.

1.3.4.Combining values of Hand Component:

The final value of loss of function of Hand Component is obtained by summing up values of loss of Prehension, Sensation and Strength.

1.3.4.Combining values for the Extremity:

Values of impairment of Arm Component and impairment of Hand Component should be added by using combining formula.

$$a + b\,\frac{90-A}{90}$$

a = higher value
b = lower value

Example: Impairment of Arm - 27%, Impairment of Hand - 64%

Total of upper limb (by combining formula)

$$= 64 + 27\,\frac{90-64}{90} = 71.8\%$$

The total value can also be obtained by using the 'Ready Beckoner Table' for combining formula (Annexed).The total value can also be obtained by using the 'Ready Beckoner Table' for combining formula (Annexed).

2. Guidelines for Evaluation of PPI (disability) in Lower Limb

The measurement of loss of function in lower extremity is divided into two components: Mobility and Stability components

2.1. Mobility Component:

1. Total value of Mobility component is 90%
2. It includes Range of Movement (ROM) and Muscle Strength

2.1.1 Principles of Evaluation of Range of Movement:

1. The value of maximum range of movement in mobility component is 90%.
2. Each of three joints i.e. Hip, Knee and Foot-Ankle component is weighted equally-30%.

Example:

A fracture of right Hip joint bones may affect range of Motion of the Hip joint. Loss of ROM of the affected Hip is different and should be assessed as given in **Form B** (Assessment Performa for lower extremity).

Affected Joint-Rt. Hip:

Arc of Movement	Normal ROM	Active ROM	Loss in % age
a. Flexion-Extension	$0\text{-}140^0$	70^0	50
b. Abduction-Adduction	$0\text{-}90^0$	60^0	33
c. Rotation	$0\text{-}90^0$	30^0	66

Mean loss of ROM of Rt Hip = (50+33+66)/3 = 50%

Since the Hip constitutes 30% of the total mobility component of the lower limb, the loss of Motion in relation to the lower limb will be 50 × 0.30 = 15%.

If more than one joint of the limb is involved, the mean loss of ROM in percentage should be calculated in relation to individual joint separately and then added together as follows to calculate the loss of mobility component in relation to that particular limb.

For example:

Mean loss of ROM of Rt. Hip 50%

Mean loss of ROM Rt. Knee 40%

Loss of Mobility component of Rt. Lower Limb will be

(50 × 0.30) + (40 × 0.30) = 27%

2.1.2. Principle of Evaluation of Muscle Strength:

1. The value for maximum muscle Strength in the limb is 90%
2. Strength of muscles can be tested by Manual Method and graded 0-5 as advocated by MRC of Great Britain depending upon the residual strength in the muscle group.
3. Manual muscle grading can be given percentage like below:

Grade of Ms. Strength	Loss of Strength in % age
0	100
1	80
2	60

3	40
4	20
5	0

4. Mean percentage of muscle strength loss around a joint is multiplied by 0.30 to calculate loss in relation to limb.

5. If there has been loss of muscle strength involving more than one joint the values are added as has been described for loss of ROM.

2.1.3. Combining values for mobility component:

1. The values of loss of ROM and loss of muscle strength should be combined with the help of combining formula:

$$= a + b \frac{90-a}{90}$$

(a = higher value, b = lower value)

Example: Let us assume that the individual with a fracture of right Hip bones has in addition to 16% loss of Motion, 8% loss of muscle Strength also. To combine, Motion-16% & Strength-8%

$$\text{Combined values} = \frac{16 + 8\ (90 - 16)}{90}$$

$$= 22.6\%$$

2.2 Stability Component:

1. Total value of the Stability component is 90%

2. It should be tested by clinical method as given in 'Form B' (Assessment Performa for lower extremity). There are nine activities, which need to be tested, and each activity has a value of ten per cent (10%). The percentage value in relation to each activity depends upon the percentage of loss of stability in relation to each activity.

2.3. Extra points:

Extra points have been given for pain, deformities, contractures, loss of sensation and shortening Maximum points to be added are 10% (excluding shortening). Details are as following:

i) Deformity	a. In functional position	3%
	b. In non-functional position	6%
ii) Pain	a. Severe (grossly interfering with function)	9%
	b. Moderate (moderately interfering with function)	6%

		c. Mild (mildly interfering with function)	3%
iii)	Loss of Sensation	a. Complete Loss	9%
		b. Partial Loss	6%
iv)	Shortening	First”	Nil
	(For every additional	½” shortening	4%
v)	Complications	a. Superficial complications	3%
		b. Deep complications	6%

3. Guidelines for Evaluation of Permanent Physical Impairment of Trunk (Spine)

Basic guidelines:

1. As permanent physical impairment caused by spinal deformity tends to change over the years, the certificate issued in relation to spine should be reviewed as per the standard format of the certificate given at Annexure.
2. Permanent physical impairment should be awarded in relation to spine and not in relation to whole body.
3. Permanent physical impairment due to neurological deficit in addition to spinal impairment should be added by combining formula.

The local effects of the lesions of the spine can be conventionally divided into 'Traumatic and Non-traumatic'. The percentage of PPI in relation to each situation should be valued as follows :

3.1 TRAUMATIC LESIONS :

3.1.1 Cervical Spine injuries	**Percentage of PPI in relation of Spine**
i) 25% or more compression of one or two adjacent vertebral bodies with No involvement of posterior elements. No nerve root involvement. Moderate Neck Rigidity and persistent Soreness.	20
ii) Posterior element damage with radiological evidence of moderate partial dislocation/sub-luxation including Whiplash injury.	
a) With fusion healed, No permanent motor or sensory changes.	10
b) Persistent pain with radiologically demonstrable instability.	25
iii) Severe Dislocation :	
a) Fair to good reduction with or without fusion with no residual motor or sensory involvement :	10
b) Inadequate reduction with fusion and persistent radicular pain.	15

3.1.2 Cervical Inter vertebral Disc Lesions	**Percentage of PPI in relation to spine**
i) Treated case of disc lesion with persistent pain and no neurological deficit	10
ii) Treated case with pain and instability	15

3.1.3. Thoracic and Thoraco-Lumbar Spine Injuries :

i) Compression of less than 50% involving one vertebral body with no neurological manifestation	10

ii)	Compression of more than 50% involving single vertebra or more with involvement of posterior elements, healed, no neurological manifestations Persistent pain, fusion indicated	20
iii)	Same as (b) with fusion, pain only on heavy use of back	15
iv)	Radiologically demonstrable instability with fracture or fracture dislocation with persistent pain.	30

3.1.4 Lumbar and Lumbo-Sacral Spine :

Fracture

a)	Compression of 25% or less of one or two adjacent vertebral bodies, No definite pattern or neurological deficit	15
b)	Compression of more than 25% with disruption of posterior elements, persistent pain and stiffness, healed with or without fusion, inability to lift more than 10 kgs.	30
c)	Radiologically demonstrable instability in low lumbar or Lumbo-sacral spine with pain.	35

3.1.5. Disc lesion

a)	Treated case with persistent pain.	15
b)	Treated case with pain and instability.	20
c)	Treated case disc of disease with pain, activities of lifting moderately modified	25
d)	Treated case of disc disease with persistent pain and of heavy weight stiffness; aggravated by lifting of heavy weight, necessitating modifications of all activities requiring heavy weight lifting.	30

3.2 NON TRAUMATIC LESIONS :

3.2.1 Scoliosis :

Basic guidelines-following modification is suggested.

The largest structural curve should be accounted for, while calculating the PPI and not the compensatory curve or both structural curves.

3.2.2 Measurement of Spine Deformity :

Cobb's method for measurement of angle of curve in the radiograph taken in standing position should be used. The curves have been divided into following groups depending upon the angle of major structural scoliotic deformity.

Group	Cobb's Angle	PPI in relation to Spine
I	0-20	Nil
II	21-50	10%

III	51-100	20%
IV	101 & above	30%

3.2.3. Torso Imbalance :

In addition to the above, PPI should also be evaluated in relation the torso imbalance. The torso imbalance should be measured by dropping a plumb line from C-7 spine and measuring the distance of plumb line from gluteal crease.

Deviation of Plumb line	**PPI**
Up to 1.5 cms	4%
1.5-3.0 cms	8%
3.1-6.0 cms	16%
6.1 cms and more	32%

3.2.4. Head Tilt over C7 Spine	**PPI**
Upto 15	4%
More than 15	10%

3.2.5. Cardiopulmonary Test

Incases with Scoliosis of severe type cardiopulmonary function tests and percentage deviation from normal should be assessed by one of the following method whichever seems more reliable clinically at the time of assessment. The value thus obtained may be added by combining formula

a. Chest Expansion PPI

4 – 5 cm	Normal
Less than 4 cm reduction in	5% for each cm chest expansion
No expansion	25%

b. Counting in one breathe: Breathe count PPI

More than 40	Normal
0-40	5%
0-30	10%
0-20	15%
0-10	20%
Less than 5	25%

3.2.6 Associated Problems: To be added directly but the total value of PPI in relation to spine should not exceed 100%

a. Pain

Mildly interfering with ADL	4%

Moderately restriction ADL	6%
Severely restriction ADL	10%

b. Cosmetic Appearance

No obvious disfiguration with clothes on	Nil
Mild disfigurement	2%
Severe disfigurement	4%

c. Leg Length Discrepancy

First ½ shortening	Nil
Every ½ beyond first ½	4%

d. Neurological deficit- Neurological deficit should be calculated per established method of evaluation of PPI in such cases. Value thus obtained should be added telescopically using combining formula.

3.3. Kyphosis

Evaluation should be done on the similar guidelines as used for scoliosis with the following modifications

3.3.1. Spinal Deformity	PPI
Less than 20	Nil
21-40	10%
41-60	20%
Above 60	30%

3.3.2. Torso Imbalance – Plumb line dropped from external ear normally falls at ankle level. The deviation from normal should be measured from ankle anterior joint line to the plumb line.

Less than 5 cm in front of ankle	4%
5 to 10 cm in front of ankle	8%
10 to 15 cm in front of ankle	16%
More than 15 cm in front of ankle	32%
(Add directly)	

3.4.1. Miscellaneous conditions:

Those conditions of the spine which cause stiffness and pain etc are rated as follows.

Conditions	Percentage PPI
a. Subjective symptoms of pain, no involuntary	

Muscle spasm, not substantiated by demonstrable structural pathology	0%
b. Pain, persistent muscles spasm and stiffness of spine, Substantiated by mild radiological change	20%
c. Same as B with moderate radiological changes	-25%
d. Same as B with severe radiological changes involving Anyone of the regions of spine	-30%
e. Same as D involving whole spine	-40%

4. Guidelines for Evaluation of disability (PPI) in Neurological Conditions may/may not be associated with Spine.

Basic Guidelines:

1.Assessment in neurological conditions is not the assessment of disease but the Assessment of its effects, i.e., clinical manifestations.

2.These guidelines should only be used for Central and upper motor neuron(UMN) lesions.

3.Performa (form A & B) will be utilized for assessment of lower motor neuron lesions, muscular disorders and other loco motor conditions.

4.Normally any neurological assessment for the purpose of certification has to be done six months after the onset of disease however exact time period is to be decided by the Medical doctor who is evaluating the case who has to recommend the review of the certificate as given in the standard format of certificate.

5.Total percentage of physical impairment in any neurological condition should not exceed 100%.

6.In mixed cases the highest score will be taken into consideration. The lower score will be added telescopically to it by the help of combining formula

7.Additional weightage of 4% will be given for dominant upper extremity.

8.Additional weightage up to 10% can be given for loss of Sensation in each extremity but keeping a total 100%.

Neurological Status	Physical Impairment
Altered sensorium	100%

4.1 Intellectual Impairment (to be assessed by Psychiatrist/Clinical Psychologist)

Degree of Mental Retardation	IQ Range	Intellectual Impairment
Border line	70-79	25%

Mild	50-69	59%
Moderate	35-49	75%
Severe	20-34	90%
Profound	Less than 20	100%

4.2 Speech defect **PPI**

Mild dysarthria	Nil
Moderate dysarthria	25%
Severe dysarthria	50%

4.3 Cranial Nerve Disability

Type of Cranial Nerve Involvement	**Physical Impairment**
Motor Cranial nerve	20% for each nerve
Sensory Cranial nerve	10% for each nerve

4.4 Motor system Disability – Hemi paresis

Neurological Involvement	**Physical Impairment**
– Mild	25%
– Moderate	50%
– Severe	75%

4.5 Sensory System Disability

Anaesthesia	Up to 10% for each limb
Hypoaesthesia	depending upon % of loss of Sensation
Paraesthesia	Loss of Sensation up to 30% depending
Hands/feet sensory loss	upon % loss Sensation

4.6 Bladder disability due to neurogenic involvement

Bladder Involvement	**Physical Impairment**
Mild (Hesitancy/Frequency)	25%
Moderate (precipitancy)	50%
Severe (occasional but recurrent incontinence)	75%
Very Severe (Retention/total incontinence	100%

4.7 Post Head Injury Fits & Epileptic Convulsions

Frequency/Severity of convulsions	**Physical Impairment**
Mild-occurrence of one convulsion only	Nil
Moderate 1-5 convulsions/month on adequate medication	25%

Severe 6-10 convulsions/month on adequate medication	50%
Very Severe more than 10 fits/mth on adequate medication	75%

4.8 Ataxia (Sensory or Cerebellar)

Severity of Ataxia	Physical Impairment
Mild (detected on examination)	25%
Moderate	50%
Severe	75%
Very Severe	100%

5. Guidelines for Evaluation of PPI in cases of Short Stature/Dwarfism

1. Recumbent length or longitudinal height below 3rd percentile or less than 2 Standard Deviation from the mean is considered to have 'Short Stature'.
2. The evaluation of 'Short Statured' person should be considered only when it is of disproportionate variety and is accompanied by underlying pathological conditions, e.g., Achondroplasia, Spondyloepiphysial dysplasia, Mucopolysacchroidosis etc.
3. The Indian Council of Medical Research (ICMR) norms as enclosed should be taken as guidelines for the height.
4. Every 1 inch. Vertical height reduction should be valued as 4% Permanent Physical Impairment (PPI).
5. Associated skeletal deformities should be evaluated separately and total percentage of both should be added by combining formula.

ICMR Norms for Indian Population

Standing Heights for Indian Population (Inches) Mean & Standard Deviations

	Male			Female		
Age	Mean	S.D	2SD	Mean	S.D	2SD
Less than 3 months	22.113	2.32	17.49	21.65	2.13	17.39
3 months +	24.68	1.58	21.52	23.98	2.40	21.80
6 months +	25.55	3.19	19.17	25.35	1.43	22.49
9 months +	27.36	1.77	23.82	26.26	1.52	23.22
1 year +	29.09	2.07	24.95	28.54	2.04	24.46
2 years +	32.13	2.10	27.93	31.53	2.28	26.97
3 years +	34.96	2.58	29.80	34.33	2.50	29.33
4 years +	37.80	2.65	32.50	37.20	2.50	32.20
5 years +	40.19	3.16	33.84	39.92	2.90	34.12
6 years +	42.71	2.81	37.09	42.28	3.41	35.46
7 years +	44.84	3.41	38.02	44.40	3.34	37.72
8 years +	46.96	2.89	41.18	46.53	3.03	40.47
9 years +	48.70	3.65	41.40	48.38	2.96	42.46
10 years +	48.97	3.93	41.11	50.55	3.15	44.25
11 years +	52.51	3.83	44.86	52.60	3.73	45.14
12 years +	54.45	3.99	46.47	54.80	4.03	46.74
13 years +	56.93	3.84	49.25	56.65	3.63	49.39
14 years +	59.10	3.95	51.20	58.07	3.82	50.43
15 years +	61.22	3.94	53.34	58.89	3.27	52.35
16 years +	62.79	3.84	55.11	59.44	2.80	53.84
17 years +	63.54	4.11	55.32	59.64	2.95	53.74
18 years +	64.21	3.76	56.69	59.72	2.31	55.10
19 years +	64.37	3.79	56.72	59.72	2.31	55.19
20 years +	64.60	2.75	59.10	59.72	2.32	55.08
21 years	64.64	2.40	59.84	60.24	2.24	55.76

5.Guidelines for Evaluation of PPI in Amputees:

Basic Guidelines:

1. In case of multiple amputees if the total sum of permanent physical impairment is above 100%, it should be taken as 100% only.
2. If the stump is unfit for fitting the prosthesis, additional weight-age of 5% should be added to the value.
3. In case of amputation in more than one limb percentage of each limb is added by combining formula and another 10% will be added but when only toes or fingers are involved only 5% will be added.
4. Any complication in form of stiffness of proximal joint, neuroma, infection etc., should be given up to a total of 10% additional weight-age.
5. Dominant upper extremity should be given 4% additional weight-age.

Upper Limb Amputations	**PPI & loss of Physical Function each limb**
1. Fore-quarter amputation	100%
2. Shoulder Disarticulation	90%
3. Above Elbow up to upper 1/3 of Arm	85%
4. Above Elbow up to lower 1/3 of fore Arm	80%
5. Elbow disarticulation	75%
6. Below Elbow up to 1/3 of Forearm	70%
7. Below Elbow up to 1/3 of Forearm	65%
8. Wrist disarticulation	60%
9. Hand through carpal bones	55%
10. Thumb through C.M. or 1st MC joint	30%
11. Thumb disarticulation through M-C Joint or. Phalanx	25%
12. Thumb disarticulation through IP joint or distal phalanx	15%

		Index Finger (15%)	Middle Finger (5%)	Ring Finger (3%)	Little Finger (2%)
13.	Amputation through Prox Phalanx or Disarticulation through M.P.	15%	5%	3%	2%
14.	Amputation through middle Phalanx or Disarticulation through PIP joint	10%	4%	2%	1%
15.	Amputation through distal Phalanx or through DIP joint	5%	2%	1%	1%

Lower Limb Amputations	**PPI & loss of Physical function each limb**
1. Hind quarter	100%
2. Hip disarticulation	90%
3. Above Knee up to upper 1/3 of thigh	85%
4. Above Knee up to lower 1/3 of thigh	80%
5. Through Knee	75%
6. B. K. up to 8 cm	70%
7. B. K. up to lower 1/3 of leg	60%
8. Through Ankle	55%
9. Syme's amputation	50%

10.	Up to mid-foot	40%
11.	Up to fore-foot	30%
12.	All toes	20%
13.	Loss of first toe	10%
14.	Loss of second toe	5%
15.	Loss of third toe	4%
16.	Loss of fourth toe	3%
17.	Loss of fifth toe	2%

6. Evaluation of PPI of Congenital Deficiencies of the Limbs.

6.1 Transverse Deficiencies:

1. Functionally congenital transverse limb deficiencies are comparable to acquired amputations and can be called synonymously as congenital amputation, however, in some cases revision of amputation is required to fit prosthesis.

2. The transverse limb deficiencies therefore should be assessed on basis of the guidelines applicable to the evaluation of PPI in cases of amputees as given in the preceding chapter.

For example:

	Deficiency	Equivalent to amputation	**PPI**
1.	Transverse deficiency Rt. Arm complete	(Shoulder disarticulation)	90%
2.	Transverse deficiency at thigh complete	(Hip disarticulation)	90%
3.	Transverse deficiency proximal Upper Arm	(Above Elbow amp.)	85%
4.	Transverse deficiency at lower thigh	(Above Knee amp. Lower 1/3)	80%
5.	Transverse deficiency fore arm complete	(Elbow disarticulation)	75%
6.	Transverse deficiency lower forearm	(Below Elbow amp)	65%
7.	Transverse deficiency Carpal complete	(Wrist disarticulation)	60%
8.	Transverse deficiency Metacarpal complete	(Disarticulation through carpal bones)	55%

6.2 Longitudinal Deficiencies:

6.2.1 Basic Guidelines

1. In cases of longitudinal deficiencies of limbs, due consideration should be given to functional impairment.
2. In upper limb, loss of ROM, Muscle Strength and Hand functions like Prehension etc. should be tested while assessing the case for PPI.
3. In lower limb clinical method of assessing the Stability component and Shortening of lower limb should be given due weightage.
4. Apart from functional assessment the lost joint/part of body should also be valued as per distribution given in chapter. 'Guidelines for Evaluation of PPI in Upper and Lower Extremity'. The values so obtained should be added with the help of combining formula.

Example: Congenital absence of Humerus where Forearm bones directly articulate with Scapula.

There will be mild reduction in ROM and Strength of muscles in the existing joints apart from loss of body part.

Loss of shoulder joint can be given-30%

Loss of ROM of Elbow/Shoulder & Wrist

All the Components should be added together by the combining formula of

6.2.2 In case of loss of single bone in forearm the evaluation should be based on the principles of evaluation of Arm component which include evaluation of ROM, Muscle Strength and Coordinated Activities. The values so obtained should be added together with the help of 'combining formula'.

6.2.3. In case of loss of single bone in leg the evaluation should be based on the principles of evaluation of Mobility component and Stability components of the Lower Extremity. The values obtained should be added together with the help of 'combining formula'.

7. Guidelines for Evaluation of Physical Impairment due to Cardiopulmonary Diseases.

7.1 Basic Guidelines:

1. Modified New York Heart Association subjective classification should be utilized to assess functional disability.
2. The assessing physician should be alert to the fact that patients who come for disability claims are likely to exaggerate their symptoms. In case of any doubt patients should be referred for detailed physiological evaluation.
3. Disability evaluation of cardiopulmonary patients should be done after full medical, surgical and rehabilitative treatment available because most of these diseases are potentially treatable.
4. Assessment of cardiopulmonary impairment should also be done in diseases, which might have associated cardiopulmonary problems eg. Amputees, Myopathies, etc.
5. For respiratory assessment, routine respiratory functions test should be done. However, in cases of interstitial lung diseases, diffusion studies may be done.
6. In cases of Angina Pectoris (chest pain) base line studies in resting ECG should be done. When there is persistence of symptoms, exercise or stress test should be done.

7.2 Proposed classification with loss of function is as follows:

Group 0: A patient with cardiopulmonary disease who is asymptomatic (i.e has no symptoms of breathlessness, palpitation, fatigue or chest pain).

Group 1: A patient with cardiopulmonary disease who becomes symptomatic during his ordinary physical activity but has mild restriction (25%) of his physical activities.

Group 2: A patient with cardiopulmonary disease who becomes symptomatic during his ordinary physical activity & has 25-50% restriction of his ordinary physical activities.

Group 3: A patient with cardiopulmonary disease that becomes symptomatic during less than ordinary physical activity so that his ordinary physical activities are 50-75% restricted.

Group 4: A patient with cardiopulmonary disease who is symptomatic even at rest or on mildest exertion so that his ordinary physical activity is severely or completely restricted (75-100%)

Group 5: A patient with cardiopulmonary disease who gets intermittent symptoms at rest (i.e. patients with Bronchial Asthma, Paroxysmal nocturnal dyspnoea, etc.)

MINISTRY OF SOCIAL JUSTICE AND EMPOWERMENT

NOTIFICATION

NEW DELHI, THE 1st JUNE, 2001

Subject: – Guidelines for evaluation of various disabilities and procedure for certification.

No. 16-18/97-NI.I.

In order to review the guidelines for evaluation of various disabilities and procedure for certification as given in the Ministry of Welfare's O.M. No. 4-2/83-HW.-III, dated the 6th August, 1986 and to recommend appropriate modifications/alterations keeping in view the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995, Government of India in Ministry of Social Justice and Empowerment, vide Order No. 16-18/97-NI. I, dated 28-8-1998, set up four committees under the Chairmanships of Director General of Health Services-one each in the area of mental retardation, loco motor/ orthopaedic disability, visual disability and speech & hearing disability. Subsequently, another committee was also constituted on 21-7-1999 for evaluation, assessment of multiple disabilities and categorization and extent of disability & procedures for certification.

2. After having considered the reports of these committees the undersigned is directed to convey the approval of the President to notify the guidelines for evaluation of following disabilities and procedure for certification :–

1. Visual Impairment
2. Locomotor Disability
3. Speech & Hearing
4. Mental Retardation
5. Multiple Disabilities.

copy of the Report is enclosed herewith.

3. The minimum degree of disability should be 40% in order to be eligible for any concession/benefit.

4. According to the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Rules, 1996 notified on 31.12.1996 by the Central Government in exercise of the powers conferred by sub-section (1) and (2) of section 73 of the Persons with Disabilities Act, 95 to give disability certificate, will be a Medical Board duly constituted by the Central and State Government. The State Government may constitute a Medical Board consisting of at least three members, out of which **at least one shall be a specialist in the particular field for assessing loco motor/visual including low vision/hearing and speech disability, mental retardation and leprosy cured as the case may be.**

5. Specified tests as indicated in guidelines should be conducted by the medical board and recorded before a certificate is given.

6. The certificate would be valid for a period of five years for those whose disability is temporary. For those who acquire permanent disability the validity can be shown as permanent.

7. The Sate Governments/UT Administrations may constitute the medical board indicated in para 4 above immediately, if not done so far.

8. The Director General of Health Services, Ministry of Health and Family Welfare will be the final authority, should there arise any controversy/doubt regarding the interpretation of the definitions/classifications/evaluations/tests etc.

GAURI CHATTERJI, Jt. Secy.

Reports of the Committee set up to review the guidelines for evaluation of various disabilities and procedure for certification and to recommend appropriate modifications/alteration keeping in view the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995.

In order to review the definitions of various types of disability, the guidelines for evaluation of various disabilities and procedure for certification as given in the Ministry of Welfare's O.M. N. 4-2./38-HW III. Dated the 6th August, 1986 and to recommend appropriate modifications/alterations keeping in view the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act 1995, five Sub-Committees were constituted in the areas of Mental Retardation, Orthopaedic/Locomotor Disability, Visual Disability, Speech & Hearing and Multiple Disabilities, under the Chairmanship of Dr. S. P. Agarwal, Director General of Health Services, vide the Ministry of Social Justice & Empowerments Order No. 16-18/97-NI.I, dated 28.8.1998 and 21.7.1999.

2. The Sub-Committees, after detailed deliberations, have submitted their reports. The reports of the Committees set up to review the guidelines for evaluation of various disabilities and procedure for certification on each of the area of the disabilities are given in pages referred earlier.

VISUAL DISABILITY
INTROSPECTION & INTERVENTION
BY
DISABILITY CERTIFICATION

In India approx. three million persons are suffering from vision impairment. This include blind and low vision who need intervention in form of assistive aid/ technology support in their mobility, daily living skills, to get education, to carry on vocation/employment etc. to compete with their counterpart in the society. Legislations are framed, Acts were passed by the parliament, and activists pressed their demands through agitation & dharnas that resulted in a policy framework, schemes, programs, facilities and concessions, reservation in education & employment. Who is eligible for all these facilities & concessions? The individual with visual disability 40% or above certified by a disability certificate issued by a duly constituted medical board. To get a disability certificate by a disabled individual, other than an apparent blind person is still a question.

It is because either a lack of adequate information among expert member of board or imposition of their personal opinion in deciding disability.

Facts about vision impairment, prevalence, degree, distribution and disability assessment guidelines need to be popularized amongst the medical doctors including expert members. The technology devices, which are value addition in life of others, may be a basic need for a person with visual impairment. Disability assessment and certification is first need before going for any additional support/assistance from government. With this background in mind, facts about persons with visual disability and guidelines for disability certification have been compiled in the simplest form, in the forthcoming pages.

As per definition adopted by National Sample Survey Organization-a person with visual disability is one who does not have light perception, when both eyes are taken together, or if a person has light perception but could not correctly count fingers of a hand (after best possible correction with spectacles) from a distance of 3 meters in good day-light.

Thus, following the above definition, the visually disabled persons can be categorized into two broad groups:

***Blindness*:** Persons who does not have light perception or persons who have light perception but cannot count fingers at a distance of 1 meter even with spectacles (best possible correction).

***Low vision*:** persons who have light perception and can count fingers up to a distance of 3 meters even with spectacles.

As per National Census 2001, there are more than 10 million persons suffering with visual disability in contrary NSSO, 2002 reported 03 million persons with visual disability. The significant difference is due to definition adopted by them. Since NSSO having expertise and experienced in such survey, their report may be considered more authentic.

In the country as a whole, the prevalence and incidence of visual disability has decreased marginally between 1981 & 1991, and substantially between 1991 and 2002. In the improved conditions of better health care over time, ailments, like diarrhea, cataract, glaucoma, etc. causing visual disability might have been prevented largely during the recent years. It may also be noted that a large proportion of people are using spectacles as a preventive measure to improve their ability to see objects properly that they could not have done so without spectacles. Further, visual disability is judged with or without spectacles depending upon whether one is using it or not.

The reduction in prevalence and incidence rate in visual disability from 36$^{th\ (1981)}$ to 58th round (2002) was due to various preventive measures taken and improvement in services and use of technology in medical science.

Prevalence & Incidence of visually disabled persons (per 1,000 persons) during last three decade.(from NSS 36th, 47th and 58th round)

All-India Sector	36th round (July – Dec., 1981) Persons	47th round (July – Dec., 1991) persons	58th round (July – Dec., 2002) Persons
		Prevalence rate	
Rural	5.53	5.25	2.96
Urban	3.56	3.02	1.94
		Incidence rate	
Rural	.038	.025	.013
Urban	.030	.020	.009

Prevalence:

Out of every thousand persons, about 2.69 (2.40 for male and 3.01 for female) was visually disabled. 72 % of them were blind and rest 28% had low vision. The prevalence of visual disability was substantially higher among the females than males. The prevalence rate among the rural residents (296) was also significantly higher than in urban residents (194). 24 per cent of the visually disabled were using spectacles. Amongst the persons with low vision, 51% were using spectacle.

Points to be remembered in visual disability assessment.

1. Vision has been taken as 100% and percentage of disability in such cases should be calculated from that and not thinking human body as 100% and considering vision as part of that.

2. Disability percentage should be calculated following latest guidelines (2001) framed and not by personal opinion.

3. Disability guidelines are based on functional loss (visual) taking medical diagnosis in to account and not mere on medical diagnosis.

4. The assessment has to be done after best possible correction medical/ surgical & glasses)

5. In Vision assessment both eyes should be tested separately.

6. In calculating disability percentage, vision, acuity and limitation of field vision has to be taken in to account.

7. In calculating disability, age, sex, education and nature of work being performed by individual has no role to play.

8. In case of multiple disabilities, if a person has disability other than visual, it should be added as per guidelines and not mere summing percentage of two disabilities.

9. In case of dissatisfaction by individual issued disability certificate, the decision taken (disability percentage) may be reviewed by the same board on individual's request.

10. In case of any quarry, the DGHS, Govt. of India is the final authority (appellate authority)

GUIDELINES
FOR ASSESSMENT OF VISUAL DISABILITY

1. **Definition**: - **Blindness** refers to a condition where a persons suffers from any of the condition, namely,
   i) Total absence of sight; or
   ii) **Visual acuity** not exceeding 6/60 or 20/200 (Snellen) in the better eye with best correcting lenses; or
   iii) **Limitation of field of vision** subtending an angle of 20 degree or worse;
2. **Low Vision**: -Persons with low vision means a person a with impairment of vision of less than 6/18 to 6/60 with best correction in the better eye or impairment of field in any one of the following categories:-
   a) Reduction of fields less than 50 degrees
   b) Hemianopia with macular involvement
   c) Altitudinal defect involving lower fields.

3. Process of Certification

A disability certificate shall be issued by a Medical Board duly constituted by the Central/State Government having, at least three members. Out of which, at least one members shall be a specialist in ophthalmology.

It was also decided that whenever required the Chairman of the Board may co-opt other experts including that of the members constituted for the purpose by the Central and the State Government.

On representation by the applicant, the Medical Board may review its decision having regard to all the facts and circumstances of the case and pass such order in the matter as it thinks fit.

If visual disability is associated with one or more other disability (other than visual disability), the guidelines for multiple disability in disability assessment has to be followed.

4. Variables in assessing Vision Disability (PPI)

In Vision Disability following variables need to be taken into consideration while assessing function loss resulting permanent physical impairment (disability).

1. Vision

2. Acuity of vision
3. Field of vision (in degrees)
4. Hemianopia
5. Altitudinal Defect (in lower field)

5. **Categories of Visual Disability**

All with correction

Category	Better eye	Worse eye	% age impairment
Category 0	**6/9-6/18**	**6/24 - 6/36**	**20%**
Category I	**6/18-6/36**	**6/60 - Nil**	**40%**
Category II	**6/60-4/60 or Field of vision 10-20**	**3/60 - Nil**	**75%**
Category III	**3/60-1/60 or Field of vision 10o**	**F.C at 1ft - Nil**	**100%**
Category IV	**F.C at 1 ft-Nil Or field of vision 10o**	**F.C at 1 ft–Nil**	**100%**
One eyed persons 6/6		**F.C at 1 ft.-Nil or Field of vision 10**	**30%**

(Note: F. C. means finger Count.)

No... 16-18/97-NI.I.

Government of India
Ministry of Social Justice & Empowerment
Shastri Bhavan
New Delhi, Dated, July21' 1999

ORDER

In It has been decided t constitute a Sub-Committee in the sector of Multiple Disability, in order to have standard definitions, and guidelines for evaluation and procedure for certification and to make appropriate recommendations keeping in view the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995 Accordingly, a Sub-Committee is hereby constituted in the sector of multiple disability, with the following Members:

1.	Dr. S. P. Agarwal Director General Health Services Ministry of Health and Family Welfare, Nirman Bhawan, New Delhi-11	Chairperson
2.	Smt. Aloka Guha. Director, Spastics Society of Tamil Nadu, Opp. TTTI, Taramani Road, Chennai-13	Member
3.	Dr. H.C. Goyal Consultant, Rehabilitation Department Safdarjung Hospital, New Delhi.	Member
4.	Dr. Uma Tuli, General Secretary, Amar Joyti Charitable Trust, N-192, Greater Kailas-1,New Dehi-110048.	Member
5.	Dr. D. K. Menon, Director ,National Institute for the Mentally Handicapped, Manovikas Nagar,Secunderabad-500 009.	Member-Secretary

3. The terms of reference for the Committee are as follows: -

(a)Providing uniform definitions and categorization of degree and extent of the Disabilities.

(b)Recommending authorities competent to give certification.

(c)The Committee will submit its report in two months.

TA/DA to the members of the committee will be borne by the National Institute for the Mentally Handicapped, Secunderabad

(Gouri Chatterjee)
Joint Secretary to the Govt. Of India
Tele No. 338 1641

To
All Members of the Committees
Copy for Information to :
PSs to Secretary (SJ&E) /AS(SJ&E) /JS(DD)

MENTAL RETARDATION

1. **Definition :-** Mental retardation is a condition of arrested or incomplete development of the mind, which is especially characterized by impairment of skills manifested during the development period which contributed to the overall level of intelligence, i.e., cognitive, language, motor and social abilities.

2. Categories of Mental Retardation :-

2.1 **Mild Mental Retardation: -** The range of 50 to 69 (standardized IQ test) is indicative of mild retardation. Understanding and use of language tend to be delayed to a varying degree and executive speech problems that interfere with the development of independence may persist into adult life.

2.2 **Moderate Mental Retardation :-** The IQ is of 35 to 49 Discrepant profiles of abilities are common in this group with some individuals achieving higher levels in visuo-spatial skills than in tasks dependent on language while others are markedly clumsy, do not enjoy social interaction and simple conversation. The level of development of language is variable. Some of those affected can take part in simple conversations while others have only enough language to communicate their basic needs.

2.3 **Severe Mental Retardation: -** The IQ is usually in the range of 20 to 34. In this category, most of the people suffer from a marked degree of motor impairment or other associated deficits indicating the presence of clinically significant damage to or mal-development of the central nervous system.

2.4 **Profound Mental Retardation: -** The IQ in this category estimated to be under 20. The ability to understand or comply with requests or instructions are severely limited. Most of such individuals are immobile or severely restricted in mobility incontinent and capable at most of only very rudimentary forms of non-verbal communication. They posses little or no ability to care for their own basic needs and require constant help and supervision.

3. Process of Certifications:-

3.1 A disability certificate shall be issued by a Medical Board consisting of three members duly constituted by the Central/State Government. At least one shall be a specialist in the area of mental retardation, namely **Psychiatrist, Pediatrician and Clinical Psychologist**. Copy of the Certificate for Mental Retardation/Illness is enclosed.

It was also decided that whenever required the Chairman of the Board may co-opt other experts including that of the members constituted for the purpose by the Central and the State Government.

4. Variables in Assessing Disability (PPI)

Following variables need to be taken into consideration while assessing function loss resulting permanent Physical Impairment (disability) in Mental Retardation/Mental Illness.

a. Clinical Assessment,
b. Assessment of Adaptive Behavior and
c. Intellectual functioning.

Assessment of Permanent Physical Impairment in Mental Illness based on Indian Disability Evaluation and Assessment Scale (IDEA)

A scale for measuring and quantifying disability in mental disorders, developed by the Rehabilitation Committee of Indian Psychiatric Society, December 2000.

Items:

I. Self Care: Includes taking care of body hygiene, grooming, health including bathing, toileting, dressing eating taking care of one's health.

II. Interpersonal Activities (Social Relationships): Includes initiating and maintaining interactions with others in contextual and social appropriate manner.

III. Communication and Understanding: Includes communication and conversation with others by producing and comprehending spoken/written/nonverbal messages.

IV. Work: Three areas are Employment/ Housework/ Education Measures on any aspect.

1. Performing in Work/ Job: Performing in work/ employment (paid) employment/ self employment/ family concern or otherwise. Measure ability to perform tasks at employment completely and efficiently and in proper time includes seeking employment.

2. Performing in Housework: Maintaining household including cooking, caring for other people at home, taking care of belongings etc. Measures ability to take responsibility for and perform household tasks completely and efficiently and in proper time.

3. Performing in school/ college: Measures performance education related tasks.

Scores for each item:

0- NO disability (none, absent, negligible)
1- MILD disability (slight, low)
2- MODERATE disability (medium, fair)
3- SEVERE disability (high, extreme)
4- PROFOUND disability (total, cannot do)

TOTAL SCORE
Add scores of the 4 items and obtain a total score
Additional Weightage for Duration of illness (DOI):
< 2 years: score to be added is 1
2-5 years: add 2
6-10 years: add 3
> 10 years: add 4

GLOBAL DISABILITY

Total Disability score + DOI score = Global Disability score

Percentages:

0	No Disability	=0%
1-6	Mild Disability	=<40%
7-13	Moderate Disability	= 40-70%
14-19	Severe Disability	=71-99%
20	Profound Disability	=100 %

Cut off for welfare measures

MANUAL FOR "IDEAS"

In order to score this instrument, information from all possible sources should be obtained. This will include interview of patient, the care giver and case notes when available.

I. SELF CARE:

This should be regarded as activity guided by social norms and conventions. The broad areas covered are

a. Maintenance of personal hygiene and physical health.
b. Eating
c. Maintenance of personal belongings and living space

a. Does he look after himself, wash his clothes regularly, and take a bath and brush his teeth?
b. Does he have regular meals?
c. Does he take food of right quality and quantity?
d. What about his table manners?
e. Does he take care of his personal belongings with reasonable standard of Cleanliness and orderliness?

0 = No disability

Patient's level and pattern of self-care and normal, within the social cultural and economic context.

1 = Mild

Mild deterioration in self-care and appearance (not bathing, shaving, changing clothes for the occasion as expected). Does not have adverse consequences such as hazards to his health to his health. No embarrassment to family

2 = Moderate

Lack of concern for self-care should be clearly established such as mild deterioration of physical health, obesity, tooth decay & body odors.

3 = Severe

Decline in self-care should be marked in all areas. Patient wearing torn clothes, would only wash if made to and would only eat if told. Evidence of serious hazards to physical health. (Malnutrition, infection, patient unacceptable in public).

4 = Profound

Total or near total lack of self-care (Example: risk to physical survival, needs feeding, washing, putting on clothes etc., Constant supervision necessary)

II INTER PERSONAL ACTIVITIES

Includes patient's response to questions, requests and demands of others. Activities of regulating emotions. Activities of initiating, maintaining and terminating interactions and activities of engaging in physical intimacy.

Guiding Questions

a. What is his behavior with others?
b. Is he polite?
c. Does he respond to questions?
d. Is he able to regulate verbal and physical aggression ?
e. Is he able to act independently in social interactions?
f. How does he behave with strangers?
g. Is he able to maintain friendship?
h. Does he shows physical expression of affection and desire?

Scoring

0 = No

Patients gets along reasonably well with people personal relationships No friction in inter-personal relationships

1 – Mild

Some friction on isolated occasions. Patient known to be nervous or irritable but generally tolerated by others.

2 = Moderate

Factual evidence that pattern of response to people is unhealthy. May be seen on more than few occasion. Could isolate himself from others and avoid company.

3 = Severe

Behavior in social situations is undesirable and generalized. Causes serious problem in daily living/ or work. Patient is socially ostracized.

4 = Profound

Patient in serious and lasting conflict, serious danger to problems or others Family afraid of potential consequences.

III COMMUNICATION AND UNDERSTANDING

Understanding spoken messages as well as written and non-verbal messages and ability to reduce messages in order to communicate with others.

1. Questions

a. Does he avoid talking to people?
b. When people come home what does he do?
c. Does he ever visit others?
d. Is he able to start, maintain and end a conversation?
e. Does he understand body language and emotions of others such as, crying, screaming, etc.
f. Does he indulge in reading and writing?
g. Do you encourage him to be more sociable?

Scoring:

0 = No disability

Patient mixes, talks and generally interacts with people as much as can be expected in his socio-cultural context. No evidence of avoiding people.

1 = Mild

Patient described as uncommunicative or solitary in social situations. Sings of social anxiety might be reported.

2 = Moderate

A very narrow range of social contact, evidence of active avoidance of people on some occasions and interference with performance of social rules causes concern to family.

3 = Severe

Evidence of more generalized, active avoidance of contact with people (leave the room when visitors arrive and would not answer the door or phone).

4 = Profound

Hardly has contacts and actively avoids people nearly all the time. eg: may lock himself inside the room. Verbal communication is nil or a bare minimum.

IV. WORK

This includes employment, housework and educational performance. Score only one category in case of an overlap.

Employment:

Guiding Questions

a.Is he employed/unemployed?
b.If employed, does he go to work regularly?
c.Does he like his job and coping well with it?
d.Can you rely on him financially?
e.If unemployed does he make any efforts to find a job?

Scoring:

0 = No disability.-Patient goes to work regularly and his output and quality of work performance are within acceptable levels for the job.

1 = Mild-Noticeable decline patient's bilgy to work, to cope with it and meet the demands of work. May threaten to quit.

2 = Moderate--Declining work performance, frequent absences, lack of concern about all this. Financial difficulties foreseen.

3 = Severe- Marked decline in work performance, disruptive at work, unwilling to adhere to disciplines of work. Threat of losing his job.

4 = Profound-Has been largely absent from work, termination imminent. Unemployed and making no efforts to find jobs.

In similar ways, housewives should be rated on the amount, regularity and efficiency in which tasks in the following areas are completed. Consider the amount of help required completing these. Acquiring daily necessities, making, storing and serving of food, cleaning the house, working with those helping with domestic duties such as maids, cooks etc. looking after possessions and valuable in the house.

Student: Assess an score on performance in school/college, regularity discipline, interest in future studies, behavior at educational institutions. Those who had to discontinue education on account of mental disability and unable to continue further should be given a score of 4.

IDEAS SCORING SHEET

ITEMS	0	1	2	3	4
Self Care					
Interpersonal Activities					
Communication & Understanding					
Work					
A. TOTAL SCORE					
B. DOI SCORE					
GLOBAL SCORE (A+B)					

STANDARD FORMAT OF THE CERTIFICATE

OF MENTAL RETARDATION FOR GOVERNMENT BENEFITS

(NAME & ADDRESS OF THE INSTITUTE/HOSPITAL ISSUING THE CERTIFICATE)

Certificate No. Date-

This is to certify that /Smt./Kum. _____

Son/Daughter of _____of Town/City ----------

_____ with particulars

given below:-

a) Age

b) Sex

c) Signature/Thumb impression

CATEGORISATION OF MENTAL RETARDATION- Mild/Moderate/Severe/Profound

Validity of the Certificate: Permanent

Signature of the Government
Doctor/Hospital with seal

Chairperson Mental Retardation
Certification Board

Recent Attested Photograph
Showing the disability affixed here

Dated:

Place:

(TO BE PUBLISHED IN GAZETTE OF INDIA (EXTRAORDINARY) PART I SECTION 1)

GOVERNMENT OF INDIA

MINISTRY OF SOCIAL JUSTICE AND EMPOWERMENT

PUBLISHED ON WEDNESDAY, FEBRUARY 27, 2002

Subject:-Guidelines for evaluation and assessment of mental illness and procedure for certification.

No. 16-18/97-NI.I Dated:18TH February, 2002.

Mental illness has been recognized as one of the disabilities under Section 2 (i) of the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995. "Mental illness" has been defined under Section 2(q) of the said Act as any mental disorder other than mental retardation.

2. In order to prescribe guidelines for evaluation and assessment of mental illness and procedure for certification, a Committee was constituted by the Department of Health, Government of India vide Order dated 6th August, 2001 under the Chairmanship of Director General of Health Services on the basis of request made by the Ministry of Social Justice & Empowerment. The Committee has submitted its report.

3. After having considered the report of the Committee, the undersigned is directed to convey the approval of the President to notify the guidelines for evaluation and assessment of mental illness and procedure for certification. Copy of the Report is enclosed herewith as **annexed**.

4. The minimum degree of disability should be 40% in order to be eligible for any concessions/benefits.

5. According to the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Rules, 1996 notified by the Central Government in exercise of the powers conferred by sub-section (1) and (2) of section 73 of the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995 (1of 1996), authorities to give disability Certificate will be a Medical Board duly constituted by the Central and the State Government. The Committee has recommended that certification of disability for the purposes of the Act may be carried out by a medical board comprising of the following members:

a. The Medical Superintendent / Principal /
Director /Head of the Institution or his nominee -Chairperson
b. Psychiatrist -Member
c. Physician - Member

6. At least two of the members, including Chairperson of the board must be present and sign the disability certificate.

7. The State Governments are, therefore, requested to constitute Medical Board as indicated above immediately.

8. Specified test as indicated in annexed should be conducted by the medical board and recorded before a certificate is given.

9. The certificate would be valid for a period of five years for those whose disability is temporary and are below the age 18 years. For those who acquire permanent disability, the validity can be shown as 'Permanent' in the certificate.

10. The Director General of Health Services, Ministry of Health and Family Welfare shall be the final authority, should there arise any controversy/doubt regarding the interpretation of the definitions/classifications/evaluation tests etc.

(Smt. RAJWANT SANDHU)
Joint Secretary to the Government of India.

ANNEXURE A

MINUTES OF THE MEETING

Minutes of the meeting of the committee to review the definition of mental illness and formulating guidelines for assessment of mental illness disability and procedure for certification held on 27th September 2001 (Thursday) under the chairmanship of DGHS.

A meeting was held under the chairmanship of DGHS on 27th September to review the definition of mental illness and formulating guidelines for assessment of mental illness disability and procedure for certification.

1.After detailed discussion consensus was reached on the view that the present definition of "mental illness" as contained in the Persons with Disabilities (equal opportunities, protection of rights and full participation) Act, 1995 section 2 (q) may be retained unchanged. This will be most suitable for the purpose of PWD Act.

2. With regard to assessment of disability related to mental illness it was agreed that the Indian Disability Evaluation and Assessment Scale (IDEAS) developed by the Rehabilitation Committee of the Indian Psychiatric Society (IPS) through a task force should be used with modifications for the purposes of the Act. The modified scale, IDEAS is appended.

3. The Committee further recommended that certification of disability for the purposes of the Act may be carried out by a medical board comprising of the following members:

(i) The Medical Superintendent /Principal/Director/
Head of the Instt. or his nominee –Chairperson.

(ii) Psychiatrist –Member

(iii) Physician –Member.

At least two of the members, including Chairperson of the board must be present and sign the disability certificate.

4. Meeting ended with the vote of thanks to the chair.

No-16-18/97 – NI.I
Government of India
Ministry of Social Justice & Empowerment
New Delhi, dated 28th August 1998

ORDER

In order to review the definitions of various types of disability the guidelines of evaluation of various disabilities and procedure for certification as given in the Ministry of Welfares O.M.no:4-2/83-HW. III. Dated the 6th August 1986 and to recommend appropriate modifications alterations keeping in view the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation)Act, 1995, the following sub committees are hereby constituted in the areas of Mental Retardation, Orthopedic/Loco motor Disability, Visual Disability and Speech and Hearing Disability.

Sub-Committee on Mental Retardation

1.Dr.S.P. Aggarwal — Chairperson
Director General
Health Services, Ministry of Health & Family Welfare,
Nirman Bhawan,
New Delhi – 11

2. Dr.R.Srinivastava Murty — Co-Chairperson
Prof & head, Dept.of Psychiatry,
NIMHANS,
Bangalore – 22

3. Dr G G Prabhu — Member
Workehil Cour,
Mysore.

4. Dr.(Mrs) Neena Vohra — Member
Consultant & HOD, Psychiatry,
Dr.R.M.L.Hospital,
New Delhi

5. Dr.Anand Pandit, — Member
Hony, Prof & Director,
KEM Hospital,
Pune – 11.

6. Dr.D.K.Menon, — Member Secretary
Director,
NIMH,
Secunderabad,

SPEECH & HEARING DISABILITY

1. **Definition of Hearing**:- A person with hearing impairment having difficulty of various degrees in hearing sounds is an impaired person.

2. **Points to be remembered in Hearing Disability Assessment**:

   a. Hearing has been taken as 100% and percentage of disability in such cases should be calculated in relation to this and not thinking human body as 100%

   b. Disability percentage should be calculated following latest guidelines notified (2001) and not of personal opinion.

   c. Disability guidelines are based on loss in function (hearing) taking medical diagnosis into account and not mere based on medical diagnosis.

   d. The assessment has to be done after possible correction, mechanical cleaning of ear canal but without hearing aid.

   e. Hearing in both ear should be tested separately.

   f. In calculating disability percentage, hearing and speech discrimination have to be taken into account.

   g. While calculating disability, age, sex, education and nature of work being performed by individual have no role to play.

   h. In Multiple Disability, if a person has disability other than hearing, it should be added as per guidelines and not mere summing percentage of two disability.

   i. The board may review certificate issued by it, on the request/representation of disabled.

   j. The DGHs, Govt.of India is final authority (Appellate authority)

2. Variables in assessing Hearing Impairment (PPI)

1.Hearing loss in units of dB level in each ear separately

2.Speech discrimination

3. Categories of Hearing Impairment.

Category	Type of Impairment	dB Level	Speech discrimination	% age of impairment
I	Mild hearing	dB 26 to 40 dB in better ear	80 to 100% in better ear	Less than 40%
II (a)	Moderate hearing	41 to 60 dB in better ear	50 to 80% in better ear	40% to 50%
II (b)	Severe hearing Impairment	61 to 70 dB in better ear	40 to 50% in better ear	51% to 70%
III	a. Profound hearing Impairment b. Total deafness	71 to 90 dB 91 dB and above/ in better ear/ no	Less than 40% in better ear/ very poor discrimination	71% to 100%

		hearing		

i) Pure tone average of hearing in 500 and 2000 HZ, 4000 HZ by conduction (AC and BC) should be taken as basis for consideration as per the test recommendations.

ii) When there is only an island of hearing present in one or two frequencies in better ear, it should be considered as total loss of hearing.

iii) Wherever there is no response (NR) at any of the 4 frequencies (500, 1000, 2000 and 4000 HZ), it should be considered as equivalent to 100 dB loss for the purpose of classification of disability and in arriving at the average.

4. Process of Certification

A disability certificate shall be issued by a Medical Board duly constituted by the Central and State Government. Out of which at least one member shall be a specialist in the field of ENT.

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EVALUATION OF IMPAIRMENTS, DISABILITIES IN CASE OF OCCUPATIONAL AND OTHER DISEASES AND ACCIDENTS

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CONTENTS

PREFACE

The document has been prepared after a one year study of literature by eminent doctors from all over India. A background paper was then circulated to many specialists in the country. Subsequently a meeting was called in New Delhi to discuss the preliminary document in detail. After compilation of the deliberations of the meeting, comments of other specialists were incorporated into this final document.

Already doctors have started using the guidelines from the preliminary document for assessing disability in Mumbai and Madras. We also hope that this document will be useful for Workmen's Compensation Issues, the ESI Corporation, the Labour Ministry, and other Government Hospitals all over the country, and all doctors connected with occupational health in the voluntary sector.

In this whole process of making this document some recommendations were repeatedly made by the doctors. They are :

- The final DISABILITY value arrived at by the assessing agent should not be less than the IMPAIRMENT value derived from the document.

- All malignancies due to occupational causes should be assigned 100% impairment.

- Assessment of disability in the normal course of events would be done after maximum rehabilitative efforts have been made and patients impairment is stable. But there are many injuries due to occupational diseases which may progress with time and these should be reassessed whenever the patient complains of increased symptoms and signs or after one year's interval, which ever is earlier.

- The final disability value allotted should be a multiple of 5. If the value arrived at through the document is not such, then the nearest higher multiple of 5 should be assigned.

A person affected by an ailment or having met with an accident is expected to produce a disability certificate from a doctor in order to claim compensation as per the law. But, there are no guidelines available either in the standard textbooks of medicine or in the law to assess disabilities ranging from an organ removed at surgery and head injuries to radiation induced bone-marrow depression.

The aim of this document is to evolve a comprehensive document for guidelines for assessment of disability. A review of literature on the above subject of the past 60 years and also case laws related to the subject all over the world were put together as a background paper in 1995. The background paper was circulated to doctors and occupational experts of leading medical college hospitals and other government and non-government set-ups. A series of meetings were organised in New Delhi and Mumbai over a period of one year from mid 1995 to mid 1996 and a consensus was evolved of the opinions given by them.

A draft of the final document was circulated to people all over India and after a final meeting of doctors and occupational health experts in June 1996 at New Delhi, this final version of the document has been prepared.

This document has received favorable comments even at preliminary stage from experts in occupational health even from industrialized countries like Japan.

We hope that this document will be used by the government hospitals and occupational health centres in India. We also feel that there is need to organise workshops for the doctors on the subject. Even though, this document was designed to assess disability as a percentage loss of function of whole human body in cases of occupational diseases and accidents, these can also be refered where a disability assessment has to be made in conditions of a non-occupational origin.

Along with the team of Centre for Occupational & Environmental Health, I am also thankful to Dr.Veena Murlidhar, Vijay Kanhere, Dr.Murlidhar V. for compiling this document. We are also grateful to all the participants in various workshops organised to discuss this document and also experts who provided with their valuable comments.

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INTRODUCTION

"What is man? " the Bible asks.
"A machine,"the engineer replies, " subject to the laws of thermodynamics."
"A voter",the politician answers
"A worker", the economist proclaims.

But the poet,concerned with the essences of life, says that a man is not an economic entity, nor a statistical cipher. A man's a man,with a mind that can preceive the truth, with a heart that understands love and beauty, with eyes that can behold the glories of the sunset, and cheeks that can feel the gentle winds of morning.

- a quote in Disability — Determination and Evaluation By Henry. H.Kessler.

— Chandrappa. One Such man—with a mind,a heart,eyes and cheeks—He came to Bombay, our very own El-Dorado,from distant Andhra Pradesh, with a healthy young body to find work in one of our many, textile mills. Today, more than thirty years later, he appears old and tired, much beyond his fifty-two years. He walks slowly,only with a stoop, cannot speak more than two to three words in a single breath and is terrorised by his own air passages which refuse to provide him life giving oxygen inspite of all his coaxing and herculean breathing effort.

And then there is the story of the venerable late Bhailalbhai Patel. The crusade he carried out against the bureaucratic machinery to actually realise the compensation which was in any case officially due to the workers who had contracted Silicosis is the stuff legends are made of.

Inspite of the huge workforce of our country, the incidence of notifiable diseases recorded with the factory inspectorate is pathetic. Probably, this has a lot to do with lack of awareness amongst doctors regarding Notifiable Occupational Diseases and also extreme resistance on their part to issue such certificates even when they know the occupation-related nature of the disease.

This has been borne out time and again by the experience of workers and of activists in Gujarat and Maharashtra, the two states with booming industrial sectors. In Gujarat, doctors would not certify Occupational dermatitis and even clear-cut cases of chrome ulcers. In Bombay, although prospective long-term studies have been carried out on textile workers and papers presented at international seminars and conferences, when it comes to sharing the results of the study and literature sources for the same, one is up against a blank wall !!(even misguided !!).

This phenomenon is by no means peculiar to our country alone. Says Englishman Kinnersly in the foreword of his book "The Hazards of work."

" — although every word has passed through my typewriter this is not my book alone. Many people have contributed to it in many ways and I would like to be able to thank them all, particulary those who wrote the original material—. I cannot do this in every case, not because there is no space , but because some of them have asked me not to mention them or to hide them behind a pseudonym. It is a sad reflection on supposedly humanitarian professions like medicine and sociology when their members can still fear for their jobs if they are seen to side too obviously with those their skills are designed to serve."

HISTORICAL PERSPECTIVE

The oldest known disability benefit for workers is probably the isolated programs of accident benefit throughout the history of the guilds. In Europe, mutual funds among miners,rail-road workers and navigation workers existed. Dutch navigation administration officials also provided relief in case of accidents and deaths in

the course of employment as far back as the fifteenth and sixteenth centuries.

The industrial revolution in England brought great changes. Injury and death were everyday occurrences. An injured worker's only recourse was to seek legal remedy. The employee had to prove that he did not assume the risk of employment, that there was no contributory neglience on his part and that the accident did not result from an act of a fellow employee.

The first breakthrough came in 1837 when greater responsibility was placed on the employer in providing adequate conditions of work to prevent or minimize accidents. But there was not much perceptible change. Continued social pressure culminated in passage in 1880, of the Employer's liability Act which reduced the defenses of the employer with respect to contributory negligence. Soon after a similar act was also passed in the United States.

Efforts to replace legal action by social insurance were pioneered by Bismarck . Other European countries were also attracted to such an arrangement. After further reform, the Workmen's Compensation Act was enacted in England in 1897. Of all the benefit programs which exist, Workmen's Compensation is the most universal.

THE INDIAN CONTEXT

The **Workmen's Compensation Act**, enacted in 1923 was adapted by the Parliament of free India by the Adaptation of Laws Order 1950.

The act is divided into

1. four Chapters which contain the legal definition and procedures involved in filing compensation claims under this act and
2. four Schedules which list out the injuries and occuptional diseases which qualify for compensation under this act as well as a list of various categories/types of workers who qualify for compensation under this act.

Elaborating a bit about the Schedules (since it is relevant to this paper)

Schedule I -	lists out an entire range of amputations from that of a whole limb to a little toe for which the extent and percentage of disability has been specified.
Schedule II -	Consists of a list of persons who are included in the definition of workmen.
Schedule III -	is a list of occupational diseases (divided into three parts) for which compensation may be claimed .
Schedule IV -	deals with compensation payable to a workman in case of death or disablement.

The **Employees State Insurance Act (1948)** has the same chapters and schedules.

The **Workmen's Compensation (Schedule III.Parts A ,B and C Occupational Diseases) Rules, 1991 (proposed)** is a recently formulated set of rules. These are supplementary to Schedule III of the Workmen's Compensation act.

Anyone who is familiar with industrial accidents and their results would appreciate the multiplicity of their forms. The Schedules, as described in the Workmen's Compensation act are far from comprehensive because of their ambiguity and limited scope. **"The Workmen's Compensation Rules"** is a commendable attempt to bridge this gap. It deals with more areas like evaluation of Hearing, Respiratory, Cardiovascular and Central Nervous System impairment.

DOCTOR AND DISABILITY EVALUATION

The present practice in our country is one of doctors awarding disability percentage on the basis of the Schedule in Workmen's Compensation Act. In case of non-scheduled injuries or occupational diseases, the doctor awards an arbitrary value. (which may be in terms of Scheduled values assigned to other parts of the body.) There are Several disadvantages of such arbritrariness. Often a worker's fate hangs on how much disability the consultant will award him just by one look at his Xray.

Fifty years after the Workmen's Compensation laws were enacted in the United States, the American Medical Association developed a series of guides for the physicians. These were published by the **Committee on Rating of Mental and Physical impairment** as a series of articles in the **Journal of American Medical Association** between 1958 to 1970 (In the following pages,the assessment of disability has been discussed systemswise as has been done by the committee. These guides have been referred to as **JAMA guides**. Although some of the organs/systems discussed seem unlikely to be affected by occupational diseases/injuries, they have still been included so that a complete picture is provided).

The purpose of these guides was

1. to reduce the discrepancies in medical opinions and
2. to advise the physician of his role in disability evaluations.

The physician is not an advocate, an administrator or a judge, and disability evaluation being an administrative and judicial functions, he is competent to evaluate only the physical **impairment** in order to help the adjudicating officer to define the limits of functional incapacity suffered by the injured workers.

This separation of the concept of disability from the concept of **impairment** has been further explained through the following terms.

(1) Permanent **Impairment**.- This is a purely medical condition. Permanent impairment is any anatomic or functional abnormality or loss after maximal medical rehabilitation has been achieved and which abnormality or loss the physician considers stable or nonprogressive at the time evaluation is made. It is always a basic consideration in the evaluation of permanent disability. It should be remembered, however,that permanent impairment is a contributing factor to, but not necessarily an indication of, the extent of a patient'spermanent disability.

(2) Permanent **Disability**.- This is not a purely medical condition. A patient is "permanently disabled" or "under a permanent disability" when his actual or presumed ability to engage in gainful activity is reduced or absent because of "impairment" and no fundamental or marked change in the future can be expected.

(3) Evaluation (Rating) of Permanent **Impairment**.- This is a function that physicians alone are competent to perform. Evaluation of permanent impairment defines the scope of medical responsibility and therefore represents the physician's role in the evaluation of permanent disability. Evaluation of permanent impairment is an appraisal of the nature and extent of the patient's illness or injury as it affects his personal efficiency in the activities of daily living. These activities are self- care, communication, normal living postures, ambulation, elevation, traveling, and nonspecialized hand activities. It is not the duty of physicians to evaluate the social and economic effects of permanent impairment. These effects must be evaluated by administrators in making determinations of permanent disability.

(4) Evaluation (Rating) of Permanent **Disability**.- This is an administrative, not a medical, responsibility and function. Evaluation of permanent disability is an appraisal of the patient's present and probable future ability to engage in gainful activity as it is affected by nonmedical factors such as age, sex, education, economic and

social environment, and the medical factor-permanent impairment.

In 1981, WHO sponsored the Expert Group Meeting On Disability Evaluation and the National Seminar On Disability Evaluation and Dissemination at Delhi. A manual was developed as an outcome of these seminars to evaluate various categories of permanent physical impairments. In the following pages this manual has been referred to as the **AIIMS document**. This document also maintains that doctors should evalute only physical impairment. But the document does provide disability percentage values for some categories (eg.Neurological)

"Workmen's Compensation Rules " has extensively adopted from the above AIIMS document and it also maintains the difference between the concepts of impairment and disability.

Note: During the meeting of specialists held in Delhi to discuss the document it was recommended that the final disability value arrived at should not be less than the impairment value.

MEASUREMENT OF IMPAIRMENT

The almost infinite variety of end results of injury need not be an obstacle to accurate evaluation of the functional impairment if the decrease in function is measured without regard for its cause. The age of patient also is not considered. Although it is recognized that the effects of injury probably are more severe in the older person than in the younger one, the effects will be reflected in the degree of functional impairment.

The percentages assigned for individual impairments are based on the closest possible approximation of the physiological significance of the impairment. In multiple impairments, two complementary systems are used : adding percentages and combining percentages.

Adding Percentages : Each major part of a limb is represented by a percentage value. For example, each of the three joints of the leg and its associated muscle group is given the value of 0.30 .If the impairment affects more than one joint or more than one muscle group, the two or three percentages are added to yield the total value of fuctional impairment for the extremity.

Combining Percentages : When there is more than one type of impairment, the two or more values are combined as many times as is necessary to yield the sum for that part. The formula for combining values is :

$$\frac{a + b\,(100 - a)}{100} = x$$

in which 'a' is the higher and 'b' the lower of the two values to be combined.

OR use formula

$$a + b - \frac{ab}{100}$$

(value may be rounded off to the nearest whole number)

For example, the value for loss of prehension in the hand is combined with the value for loss of sensation to yield an estimate of funtional impairment for the hand. Thus,if there is a 75 percent loss of prehension and a 50 percent loss of sensation, the total value for the hand is not 125 percent, but 87.5 percent.

$$75 + \frac{50(100 - 75)}{100} = 87.5 \text{ i.e. } 88\%$$

Any value can be combined with a third value to obtain the combination for the three values, and so on until the final estimate is reached, provided all values so treated are physiologically of the same importance. For example, the combination of the three values representing mobility of the leg may be combined with the single value for stability (weight- bearing capacity) because the two functions of the leg, mobility and stability, are funtionally of equal significance.

If the injury has affected more than one limb, or the spine and one or more limbs, the combining formula is used to obtain the value for the entire body. Two, three, or five values may be combined for the final determination. Thus, an injury resulting in 25 percent loss of function of one arm, 50 percent loss of function in the other leg will represent a 62.5 percent loss for the entire body i.e. 63%. If there is no further disability to be added then this value has to be rounded off to the nearest multiple of 5 i.e. 65%.

This combining method used to combine various impairments is based on the principle that each impairment acts not on the whole part but on the portion which remains after the preceding impairment has acted. For computation, the source and chronology of the impairment values are immaterial.

After the values of all impairments involved have been computed and transposed to a common denominator, the final imapairment value, whether the result of single or combined impairments should be expressed in terms of the nearest higher multiple of five.

Dr. Veena Murlidhar

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LIST OF SPECIALISTS WHO COMMENTED ON THE PRELIMINARY DOCUMENT AT THE DELHI MEETING AND LATER ON BY CORRESPONDENCE

Dr. J. Amalorpavanathan	Assistant Professor Surgery, Madras Medical College
Dr. B. S. Chouhan	Desert Science Centre, Jodhpur
Dr. Kunal Datta	Medical Superintendent ESI Hospital, Belur, Calcutta
Dr. S. K. Dave	National Institute of Occupational Health, Ahmedabad
Dr. T. George	Orthopaedic Surgeon Railway Hospital, Tiruchi
Dr. Pratibha Gupta	Professor of Physiology, University College Medical Sciences, New Delhi
Dr. (Mrs.) M. A. Gore	Professor of Surgery & Head Burns Unit LTM Medical College, Mumbai
Harsh Jaitli	Occupational Health Expert, PRIA, New Delhi
Vijay Kanhere	Occupational Health Expert Occupational Health & Safety Centre (OHSC), Mumbai and PRIA, New Delhi
Dr. Yash Lokhandwala	Senior Lecturer, Dept. of Cardiology KEM Hospital, Mumbai
Dr. Smarajit Jana	Epidemiologist, Dept. of Epidemiology All India Institute of Hygiene and Public Health, Calcutta
Dr. N. K. Mehrotra	Deputy Director, Industrial Toxicology Research Centre (ITRC), Lucknow
Dr. Murlidhar, V.	Associate Professor Surgery, LTM Medical College, Mumbai Consultant OHSC, Mumbai
Dr. Veena Murlidhar	Occupational Health & Safety Centre (OHSC), Mumbai
Dr. S. Nundy	Head, Dept. of Gastroentrology AIIMS, New Delhi
Dr. J. R. Parikh	Deputy Director, National Institute of Occupational Health (NIOH), Ahmedabad
Dr. H. N. Saiyyed	Occupational Health Expert Regional Occupational Health Centre (E) Calcutta
Dr. Nilesh Shah	Associate Professor Psychiatry LTM Medical College, Bombay
Dr. Zaibunissa	Opthalmic Surgeon, Government Hospital, Tiruchi.

CHAPTER 1

EXTREMITIES AND BACK

Evaluation of permanent impairment has been provided for

1) Upper extremity
2) Lower extremity
3) Amputations.

1) **Upper extremity** :-

It is divided into arm component and hand component, *each of them given a value of 90%.

The arm component is tested for range of motion, strength of muscles and coordinated activities.

Range of motion and strength of muscles is tested at each joint (shoulder, elbow and wrist). Each joint is given an equal value of 30%.

The hand component is tested for prehension, strength and sensation. A proforma with organised columns has been provided so that all the required tests can be applied one after another and values written down. Combining formula has to be used when calculating final impairment value; for preferred extremity 4% more value is added.

EVALUATION OF IMPAIRMENT OF UPPER EXTREMITY

The upper extremity is evaluated for ARM COMPONENT and HAND COMPONENT

ARM COMPONENT

Total value of arm component is 90%

Principles of evaluation of range of motion of joints

1) The values for maximum R.O.M. in the arm component is 90%
2) Each of the three joints of the arm is weighted equally (30%)
3) ROM is compared with the normal range on the unaffected side and percentage loss of ROM is measured. Each joint is tested for all movements.
4) After detecting the percentage loss of each movement of a joint combine the values using the formula $a+\frac{b\,(100-a)}{100}$. Multiply this by 0.3 for final valueof loss of R.O.M for the joint.

Example

A fracture of the right shoulder joint may affect range of motion so that active abduction is 90% The left shoulder exhibits a range of active abduction of 180. Hence there is loss of 50% of abduction movement of the right shoulder. The percentage loss of arm component in the shoulder is 50% X 0.30 OR 15% loss of motion for the arm component.

If more than one joint is involved, same method is applied and the losses in each of the affected joints are added.

Say, Loss of abduction of the shoulder = 60%
Loss of extension of the wrist = 40%
Then Loss of range of motion for the arm = (60 X 0.30) + (40 X 0.30) = 30%

Principles of Evaluation of strength of muscles

1) Strength of muscles can be tested by manual testing like 0-5 grading.
2) Manual muscle gradings can be given percentages like

Gr	0	—	100%	no movements
Gr	1	—	80%	flicker of movement
Gr	2	—	60%	movement possible with gravity eliminated
Gr	3	—	40%	movement possible against gravity
Gr	4	—	20%	movement possible against slight resistance
Gr	5	—	0%	normal power

3) The mean percentage of muscle strength loss is multiplied by 0.30.
4) If there has been a loss of muscle strength of more than one joint, the values are added as has been described for loss of range of motion.

Principles of Evaluation of co-ordinated activities

1) The total value for co-ordinated activities is 90%
2) Ten different co-ordinated activities are to be tested as given in the proforma.
3) Each activity has a value of 9%

Combining Values for the Arm Component

1) The value of loss of function of arm component is obtained by combining the values of range of movement, muscle strength & co-ordinated activities, using the combining formula

$$a + \frac{b(90 - a)}{90}$$

Where a = value of disability for one component
b = value of disability for another component

Example

Let us assume that an individual with a fracture of the right shoulder joint has in addition to 16.5% loss of motion of his arm, 8.3% loss of strength of muscles, and 5% loss of co-ordination. We combine these values as :

Range of motion :
Strength of Muscles : 8.3%
} $16.5 + \frac{8.3(90 - 16.5)}{90}$ = 23.3% i.e. 23%

Co-ordination : 5%
$23 + \frac{5(90 - 23)}{90}$ = 26.7% i.e. 27%

So total value of arm component = 27.0%

HAND COMPONENT

Total value of hand component is 90%

The functional impairment of hand is expressed as loss of prehension, loss of sensation, loss of strength.

Principles of Evaluation of prehension

Total value of Prehension is 30% It includes :

(A) Opposition (8%) Tested against
Index finger (2%). Middle finger (2%)
Ring finger (2%) & Little finger (2%)

(B) Lateral pinch (5%). Tested by asking the patient to hold a key.

(C) Cylindrical Grasp (6%). Tested for
(a) Large object of 4 inch size (3%)
(b) Small object of 1 inch size (3%)

(D) Spherical Grasp (6%). Tested for
(a) Large object 4 inch size (3%)
(b) Small object 1 inch size (3%)

(E) Hook Grasp (5%). Tested by asking the patient to lift a bag.

Principles of Evaluation of Sensations

Total value of sensation is 30% It includes:

1) Radial side of thumb (4.8%)
2) Ulnar side of thumb (1.2%)
3) Radial side of each finger (4.8%)
4) Ulnar side of each finger (1.2%)

Principles of Evaluation of Strength

Total value of strength is 30%. It includes:

1) Grip Strength (20%)
2) Pinch Strength (10%)

Strength will be tested with hand dynamo-meter or by clinical method (Grip Method).

10% additional weightage to be given to the following factors :

1. Infection
2. Deformity
3. Malalignment
4. Contractures
5. Cosmetic appearance
6. Abnormal Mobility

Dominant Extremity should be given 4% additional weight.

Combining values of the hand component

The final value of loss of function of hand component is obtained by summing up values of loss of prehension, sensation and strength.

Combining values for the Extremity

Values of impairment of arm component and impairment of hand component are combined by using the combining formula.

Example

Impairment of the arm = 27.0%
Impairment of the hand = 64%

$$64 + \frac{27(90-64)}{90} = 71.8\%$$

2) Lower extremity

It is divided into stability component and mobility component. Mobility component consists of test for range of movement and muscle strength. Both these functions are tested at the hip, knee and ankle joints and each of these joints is given a value of 30%. Stability component is tested by clinical method or scale method.

For lower extremity too a proforma has been provided with a list of tests so that they can be applied to the patient one after another and obtained values entered into the form at the same time. The final value is obtained by using combining formula.

EVALUATION OF IMPAIRMENT OF LOWER EXTREMITY (FROM AIIMS DOCUMENT)

The lower extremity is assessed for MOBILITY COMPONENT and STABILITY COMPONENT.

MOBILITY COMPONENT

Total value of mobility component is 90% . It includes range of movement and muscle strength.

Principle of evaluation of Range of Movement

1. The value of maximum range of movement in the mobility component is 90%.
2. Each of the three joints i.e. hip, knee, foot-ankle component, is weighted equally-0.30.
3. ROM is compared with the normal range on the unaffected side and percentage loss of ROM is measured. Each joint is tested for all movements. 4. After detecting the percentage loss of each movement of a joint combine the values using the formula $a+b\frac{(100-a)}{100}$. Multiply this by 0.3 for final value of loss of ROM for the joint.

Example

A fracture of the right hip joint may affect range of motion so that active abduction is 27°. The left hip exhibits a range of active abduction of 54°. Hence, there is loss of 50% of abduction movement of the right hip. The percentage loss of mobility component in the hip is 50 X 0.30 or 15% loss of motion for the mobility component.

If more than one joint is involved, same method is applied and the losses in each of the affected joints are added.

For Example.

Loss of abduction of the hip = 60%
Loss of extension of the knee = 40%
Loss of range of motion for the mobility component (60 X 0.30)+(40 X 0.30) = 30%

Principles of evaluation of Muscle Strength

1. The value for maximum muscle strength in the leg is 90%
2. Strength of muscles can be tested by manual testing like 0-5 grading.
3. Manual muscle gradings can be given percentage like Grade 0 = 100% Grade 1 = 80% Grade 2 = 60% Grade 3 = 40% Grade 4 = 20% Grade 5 = 0%
4. Mean percentage of muscle strength loss is multiplied by 0.30.
5. If there has been a loss of muscle strength of more than one joint, the values are added as has been described for loss of range of motion.

Combining Values for the Mobility Component

Let us assume that the individual with a fracture of the right hip joint has in addition to 16% loss of motion 8% loss of strength of muscles.

Combining Values

Motion 16% }
Strength 8% }

$$16 + \frac{8(90-16)}{90} = 22.6\% \text{ i.e. } 23\%$$

STABILITY COMPONENT

1. Total value of stability component is 90%
2. It is tested by 2 methods
   (i) Based on scale method.
   (ii) Based on clinical method.

Three different readings (in kg) are taken measuring the total body weight (W), scale 'A' reading and scale 'B' reading. The final value is obtained by the formula :

$$\frac{\text{Difference in body weight}}{\text{Total body weight}} \times 90$$

Scale Method
Patient is made to stand with one foot on scale A and another on scale B. 3 different readings are taken

Clinical Method
In the clinical method of evaluation nine different activities are to be tested as given in the proforma. Each activity has a value of ten percent (10%).

Clinical Method	Points
Walking on plain surface	10
Walking on slope'	10
Climbing stairs	10
Standing on both legs	10
Standing on affected leg	10
Squalting on floor	10
Sitting cross-legged	10
Kneeling	10
Taking turns	10
Total	90

Extra Points :

Extra points have been given for pain, deformities, contractures, loss of sensations and shortening, Maximum points to be added are 10% (excluding shortening).

Deformity	In functional position	3%
	In non-functional position	6%
Pain	Severe (grossly interfering with function)	9%
	Moderate (moderately interfering with function)	6%
	Mild (mildly interfering with function)	3%
Loss of Sensation	Complete loss	9%
	Partial loss	6%
Shortening	First 1/2'	NIL
	Every 1/2' beyond first 1/2	4%
Complications	Superficial complications	3%
	Deep complications	6%

AMPUTATIONS

Basic Guidelines

1. In case of multiple amputees, if the total sum of percentage permanent physical impairment is above 100% it should be taken as 100%.

2. Amputation at any level with uncorrectable inability to wear and use prosthesis, should be given 100% permanent physical impairment.

3. In case of amputation in more than one limb percentage of each limb is counted and another 10% will be added, but when only toes or fingers are involved only another 5% will be added.

4. Any complication in form of stiffness, neuroma, infection etc. has to be given a total of 10% additional weightage.

5. Dominant upper limb has been given 4% extra percentage.

Description of Injury	**Percentage of loss of earning capacity**
Amputation cases - Upper Limbs (either arm)	
1. Amputation through shoulder joint	90
2. Amputation below shoulder with stump less than 20.32 cms from tip of acromion	80
3. Amputation from 20.32 cms from tip of acromion to less than 11.43 cms below tip of olecranon	70
4. Loss of a hand or of the thumb and four fingers of one hand or amputation from 11.43 cms below tip of olecranon	60

Description of Injury	Percentage of loss of earning capacity
5. Loss of thumb	30
6. Loss of thumb and its metacarpal bone	40
7. Loss of four fingers of one hand	50
8. Loss of three fingers of one hand	30
9. Loss of two fingers of one hand	20
10. Loss of terminal phalanx of thumb	20
11. Amputation of both feet resulting in end-bearing stumps	90
12. Amputation through both feet promixal to metatarso-phalangeal joint	80
13. Loss of all toes of both feet through the metatarso-phalangeal joint	40
14. Loss of all toes of both feet proximal to the proximal inter-phalangeal joint	30
15. Loss of all toes of both feet distal to the proximal inter-phalangeal joint	20
16. Amputation at hip	90
17. Amputation below hip with stump not exceeding 12.70 cms in length measured from tip of great trenchanter	80
18. Amputation below hip with stump exceeding 12.70 cms in length measured from tip of great trenchanter but not beyond middle thigh	70
19. Amputation below middle thigh to 8.89 cms below knee	60
20. Amputation below knee with stump exceeding 8.89 cms but not exceeding 12.70 cms	50
21. Amputation below knee with stump exceeding 12.70 cms	40
22. Amputation of one foot resulting in end-bearing	30
23. Amputation through one foot proximal to the metatarso-phalangeal joint	30
24. Loss of all toes of one foot through the metatarso-phalangeal joint	20

Description of Injury	Percentage of loss of earning capacity
Other injuries	
25. Loss of one eye, without complications, the other being normal	40
26. Loss of vision of one eye, without complications or disfigurements of eye-ball, the other being normal	30
A. FINGERS OF RIGHT OR LEFT HAND	
Loss of -	
Index finger	
27. Whole	14
28. Two phalanges	11
29. One phalanx	9
30. Guillotine amputation of hip without loss of bone	5
Middle finger	
31. Whole	12
32. Two phalanges	9
33. One phalanx	7
34. Guillotine amputation of hip without loss of bone	4
Ring or Little finger	
35. Whole	7
36. Two phalanges	6
37. One phalanx	5
38. Guillotine amputation of hip without loss of bone	2

DISABILITIES OF THE BACK AND EXTREMITIES
APPROXIMATE RATING OF PERMANENT PHYSICAL IMPAIRMENTS AND
THEIR PHYSICAL LOSS OF FUNCTION

The following specific permanent physical impairments and their percentage rating are to be used only as guiding examples of about what the rating should be in a corresponding individual case. These rating are adjusted to approximate relative values of other parts of the body. They encompass pain, weakness, neuromuscular and other reactions naturally expected to exist.

LOWER EXTREMITIES	**Percent Permanent Physical Impairment and Loss of physical function to lower extremity**
1. Shortening	
0.5 inch	5
1.0 inch	10
1.5 inch	15
2.0 inch	20
2. Hip (Rating value to whole body 50%)	
A. Non-union without reconstruction	75
B. Arthoplasty, use of prosthesis able to walk and stand at work, motion free to 25% to 50% of normal	40
C. Osteotomy reconstruction, moderate motion, 1 inch shortening, no-contracture	35
D. Ankylosis and limited motion	
a) Total ankylosis, optimum position 15% flexion	50
3. Knee	
A. Surgical removal internal or external semilunar cartilage, no complication	5
B. Surgical removal both cartilages, cruciate intact	20
C. Ruptured cruciate ligament, repaired, moderate laxity	20
D. Not repaired, marked laxity	30
E. Excision of Patella	20
F. Plateau fracture, depressed bone elevated, semilunar excised	20

UPPER EXTREMITIES	Percent Permanent Physical Impairment and Loss of physical function to lower extremity
1. Shoulder	
A. Total ankylosis in optimum position, abduction 60, flexion 10 rotation, neutral position	50
B. Recurrent dislocation as frequently as every 4 to 6 months	35
C. Resection distal end of clavicle (rate motion independently)	
2. Elbow	
A. Flail elbow, pseudarthrosis above joint line, wide motion but very unstable	65
B. Resection head of radius	15
3. Soft Tissue Loss	
Isolated soft tissue loss of the end of the digit should have a value up to 25% of digit	

The following ratings for permanent impairment to the body in back injuries are suggested as reasonable and representative orthopaedic evaluations readily reconciled to the average specific award ratings.

The permanent physical imapirment cannot be evaluated soley on limited motion. It must be judged on ability to carry out such functions as lifting, stooping, reaching, twisting and jumping. Pain is a major factor of such limitations and should be evaluated in respect to its reality and its likelihood of permanency.

CERVICAL SPINE	Percent Whole Body Permanent Physical Impairment and Loss of Physical Function to whole body
1. Head sprain, contusion	
A. No involuntary muscle spasm, subjective symptoms of pain not substantiated by demonstrable structural pathology	0
B. Persistent muscle spasm, rigidity and pain substantiated by loss of anterior curve revealed by x-ray, although no demonstrable structural pathology, moderate referred shoulder-arm pain	10
C. Same as (B) with gross degenerative changes consisting of narrowing of intervertebral spaces and osteo arthritic lipping of vertebral margins	20
2. Fracture	
A. Vertebral compression 25%, one or two vertebral adjacent bodies, no fragmentation no involvement, moderate neck rigidity and persistent soreness	20

CERVICAL SPINE	Percent Whole Body Permanent Physical Impairment and Loss of Physical Function to whole body
B. Posterior elements with x-ray evidence of moderate partial dislocation	
a) No nerve root involvement, healed	15
b) With persistent pain, with mild motor and sensory manifestations	25
c) With fusion, healed no permanent motor or sensory changes	20
C. Severe dislocation, fair to good reduction with surgical fusion	
a) No residual motor or sensory changes	25
b) Poor reduction with fusion, persistent radicular pain, motor involvement, only slight weakness and numbness	35
c) Same as (b) with partial paralysis determine additional rating for loss of use of extremities and sphincters	

CERVICAL INTERVERTEBRAL DISC	Percent Whole Body Permanent Physical Impairment and Loss of Physical Function to whole body
1. Operative, successful, removal of Disc, with relief of acute pain, no fusion, no neurologic residual	10
2. Same as (1) with neurological manifestations, persistent pain, numbness, weakness in fingers	20

THORACIC AND DORSOLUMBAR SPINE	Percent Whole Body Permanent Physical Impairment and Loss of Physical Function to whole body
1. Severe costovertebral constriction or strain causally related to trauma with persistent pain moderate degenerative changes with osteoarthritic lipping, no x-ray evidence of structural trauma	10
2. Fracture	
A. Compression 25%, involving one or two vertebral bodies, mild, no fragmentation, healed, no neurological manifestations	10
B. Compression 50%, with involvement posterior elements, healed, no neurologic manifestations, persistent pain, fusion indicated	20
C. Same as (B) with fusion, pain only on heavy use of back	20
D. Total paraplegia	100
E. Posterior elements, partial paralysis with or without fusion, should be rated for loss of use of extremities and sphincters	

LOW LUMBAR	Percent Whole Body Permanent Physical Impairment and Loss of Physical Function to whole body
1. Healed sprain, contusion	
A. No involuntary muscle spasm, subjective symptoms of pain not substantiated by demonstrable structural pathology	0
B. Persistent muscle spasm, rigidity and pain substantiated by demonstrable degenerative changes, moderate osteoarthritic lipping revealed by x-ray, combined trauma and pre-existing factors	10
C. Same as (B) with more extensive osteoarthritic lipping	15
D. Same as (B) with spondylolysis or spondylolisthesis Grade I or II, demonstrable by x-ray, without surgery, combined trauma and pre-existing anomally	20
E. Same as (D) with Grade III or IV spondylolisthesis, persistent pain, without fusion, aggravated by trauma	35
F. Same as (B) or (C) with fusion laminectomy pain moderate	25
2. Fracture	
A. Vertebral compression 25%, one or two adjacent vertebral bodies, little or fragmentation, no definite pattern or neurologic changes	15
B. Compression with fragmentation posterior elements, persistent pain, weakness and stiffness, healed, no fusion, no lifting over 25 pounds	40
C. Same as (B), healed with fusion, mild pain	25
D. Same as (B), nerve root involvement to lower extremities, determine additional rating for loss of industrial function to extremities	
E. Same as (C), with fragmentation of posterior elements, with persistent pain after fusion, no neurological findings	35
F. Same as (C), with nerve root involvement to lower extremities, rate with functional loss to extremities	
G. Total paraplegia	100
H. Posterior elements, partial paralysis with or without fusion, should be rated for loss of use of extremities and sphineters	
3. Neurological Low Back Pain Disk Injury	
A. Periodic acute episodes with acute pain and persistent body list, tests for seiatic pain positive, temporary recovery 5 to 8 weeks	5
B. Surgical excision of disc, no fusion, good results, no persistent sciatic pain	10

LOW LUMBAR	Percent Whole Body Permanent Physical Impairment and Loss of Physical Function to whole body
C. Surgical excision of disc, no fusion, moderate persistent pain and stiffness aggravated by heavy lifting with necessary modification of activities	20
D. Surgial excision of disc with fusion, activities of lifting moderately modified	15
E. Surgical excision of disc with fusion, persistent pain and stiffness aggravated by heavy lifting, necessitating modification of all activities requiring heavy lifting	25

CHAPTER 2

CENTRAL NERVOUS SYSTEM

TABLE - I

	Impairment Rate
Altered Sensorium	100%

TABLE - II

Intellectual Impairment (to be assessed by clinical psychologist).	Impairment Rate
Mild (I.Q.80-90)	25%
Moderate(I.Q.70-80)	50%
Severe(I.Q.60-70)	75%
Very Severe(I.Q.below 60)	100%

TABLE - III

Speech Impairment	Impairment Rate
Mild	25%
Moderate	50%
Severe	75%
Very Severe	100%

Tested by a 100 word text. Ability to read (in educated), comprehend when read out, answer question on text clearly and ability to write a synopsis(in educated).

TABLE - IV

Cranial Nerve Impairment		Impairment Rate
(a) Motor Cranial nerves : total or partial		20% for each nerve
(b) Sensory : total or partial		10% for each nerve
(c) Optic or Auditory nerves :-		
	Unilateral	Bilateral
Mild	20%	30%
Moderate	40%	70%
Severe	60%	100%

TABLE - V

Motor System Impairment	Impairment Rate
Monoparesis	25%
Monoplegia}	50%
Hemiparesis}	
Paraparesis	75%
Paraplegia	100%
Hemiplegia}	75%
Quadriparesis}	
Quadriplegia	100%

TABLE - VI

Sensory System Impairment	Impairment Rate
Anaesthesia } Hypoaesthesia } Paraesthesia }	Each Limb 10%
For involvement of hand/hands foot/feet	25%

TABLE - VII

Bladder Impairment due to Neurogenic Involvement	Impairment Rate
Mild (Hesitancy/Frequency)	25%
Moderate (Precipitancy)	50%
Severe (Occasional incontinence)	75%
Very serve (Retention/Total incontinence)	100%

TABLE -VIII

Post Head Injury Fits & Epileptics	Impairment Rate
Mild (Occurrence of a convulsion)	25%
Moderate (1-5 fits/month on adequate medication)	50%
Severe (6-10 fits/month on adequate medication)	75%
Very severe (10 fits/month on adequate medication)	100%

TABLE IX

Ataxia (Sensory or Cerebellar)	Impairment Rate
Mild (Detected on examination)	25%
Moderate(Symptomatic but no impairment)	50%
Severe(partial impairment)	75%
Very severe (Total impairment)	100%

CHAPTER 3

PERIPHERAL SPINAL NERVES

In order to evaluate impairment resulting from effects of peripheral spinal nerve lesions, the extent of loss of function due to sensory defect (pain, discomfort, loss of sensation) or motor defect (loss of strength) is determined. For impairment of autonomic function, the guide concerned with the body system affected should be utilized.

Sensory defect :

Pain evaluation is as follows

1) Present but is forgotten during activity 0% - 25%
2) Annoying and interferes with activity 26% - 50%
3) Severe enough to prevent activity 51% - 75%
4) Severe enough to prevent activity and cause distress 76% - 100%.

Evaluation of loss of function due to sensory loss is as follows

1) Minimal loss not noticeable (0-25%).
2) Moderate loss noticeable but can carry out all activities (26-50%).
3) Severe loss interferes with carrying out daily activities (51-75%).
4) Severe loss prevents daily activities and may be distressful (76-100%).

Motor defect:

Strength is evaluated on the basis of gradation of power.

Gr	0	-	100%
Gr	1	-	80-90%
Gr	2	-	55-75%
Gr	3	-	30-50%
Gr	4	-	5-25%
Gr	5	-	0%

Values of loss of function due to sensory and motor defect have to be combined.

The site of defect of a spinal nerve may occur at the level of :

1) Spinal nerve root,
2) Spinal nerve plexus or
3) Named spinal nerve

Numerous tables have been provided which give

a) range of percentage values for loss of function due to sensory impairment.
b) range of percentage values for loss of function due to motor impairment.
c) corresponding value for impairment of the extremity
d) finally tables have been provided which provide corresponding values for impairment of extremity to impairment of whole man.

Causalgia may be severe enough to cause 100% impairment of an extremity. In such case, the table will not be applicable. This may occur especially for median, sciatic and tibial nerves. A + sign has been marked against the respective values in appropriate tables for this reason.

Persistent intercostal neuralgia is awarded 0 - 3% impairment.

The percentage values in this guide for the upper extremity are in terms of the preferred extremity. Therefore, when the impairment of an upper extremity has been determined to be between 5% and 50%, this value should be reduced by 5% if the impairment is of the non-preferred upper extremity. If the value is 51% to 100% impairment of upper extremity, the value should be reduced by 10% for the non-preferred extremity before converting to whole-person impairment.

Conversion to whole person impairment should be made in every case only when all impairments involving one extremity have been combined. In cases of bilateral involvement, individual unilateral involvements should be combined separately and each converted to whole man impairment. Finally these unilateral values are combined by using combining tables.

Table 1.- Unilateral Spinal Nerve Root Impairment

Nerve Root Impaired	Loss of function due to Sensory Deficit, Pain or Discomfort	Loss of function due to loss of strength	Impairment of Upper Extremity
C-5.....	0%-5%	0%-30%	0%-34%
C-6.....	0%-8%	0%-35%	0%-40%
C-7.....	0%-5%	0%-35%	0%-38%
C-8.....	0%-5%	0%-45%	0%-48%
T-1.....	0%-5%	0%-20%	0%-24%
			Impairment of Lower Extremity
L-3.....	0%-5%	0%-20%	0%-24%
L-4.....	0%-5%	0%-34%	0%-37%
L-5.....	0%-5%	0%-37%	0%-40%
S-1.....	0%-5%	0%-20%	0%-24%

See Tables 6 and 10 for converting extremity impairments to whole-man impairments.

Table 2- Unilateral Brachial Plexus Impairment

	Loss of function due to sensory deficit pain or	Loss of function due to loss of strength	Impairment of Upper extremity	Whole person Impairment
Brachial Plexus	0% - 100%	5% - 100%	0% - 100%	0% - 60%
Upper trunk (C-5, C-6) (Duchenne-Erb)	0% - 25%	0% - 70%	0% - 78%	0% - 47%
Middle trunk (C-7)	0% - 5%	0% - 35%	0% - 38%	0% - 23%
Lower trunk (C-8 - T1) (Klumpke-Dejerine)	0% - 20%	0% - 70%	0% - 76%	0% - 46%

Note : Conversion to whole-man impairment should be made ONLY when all impairments involving the one upper extremity have been combined.

Unilateral Lumbosacral Plexus Impairment

Loss of Function due to Sensory Deficit, Pain, or Discomfort	**Loss of Function due to loss of Strength**	**Impairment of Whole person**
0%-40%	0%-50%	0%-70%

Table 3 - Specific Unilateral Spinal Nerve Impairment Affecting the Head and Neck

Nerve	**Loss of function due to sensory deficit, pain or discomfort**	**Loss of function due to loss of strength**	**Impairment of whole person**
Greater Occipital	0% - 5%	39%	0 - 5%
Lesser Occipital	0% - 3%	0%	0% - 3%
Great Auricular	0% - 3%	0%	0% - 3%
Accessory (Spinal Accessory)	0%	0% - 10%	0% - 10%

Table 4- Specific Unilateral Spinal Nerve Impairment Affecting the Upper Extremity

Nerve	Loss of function due to sensory deficit, pain or discomfort	Loss of function due to loss of strength	Impairmentof upper extremity	Impairment of the digit
Anterior thoracic (pectoral)	0%	0% - 5%	0% - 5%	
Axillary (circumflex)	0% - 5%	0% - 35%	0% - 38%	
Dorsal scapular	0%	0% - 5%	0% - 5%	
Long thoracic (posterior thoracic n.. external respiratory n.. of Bell to serratus anterior)	0%	0% - 15%	0% - 15%	
Medial brachial cutaneous	0% - 5%	0%	0% - 5%	
Median (above midforearm)	0% - 40%	0% - 55%	0% - 73% +	
Median (below midforearm)	0% - 40%	0% - 35%	0% - 61% +	
Branch to radial side of thumb	0% - 4%	0%	0% - 4%	= 0% - 11%

contd..

Nerve	Loss of function due to sensory deficit, pain or discomfort	Loss of function due to loss of strength	Impairmentof upper extremity	Impairment of the digit
Branch to ulnar side of thumb	0% - 8%	0%	0% - 4%	= 0% - 23%
Branch to radial side of index finger	0% - 8%	0%	0% - 8%	= 0% - 37%
Branch to ulnar side of index finger	0% - 8%	0%	0% - 3%	= 0% - 13%
Branch to radial side of middle finger	0% - 7%	0%	0% - 7%	= 0% - 42%
Branch to ulnar side of middle finger	0% - 2%	0%	0% - 2%	= 0% - 12%
Branch to radial side of ring finger	0% - 3%	0%	0% - 3%	= 0% - 34%
Musculocutan - eous	0% - 5%	0% - 25%	0% - 29%	
Radial (musculospiral) (upper arm with loss of triceps) wrist placed in position of function	0% - 5%	0% - 55%	0% - 57%	
Radial (musculospiral) with sparing of triceps wrist placed in position of function	0% - 5%	0% - 40%	0% - 43%	
Subscapular (upper and lower)	0%	0% - 5%	0% - 5%	
Suprascapular	0% - 5%	0% - 15%	0 % - 19%	
Thoracodorsal (long subcapular nerve to latissimus dorsi)	0%	0% - 10%	0% - 10%	
Ulnar (above midforearm)	0% - 10%	0% - 35%	0 % - 42%	
Ulnar (below midforearm)	0% - 10%	0% - 25%	0 % - 33%	
Branch to ulnar side of ring finger	0% - 2%	0%	0 % - 2%	= 0% - 24%
Branch to radial finger side of little finger	0% - 2%	0%	0 % - 2%	= 0% - 49%
Branch to ulnar side of little finger	0% - 2%	0%	0 % - 2%	= 0% - 49%

Table 5- Conversion of Digit Impairment to Hand or Upper Extremity

	Impairment of				Impairment of		
	Digit	Hand	Upp Ext.		Digit	Hand	Upp Ext.
Thumb	0% - 1%	= 0%	= 0%	Index Finger	0% - 1%	= 0%	= 0%
	2% - 3%	= 1%	= 1%		2% - 5%	= 1%	= 1%
	4% - 6%	= 2%	= 2%		6% - 9%	= 2%	= 2%
	7% - 8%	= 3%	= 3%		10% - 13%	= 3%	= 3%
	9% - 11%	= 4%	= 4%		14% - 17%	= 4%	= 4%
	12% - 13%	= 5%	= 5%		18% - 21%	= 5%	= 5%
	14% - 16%	= 6%	= 5%		22% - 25%	= 6%	= 5%
	17% - 18%	= 7%	= 6%		26% - 29%	= 7%	= 6%
	19% - 21%	= 8%	= 7%		30% - 33%	= 8%	= 7%
	22% - 23%	= 9%	= 8%		34% - 37%	= 9%	= 8%
	24% - 26%	= 10%	= 9%		38% - 41%	= 10%	= 9%
	27% - 28%	= 11%	= 10%		42% - 45%	= 11%	= 10%
	29% - 31%	= 12%	= 11%		46% - 49%	= 12%	= 11%
Middle Finger	0% - 2%	= 0%	= 0%	Ring Finger	0% - 4%	= 0%	= 0%
	3% - 7%	= 1%	= 1%		5% - 14%	= 1%	= 1%
	8% - 12%	= 2%	= 2%		15% - 24%	= 2%	= 2%
	13% - 17%	= 3%	= 3%		25% - 34%	= 3%	= 3%
	18% - 22%	= 4%	= 4%		35% - 44%	= 4%	= 4%
	23% - 27%	= 5%	= 5%		45% - 55%	= 5%	= 5%
	28% - 32%	= 6%	= 5%				
	33% - 37%	= 7%	= 6%				
				Little Finger	0% - 9%	= 0%	= 0%
	38% - 42%	= 8%	= 7%		10% - 29%	= 1%	= 1%
	43% - 47%	= 9%	= 8%		30% - 49%	= 2%	= 2%
	48% - 52%	= 10%	= 9%				
	50% - 69%	= 3%	= 3%				
	70% - 89%	= 4%	= 4%				

Table 6 - Conversion of Impairment of the Upper Extremity to Impairment of the Whole person

Upp. Ext.	Whole man	Upp. Ext.	Whole man	Upp. Ext.	Whole man	Upp. Ext.	Whole man	Upp. Ext.	Whole man
0%	0%	20%	12%	40%	24%	60%	36%	80%	48%
1%	1%	21%	13%	41%	25%	61%	37%	81%	49%
2%	1%	22%	13%	42%	25%	62%	37%	82%	49%
3%	2%	23%	14%	43%	26%	63%	38%	83%	50%
4%	2%	24%	14%	44%	26%	64%	38%	84%	50%
5%	3%	25%	15%	45%	27%	65%	39%	85%	51%
6%	4%	26%	16%	46%	28%	66%	40%	86%	52%
7%	4%	27%	16%	47%	28%	67%	40%	87%	52%
8%	5%	28%	17%	48%	29%	68%	41%	88%	53%
9%	5%	29%	17%	49%	29%	69%	41%	89%	53%
								90%	54%

Upp. Ext.	Whole man	Upp. Ext.	Whole man	Upp. Ext.	Whole man	Upp. Ext.	Whole man	Upp. Ext.	Whole man
10%	6%	30%	18%	50%	30%	70%	42%	91%	55%
11%	7%	31%	19%	51%	31%	71%	43%	92%	55%
12%	7%	32%	19%	52%	31%	72%	43%	93%	56%
13%	8%	33%	20%	53%	32%	73%	44%	94%	56%
14%	8%	34%	20%	54%	32%	74%	44%	95%	57%
15%	9%	35%	21%	55%	33%	75%	45%	96%	58%
16%	10%	36%	22%	56%	34%	76%	46%	97%	58%
17%	10%	37%	22%	57%	34%	77%	47%	98%	59%
18%	11%	38%	23%	58%	35%	78%	48%	99%	59%
19%	11%	39%	23%	59%	36%	79%	49%	100%	60%

Note : Impairment of WHOLE MAN contributed by UPPER EXTREMITY may be rounded to the nearest 5% ONLY when it is the sole impairment involved.

Upper Extremity

Example : The patient sustained an injury at the wrist of the preferred extremity which affected the median nerve. After appropriate treatment he says he can use his hand for self care, grasping and holding but he experiences some difficulty with digital dexterity. There is little sensation in the thumb, index and middle fingers. The ring finger was not materially affected. Muscle testing of the fingers reveals complete range of motion against gravity and against some resistance. The evaluation of impairment is determined to be :

Loss of function of the upper extremity due to sensory deficit, pain, or discomfort associated with the median nerve injury :	Digit	Hand	Impairment of Upper Extremity	Whole Person	Derived From
branch to radial side of thumb	7%				Table 4
branch to ulnar side of thumb	18%				Table 4
combined values	24%	10%	9%		Table 5
branch to radial side of index finger	28%				Table 4
branch to ulnar side of index finger	8%				Table 4
combined values	34%	9%	8%		Table 5
branch to radial side of middle finger	30%				Table 4
branch to ulnar side of middle finger	6%				Table 4
combined values	34%	7%	6%		Table 5
		26%	23%		
Loss due to sensory deficit, pain, or discomfort of digits (10+9+7)					
Loss of strength due to median nerve involvement (muscle strength is good [see definition in the introduction]; i.e., 20% impairment of strength - 20% of 35% {value for total loss of strength due to injury of median nerve below midforearm from Table 4} = 7%			7%		Table 4
Impairment of upper extremity (23 combined with 7 = 28)			28%	17%	Table 6
Impairment of whole man (Table 6)				17%	

Note : 1. If this injury had involved the nonpreferred extremity, the impairment to the upper extremity would be reduced by 5% (28% - 5% = 23%) and the impairment of the whole man would have been 14% (Table 6)

Explanation : The values under the column digit are derived at From Table 4 depending on examining doctor's findings. This value is converted to value for Hand impairment on the basis of Table 4. Hand impairment value to be converted to upper extremity impairment value using Table 5. Finally impairment of whole man value is obtained from Table 6.

Table 7 -Impairment of Thoracic(Dorsal) Nerve

	Impairment of Whole person	
	Unilateral Involvement	**Bilateral Involvement**
Any 2 thoracic (dorsal)nerves....	0% - 5%	0% - 10%
Any 2 to 5 thoracic (dorsal)nerves..	5% - 15%	10% - 28%
Any 5 or more thoracic(dorsal) nerves.....	15% - 35%	28% - 58%

Phrenic nerve unilateral -5%
bilateral - Refer Guide to CNS impairment - Respiration

Table 8.-Unilateral Spinal Nerve Impairment Affecting Inguinal Region

Nerve	**Loss of Function due to Sensory Deficit, Pain or Discomfort**	**Loss of Function due to loss of Strength**	**Impairment of Whole person**
Iliohypogastric	0%-3%	0%	0%-3%
Ilioinguinal	0%-5%	0%	0%-5%
Pudendal	0%-5%	0%-5%	0%-10%

Table 9 - Specific Unilateral Spinal Nerve Impairment Affecting the Lower Extremity

Nerve	Loss of Function due to Sensory deficit, pain, or discomfort	Loss of function due to loss of strength	Impairment of lower extremity
Femoral (anterior crural)	0% - 5%	0% - 35%	0% - 38%
Femoral (anterior crural) below illacus nerves)	0% - 5%	0% - 30%	0% - 34%
Genitofemoral (genito crural)	0% - 5%	0%	0% - 5%
Inferior gluteal	0%	0% - 25%	0% - 25%
Lateral femoral gutaneous	0% - 10%	0%	0% - 10%
N. to obtrurator internus muscle	0%	0% - 10%	0% - 10%
N. to Piriformis muscles	0%	0% - 10%	0% - 10%
N. to quadratus femoris muscles	0%	5% - 10%	0% - 10%
N. to superior gemellus muscles	0%	5% - 10%	0% - 10%
Obturator	0%	0% - 10%	0% - 10%
Posterior cutaneous of thigh	0% - 5%	0%	0% - 5%
Superior gluteal	0%	0% - 20%	0% - 20%
Sciatic (above hamstring innervation)	0% - 25%	0% - 75%	0% - 81%
Common peroneal (lateral or external popliteal)	0% - 5%	0% - 35%	0% - 38%
a) Deep (above midshin)	0%	0% - 25%	0% - 25%
b) Deep (below midshin) (anterior tibial)	0%	0% - 5%	0% - 5%
c) Superficial	0% - 5%	0% - 10%	0% - 14%
Tibial nerve (medial or internal popliteal)			
a) Above knee	0% - 15%	0% - 35%	0% - 45%
b) Posterior tibial (midcalf and knee)	0% - 15%	0% - 25%	0% - 33%
c) Below midcalf	0% - 15%	0% - 15%	0% - 28%
d) Lateral plantar branch	0% - 5%	0% - 5%	0% - 10%
e) Medial plantar branch	0% - 5%	0% - 5%	0% - 10%
f) Sural (external saphenous)	0% - 5%	0%	0% - 5%

See Table 10 for converting impairment of lower extremity to impairment of whole person. Note: Conversion to whole person impairment should be made ONLY when all impairments involving the one lower extremity have been combined (peripheral nerve impairment)

Table 10 - Conversion of Impairment of the Lower Extremity to Impairment of the Whole person

Low. Ext.	**Whole prsn.**	**Low Ext.**	**Whole prsn.**	**Low Ext.**	**Whole prsn.**	**Low Ext.**	**Whole prsn.**	**Low Ext.**	**Whole prsn.**
0%	0%	20%	8%	40%	16%	60%	24%	80%	32%
1%	1%	21%	8%	41%	16%	61%	24%	81%	32%
2%	1%	22%	9%	42%	17%	62%	25%	82%	33%
3%	2%	23%	9%	43%	17%	63%	25%	83%	33%
4%	2%	24%	10%	44%	18%	64%	26%	84%	34%
5%	2%	25%	10%	45%	18%	65%	26%	85%	34%
6%	2%	26%	10%	46%	18%	66%	26%	86%	34%
7%	3%	27%	11%	47%	19%	67%	27%	87%	35%
8%	3%	28%	11%	48%	19%	68%	27%	88%	35%
9%	4%	29%	12%	49%	20%	69%	28%	89%	36%
								90%	36%
10%	4%	30%	12%	50%	20%	70%	28%	91%	36%
11%	4%	31%	12%	51%	20%	71%	28%	92%	37%
12%	5%	32%	13%	52%	21%	72%	29%	93%	37%
13%	5%	33%	13%	53%	21%	73%	29%	94%	38%
14%	6%	34%	14%	54%	22%	74%	30%	95%	38%
15%	6%	35%	14%	55%	22%	75%	30%	96%	38%
16%	6%	36%	14%	56%	22%	76%	30%	97%	39%
17%	7%	37%	15%	57%	23%	77%	31%	98%	39%
18%	7%	38%	15%	58%	23%	78%	31%	99%	40%
19%	8%	39%	16%	59%	24%	79%	32%	100%	40%

Note : Impairment of WHOLE PERSON contributed by LOWER EXTREMITY may be rounded to the nearest 5% ONLY when it is the sole impairment involved.

Example : The patient suffered a simple fracture of the lower third of the femur with involvement of the sciatic nerve. After maximal medical rehabilitation, he still has some inability to extend his toes or dorsiflex his foot unless gravity is eliminated. He can plantar flex against gravity and against some resistance. There is complete sensory loss over the posterolateral aspect of the leg and lateral aspect of the foot and heel. The evaluation of impairment would be determined as follows:

Loss of strength due to deep common peroneal nerve involvement (muscle strength is poor [see definition in the introduction]. ie, 60% impairment of strength-60% of 25% [strength value for total loss of deep common peroneal above midshin] = 15%) 15%

Loss of strength due to tibial nerve involvement (strength is good [see definition in the introduction]; ie, 20% impairment of strength- 20% of 35% [strength value for total loss of tibial nerve] = 7%) 7%

Loss of sensation due to sural nerve involvement 5%

Impairment of the lower extremity (15 combined with 7 = 21)
21 combined with 5 = 25) 25%

Impairment of whole person (Table 10) 10%

Note : If, as a result of the fracture and not the sciatic nerve injury, a permanent ankylosis of the knee were to occur, the impairment value for ankylosis as set forth in "A Guide to the Evaluation of Permanent Impairment of the Extremities and Back" should be combined with the above peripheral spinal nerve - impairment value.

CHAPTER 4

SKIN

As is the case with assessment of permanent impairment of any system, for the skin too, assessment is done after adequate time has been allowed for physiologic adjustments.

Criteria for Evaluating Permanent Skin Impairment

Table 1

Class I Impairment upto 20%	Class II Impairment 21% - 40%	Class III Impairment 41% - 60%	Class IV Impairment 61% - 80%	Class V Impairment 81% - 100%
Signs or symptoms of skin disorder are present	Signs and symptoms of skin disorder are present	Signs or symptoms of skin disorder are present	Signs and symptoms of skin disorder are present	Signs and symptoms of skin disorder are present
AND	AND	AND	AND	AND
With treatment there is no or minimal limitation in the performance ofthe activities of daily living, although certain physical and/or chemical agents might temporarily increase the extent of limitation	Intermittent treatment is required	Continuous treatment is required	Continuous treatment is required which may include periodic confinement at home or other domicile	Continuous treatment is required which necessitates confinement at home or other domicile
	AND	AND	AND	AND
	There is limitation in the performance of some of the activities of daily living	There is limitation in the performance of many of the activities of daily living	There is limitation in the performance of many of the activities of daily living	There is servere limitation in the performance of the activities daily living

Table 2. Impairment Computation Chart

Portion Involved	Percentage of Specific Part
Centre of face	18.0
Each side including ear	1.5
Scalp and back of head	3.0
Chin	3.0
Neck	3.0
Entire trunk	5.0
Arm	2.0
Forearm	2.0
Hands	16.0
Hip and thigh	1.0
Leg	3.0
Feet	10.0

The total of Table 2 is to be combined with values of Table 1 according to anatomical portions involved (See examples worked out below).

Example 1: A 40-year-old man installs and repairs large refrigeration units. Three years ago, while replacing valves on a brine tank, he developed a vesicular eruption of the skin of the hands. One week later the dorsa and soles of the feet became involved with a similar pruritic eruption.

The following positive patch tests were elicited: 1) brine solution buffered to pH7 for patch testing (The brine solution used in the refrigeration units consisted essentially of 42% calcium chloride. 0.3% sodium dichromate, and the remainder water. Dichromate was added to reduce the pH of the brine from 9 to 8 and also to reduce its corrosive action on metals). 2) old leather gloves. 3) new leather gloves. 4) leather from shoes. 5) sodium dichromate 0.5%.

Although he has had to stop all direct contact with brine solution, and although he wears only vegetable-tanned leather goods, such as shoes and gloves, there is a recurrence from time to time of the dermatitis of his hands and occasionally of his feet which requires intermittent treatment.

Diagnosis - Contact dermatitis-allergy to chrome compounds.

Impairment - 50%.
30% since impairment fits into Class 2. Involvement of hands = 16%. Involvement of feet = 10% i.e. on the basis of anatomical partS involved = 16 + 10 = 26%.
Combining 30% and 25%

$$30 + [(26/100) \times (100-30)] = 30 + 18.2 = 48.2 \quad 50\%.$$

Example 2 : A 45-year-old man developed an eczematous eruption on his left arm and hand four years ago,during the spring of the year. The eruption was effectively treated by hospitalization and topical medications. After his hospital discharge, it flared to involve the right side of his face,neck, and left forearm to the edge of his work shirt. The eruption responded incompletely to treatement but subsided in the fall. The eruption returned the next spring and subsided in the winter but during the last two years it has persisted throughout the year. Presently the eruption on the exposed areas subsides to some degree when he is off work, but returns within a day after he returns to the job, even on night shifts. He works in the warehouse of a paperbox factory, and handles only printed paper cartons. Illumination of the work area is maintained exclusively by banks of fluorescent tubes contained in very low hanging fixtures.

No positive reactions were elicited from extensive patch tests with his work, household, personal usage contactants, and standard common contactants tray materials. The minimal erythema dose (MED) determined with the carbon arc lamp was three seconds which is about ten times less than the average normal MED. Three levels of ultraviolet light were delivered to areas to which potential photosensitizers were applied. No abnormal reactions were elicited with bithional and the halogenated salicylanilides. How ever, within six hours after he was exposed to five minutes of light from an 8-w fluorescent source, a severe erythematous and edematous reaction developed on the area exposed. Five days later this area was grossly eczematous. Urinary porphyrins were within normal limits.

Whenever he is exposed to fluorescent light or sunlight, the eruption recurs. It was necessary for him to change jobs and to avoid all ultraviolet light exposure including fluorescent lighting. He can be kept comfortable by intermittent use of topical corticosteroids and a benzophenone sunscreen. Exacerbations occur periodically. for which he must be treated.

Diagnosis - Persistent photodermatitis, elicited and aggravated by ultraviolet light including exposure to fluorescent light.

Impairment - 30% impairment of the whole person for dermatitis and 70% impairment for the anatomical sites involved. By using combining formula 70%+(30/100)x(100-70) = 79 = 80%.

Example 3 : A 30-year-old man is employed in a rare metals refining plant. He was accidentally splashed with concentrated liquid zirconium chloride over his face scalp and neck. He received emergency wash treatment immediately, and was taken to the hospital, where he remained under surgical treatment for two days. Healing and epithelialization occurred without complications. He returned to work 22 days after the accident.

Examination one year after the incident revealed well- demarcated areas of depigmentation on the right side of the face, extending from behind the right ear to the center of the face, and from the mid-temple area of the scalp to the chin. There are smaller areas of depigmentation on the left side of the neck and two irregular areas behind the right ear. Maximum dimensions of the depigmented areas on the right side of the face are 16 X 11cm. There are narrow collars of hyperpigmentation around the depigmented areas. Neurological examination indicates that all of the depigmented areas are hypersensitive to cold, heat, pinprick and touch: and for some of these areas, low-temperature stimuli were mistakenly identified as "hot and burning". The depigmented areas sunburn very easily in contrast to the adjacent normal skin and there is considerable discomfort as a result. When he is operating a kiln in the plant or approaching a furnace the affected side develops a stinging sensation. In the affected areas there is occasional muscle twitching. He has experienced considerable embarrassment in attempting to explain the cosmetic disfigurement and has avoided many kinds of social activities in which he was previously active. There has been no change in the pigment loss, hyperaesthesia and intolerance to sunlight and warm atmospheres. On re-examinations during the last six months, plastic surgery intervention was not indicated.

Diagnosis - Chemical leukoderma after zirconium chloride burn.

Impairment - 40% impairment due to leukoderma combined with 30% = 58% = 60% which is to be combined with an appropriate value for the mental disturbance to determine the impairment of the whole person.

EVALUATION OF BURNS AND FACIAL INJURIES Extent of Burns in terms of area and depth involved is taken into consideration. The head and neck has been divided into eight equatable components. The following scoring system based on anatomical, functional and aesthetic factors is to be used:-

A. TEN-PERCENT FORMULA FOR EVALUATING POST-BURN DISFIGUREMENTS AND DEFORMITIES.

HEAD AND NECK- as a unit 100 percent

Distribution amongst Equatable Components

S. No.	Component		Percent
1.	Scalp & Vault Including Fore head		10
2.	Eye Brows Rt. & Lt. (10+10)		20
3.	Eye Lids—Rt.	Upper 6	
		Lower 4	10
	—Lt.	Upper 6	
		Lower 4	10
4.	Pinna	Right	10
		Left	10
5.	Nose		10
6.	Lips	Upper 5	
		Lower 5	10
7.	Cheek & Lateral	Right 5	
	Area of face	Left 5	10
8.	Neck		10

Split up of ten percent formula for each component

	Region	Deficit	Percent
1.	Scalp & vault including forehead	Scalp (Disfigurement alone)	2.5
		Scalp & Bone	
2.	Eye Brows	Part of one or both	2.5 (Rt.& Lt.)
		Total loss of one or both	10 (Rt. & Lt.)
3.	Eye Lids Upper	Skin disfigurement alone	1.5 (Rt.& Lt.)
		Deformity or full thickness loss	6 (Rt. & Lt.)
	Lower	Skin disfigurement alone	1 (Rt. & Lt.)
		Deformiting or full thickness loss	4 (Rt. & Lt.)
4.	Pinna	Anterior of posterior skin disfigurement alone	2.5 (Rt.& Lt.)
		Deformity due to full thickness involvement of skin and cartilage without obliteration of meatus	7.5 (Rt.& Lt.)
		Deformity due to full thickness involvement of skin and cartilage without obliteration of meatus	10 (Rt. & Lt.)
5.	Nose	Skin cover disfigurement alone	2.5
		Deformity due to thickness involvement with both nares patent	7.5
		Full thickness deformity with one nares obliterated (7.5+1.25)	8.75
		Full thickness deformity with both nares obliterated	10
6.	Cheek and Lateral area	Skin disfigurement alone	1.25(Rt.&Lt.)
		Deformity or full thickness loss	5 (Rt. & Lt.)

Region	Deficit	Percent
7. Lips	Skin cover disfigurement one lip alone	1.25 (Upper & Lower)
	Deformity or full thickness loss loss of one lip alone	5(Upper & Lower)
	Deformity due to involvement of both lips leading to cont	10
8. Neck	Skin cover disfigurement alone	2.5
	Deformity due to involvement of skin, muscles or deeper tissues	10

TRUNK AND GENITALIA - as a unit 100 percent

S.No.	Region		Percent Female	Male
1.	Front of the trunk & abdomen excluding breasts		10	5
2.	Breast		40 (Rt.20, Lt.20)	10 (Rt.5, Lt.5)
3.	Total Back		5	10
4.	Groins	Rt.5} Lt.5}	10	10
5.	Buttocks	Rt.2.5} Lt.2.5}	5	5
6.	Genitalia		30	60

Split up of Trunk and Gentalia

Region	Deficit	Percent Female	Male
Breast	Only skin conver disfigurement	5 (Rt. & Lt.)	1.25 (Rt. & Lt.)
	Deformity resulting in loss of function due to involvement of		
	(i) Skin, areola & nipple	15 (Rt. & Lt.)	5 (Rt. & Lt.)
	(ii) Skin, areola, nipple & parenchyma	20 (Rt. & Lt.)	5 (Rt. & Lt.)
Genitalia	Skin loss resulting in mild deformity	7.5	15
	Severe contracture of orifices or sloughing of urethra or severe deformity of penis 7.5	30	60

B. FACIAL INJURIES

For evaluation of disability in facial injuries the following scoring system is to be used.

Head and Neck as a unit 100 percent

Component		Percent
1. Scalp and vault including forehead		10
2. Eye Brows Rt. & Lt. (5+5)		10
3. Eye Lids —	Rt. Upper 6 } Lower 4 }	10
	Lt. Upper 6 } Lower 4 }	10
4. Pinna	Right Left	10 10
5. Nose		10
6.Middle and lower third of face (excluding nose & pinna)		30

Split up of ten percent Formula for each component

Region	Deficit	Percent
Scalp & vault including forehead	Scalp (Disfigurement alone) Scalp & bone	2.5
Eye Brows	Part of one or both Total loss of one or both	2.5 (Rt. & Lt.) 10 (Rt. & Lt.)
Eye Lids Upper	Skin disfigurement alone Deformity or full thickness loss	1.5 (Rt. & Lt.) 6 (Rt. & Lt.)
Lower	Skin disfigurement alone Deformity or full thickness loss	1 (Rt. & Lt.) 4 (Rt. & Lt.)
Pinna	Anterior of posterior skin disfigurement alone Deformity due to full thickness involvement of skin and cartilage without obliteration of meatus Deformity due to full thickness involvement of skin and cartilage without obliteration of meatus	2.5 (Rt. & Lt.) 7.5 (Rt. & Lt.) 10 (Rt. & Lt.)

Region	Deficit	Percent
Nose	Skin cover disfigurement alone	2.5
	Deformity due to full thickness involvement with both nares patent	7.5
	Full thickness deformity with one nares obliterated (7.5+1.25)	8.75
	Full thickness deformity with both nares obliterated	10
Middle and lower third of face	Only aesthetic loss due to soft tissue/skeletal damage	7.5
	Functional loss (mal-occlusion and mastication)	22.5
	Both aesthetic and functional losses	30

CHAPTER 5

MENTAL ILLNESS

Table 1

Psychoneuroses

Stress reactions to daily living without substantial loss of personal or social efficiency.....0%-30%
(Note : Most ratings should be in the range of 0% to 1%) Stress reactions which modify patterns of daily living.....30%-60%
Stress reactions to daily living that result in continuing regression and tissue organ pathology..... 60%-90%

Psychoses

Minor distortions of thinking with little or no disturbance in activities of daily living. (Also hospital discharges who do well on medications)	0% - 25%
Definite disturbances of thinking with definite but mild disturbances in behaviour. (Also hospital discharges who require daily medication to avoid rehospitalization)	26% - 50%
Severe disturbances of thinking and behavious that entail potential harm to self or others	51% - 76%
Severe disturbances of all components of daily living. Requiring constant supervision and care	76% - 100%

Chronic Brain Syndromes

Can carry out most activities of daily living	0% - 25%
Requires some supervision and direction to carry out most activities of daily living	25% - 50%
Requires directed care in confined environment	51% - 75%
Requires assistance in all activities even self care	76% - 100%

Table 2

Global Assessment Of Functioning Scale (GAF Scale) : Consider psychological, social, and occupational functioning on a hypothetical continuum of mental health-illness. Do not include impairment in functioning due to physical (or environmental) limitations.
Note : Use intermediate codes when appropriate, e.g. 45,68,72. The table below will help to fix the persons percentage disability within the range given below :

Code
81-90 Absent or minimal symptoms (e.g., mild anxeity before an exam), good functioning in all areas, interested and involved in a wide range of activities, socially effective, generally satisfied with life, no more than everyday problems or concerns (e.g., an occasional argument with family members)

71-80 If symptoms are present, they are transient and expectabls reactions to psychosocial stressors (e.g., difficulty concertrating after family argument); no more than slight imapirment in social, occupational, or school functioning (e.g., temporarily falling behind in school work)

61-70 Some mild symptoms (e.g., depressed mood and mild insomnia) OR some difficulty in social, occupational, or school functioning (e.g., occasional truancy, or theft within the household), but generally functioning pretty well, has some meaningful interpersonal relationships

51-60 Moderate symptoms (e.g., flat affect and circumsatantial speech, occasional panic attacks) OR any serious impairment in social, occupational, or school functioning (e.g., few friends, conflicts with co-workers)

41-50 Serious symptoms (e.g., suicidal ideation, severe obsessional rituals, frequent shoplifting) OR any serious impairment in social, occupational, or school functioning (e.g. no friends, unable to keep a job)

31-40 Some impairment in reality testing or communication (e.g., speech is at times illogical, obscure, or irrelevant) OR major impairment in several areas, such as work or school, family relations, judgement, thinking, or mood (e.g., depressed man avoids friends, neglects family, and is unable to work, child frequently beats up younger children, is defiant at home, and is failing at school)

21-30 Behavior is considerably influenced by delusions or hallucinations Or serious impairment in communication or judgement (e.g., sometimes incoherent, acts grossly inappropriately, suicidal preoccupation) OR inability to function in almost all areas (e.g., stays in bed all day; no job, home, or friends)

11-20 Some danger of hurting self or others (e.g., suicide attempts without clear expectation of death, frequently violent, manic excitement) OR occasionally fails to maintain minimal personal hygiene (e.g, smears feces) OR gross impairment in communication (e.g., largely incoherent or mute)

1-10 Persistent danger of severely hurting self or others (e.g., recurrent violence) OR persistent inability to maintain minimal personal hygiene OR serious suicidal act with clear expectation of death.

CLASSES OF RESPIRATORY IMPAIRMENT

	Class I Upto 25% impairment	Class II 26% - 50%	Class III 51% - 75%	Class IV 76% - 100%
Roentgenorgram Appearance	Usually normal but there may be evidence of healed or inactive chest disease including, for example, minimal nodular silicosis or pleural scars	May be normal or abnormal	May be normal but usually is not	Usually is normal
Dyspnea	When it occurs, is consistent with the circumstances of activity	Does not occur at rest and seldom occurs during the performace of the usual activities of daily living. The patient can keep pace with persons of same age and body built on the level without breathlessness but not on hills or stairs	Does not occur at rest but does occur during the usual activities of daily living. However, the patient can walk a mile at his own pace without dyspnea although he cannot keep pace on the level with others of the same age and body build	Occurs during such activities as climbing one flight of stairs or walking 100 yards on the level, on less exertion, or even at rest
Tests of ventilatory functions				
FEV_1	> 80% of predicted	60 - 79% of predicted	51 - 59% of predicted	< 50% of predicted
	AND	OR	OR	OR
FVC	> 80% of predicted	60 - 79% of predicted	51 - 59% of predicted	< 50% of predicted
	AND	OR	OR	OR
$(FEV_1 / FVC) \times 100$	> 75% of predicted	60 - 74% of predicted	41 - 59%	< 40% of predicted
Arterial oxygen saturation (when performed)	Not applicable	Not applicable	Usually 88% or greater at rest and after exercise	Usually less than 80% at rest and after exercise

Note -

1. Smoking : Only if (no. of years of smoking X no. of cigarettes per day) is more than 100 then the doctor may decide to reduce percentage of impairment due to other causes by maximum 10%.

2. In some cases of silicosis the lung function may keep on deteriorating even if exposure so silicosis ceases. Patient should be called back after 6 months for PFT and for X-rays after two years and impairment has to be re-evaluated.

3. It is necessary to ensure that patient has not been administered any broncho- dilators or respiratory depressors for 48 hours before recording LFTs.

Example 1 : One year ago a 56 year old carpenter sustained fractures of six ribs in the left lateral thorax, and a hemopneumothorax. He was hospitalized for one week and returned to work two and one half months later. Prior to the injury he had smoked 15 cigarettes a day and had performed his work with no difficulty. He now complains of being short of breath on climbing a 12-foot ladder but not on walking on the level.

Physical examination revealed restricted motion of the rib cage on the left, with slightly diminshed breath sounds there. The patient is obese, being 5 feet 8 inches (172.7cm) tall and weighing 176 lb (79.9 kg).

Roentgenograms of the chest reveal healed rib fractures with mild residual pleural fibrosis over the left lung and slight retraction of the heart and trachea to the left. The electrocardiogram is interprted as normal. Results of tests of ventilatory function were:

Predicted Normal	Observed Result	% of Predicted
FEV_1 2.99	2.6 liters	84%
FVC 3.90	3.0 liters	77%

Diagnosis- Pleural Fibrosis; mild; and multiple healed rib fractures, left.

Impairment - 30 % impairment of whole person.

Discussion - This patients one-second forced expiratory volume is at about the lower limits of predicted normal but his maximal voluntary ventilation is 76% of the predicted normal and he has clinical and roentgenographic evidence of a mild restrictive defect of ventillation. His complaint of exertional dyspnea is consistent with the clinical findings. In the above example FEV_1/FVC percentage has increased but the patient is still certified as disabled due to reduced FVC.

Example 2 : A textile worker, aged 42 years, height 5'5" suffering from byssinosis shows following findings on examination Dyspnea - Gr III, FEV_1 - 1.21 lts/min, FEV_1/FVC %age = 85%. Expected FEV_1 value is 2.53 lts/min.

Impairment : 80%

Patient's FEV_1 is = 47% of expected value for his age. Hence he comes in class IV impairment.

CHAPTER 6

CARDIO VASCULAR SYSTEM

Table 1-Classes of Impairment due to Organic Heart Disease

CLASS I Upto 25%	CLASS II (26%-50%)	CLASS III (51%-75%)	CLASS IV (76-100%)
Organic heart disease exists, but without resulting symptoms.	Organic heart disease exists but without resulting symptoms at rest.	Organic heart disease exists but without resulting symptoms at rest.	Organic heart disease exists with symptoms even at rest.
Walking, climbing stairs freely, and the performance of usual activities of daily living do not produce symptoms	Walking freely on the level, climbing atleast one flight of stairs and the performance of the usual activities of daily living do not produce symptoms.	Walking more than 100 meters on the level, climbing one flight of ordinary stairs or performance of usual activities of daily living produce symptoms.	The performance of any of the activities of daily living beyond the personal toilet or its equivalent produces increased discomfort.
Prolonged exertion, emotional stress, hurrying, hill climbing, recreation or similar activities do not produce symptoms	Prolonged exertion, emotional stress, hurrying, hill climbing, recreation or similar activities produce symptoms	Emotional stress, hurrying, hill climbing, recreation or smiliar activities produce symptoms.	Symptoms of cardiac insufficieny or of the anginal syndrome may be present even at rest.
Signs of congestive heart failure are not present. The existence of heart disease is enough by itself for inclusion in this class.	Signs of congestive heart failure are not present.	Sign of congestive heart failure may be present and if so are usually relieved by therapy.	Signs of congestive heart failure if present are usually resistant to therapy.

Table 2.- Classes of Impairment due to Hypertensive Vascular Disease

CLASS I Upto 25%	CLASS II (26%-50%)	CLASS III (51%-75%)	CLASS IV (76-100%)
Hypertensive vascular disease exists, diastolic pressure reading are repeatedly in excess of 100 mm. Hg and examination reveals none of the following findings	Hypertensive vascular disease exists, diastolic pressure reading are or have been repeatedly in excess of 100 mm Hg, and and examination reveals any of the following findings	Hypertensive vascular disease exists, diastolic pressure readings are or consistently in excess of 100 mm. Hg, and examination reveals any two of the following findings	Hypertensive vascular disease exists, diastolic pressure reading are consistently in excess of 100 mm. Hg and examination reveals any two of the following findings
Abnormalities of urinalysis and urinary function tests	1. Proteinuria and abnormalities in the urinary sediment and no impairment of renal function	1. Diastolic pressure readings usually in excess of 120 mm. Hg	1. Diastolic pressure readings usually in excess of 140 mm. Hg
History of hypertensive cerebrovascular damage	2. History of hypertensive cerebrovascular damage without residuals	2. Proteinuria and abnormalities in the urinary sediment with evidence of impaired renal function	2. Proteinuria and abnormalities in the urinary sediment with impaired renal function and evidence of nitrogen retention
Evidence of left ventricular hypertrophy	3. Evidence of left ventricular hypertrophy	3. Hypertensive cerebrovascular damage with permanent neurological residuals	3. Hypertensive cerebrovascular damage with permanent neurological residuals
Hypertensive abnormalities of the optic fundus (except minimal narrowing or sclerosis of arterioles)	4. Definite hypertensive changes in the retinal arterioles, with or without hemorrhages and exudates	4. Left ventricular hypertrophy but no congestive heart failure	4. Left ventricular hypertrophy, with or without congestive heart failure
		5. Retinopathy with definite hypertensive changes in arterioles, with or without hemorrhages and	5. Retinopathy as manifested by hypertensive changes in the exudates arterioles, retina, or optic nerves

VASCULAR DISEASES AFFECTING THE EXTREMITIES

The impairment values provided in this section are meant to also include rare cases in which joint motion is restricted due to vascular disease. Those cases where amputation has been done, value for amputation has to be combined with that for the vascular disease.

Table 3. CLASSES OF VASCULAR DISEASES AFFECTING THE EXTREMITIES

CLASS I (0-25% Impairment)	CLASS II (26%-50% Impairment)	CLASS III (51%-75% Impairment)	CLASS IV (76-100% Impairment)
Vascular disease (or diseases) and/or one or more of the following findings exists	Vascular disease (or diseases) and one or more of the following findings exist	Vascular disease (or diseases) and one or more of the following findings exist.	Vascular disease (or diseases) and one or more of the following indings exist
Intermittent claudication occurring on walking at least 100 meters at an average pace	Intermittent claudication occurring on walking as little as 25 meters and no more than 100 meters at an average pace	Intermittent claudication occurring on walking less than 25 meters or pain at rest occurring at intervals	Severe and constant pain at rest
Vascular damage as evidenced by physical signs such as a) healed painless stump of an amputated single digit, with evidence of persistent vascular disease or b) healed ulcer	Vascular damage as evidenced by physical signs such as a) healed amputation of two or more digits of one extremity, with evidence of persistent vascular disease or b) persistent superficial ulceration	Vascular damage as evidenced by physical signs such as a) amputation at or above the wrist or ankle of one extremity or amputation of two or more digits of two extremities, with evidence of persistent vascular disease, or b) persistent wide spread deep ulceration involving one extremity	Vascular damage as evidenced by physical signs such as a) amputation at or above the wrist or ankle of two extremities or amputation of all digits of two or more extremities with evidence of persistent vascular disease, or b) persistent wide spread or deep ulceration involving two or more extremities
Persistent edema of a moderate degree incompletely controlled by elastic supports	Marked edema, which is only partially controlled by elastic supports	Marked edema which cannot be controlled by elastic supports	Edema alone cannot be the basis for classification in this class

Example 1: A 48-year old man has had recurrent thrombophlebits in both legs for a number of years. The left leg has been especially affected. A year ago he had to reduce the length of time spent standing in order to lessen the swelling and pain of a persistent deep ulcer. When he is on his feet he wears heavy elastic stockings, full-length and made to order. Despite these supports there is still extensive edema of the ankles and calves. Impairment : 50% impairment of the whole person.

Example 2: A 54-year old man working in cold storage was shown to have Raynauds phenomenon when he lost the great and second toes of the left foot 10 years ago. Bilateral lumbar smpathectomy was performed. Two years ago the left leg was amputated 3 in. below the knee. Since then the index and middle fingers of the right hand have been amputated. All sites of amputation healed. There is however, infection deep in the right foot, and there are signs of severe ischemia nearly to the knee, but further surgery is not deemed necessary at this time.

Impairment : 95% impairment of the whole person; 85% contributed by class 4 peripheral vascular diesase and 50% contributed by amputation of left leg, 14% by amputation of right index finger and 12% by amputation of right middle finger.

CHAPTER 8

REPRODUCTIVE AND URINARY SYSTEMS

Table 1 - Classes of Upper Urinary Tract Impairment

CLASS I Impairment Upto 25%	CLASS II Impairment 26%-50%	CLASS III Impairment 51%-75%	CLASS IV Impairment 76-100%
Diminution of upper urinary tract function as evidenced by creatinine clearance of 75 to 90 liters / 24 hrs (52 to 62.5ml / mm)	Diminution of upper urinary tract function as evidenced by creatinine clearance of 60 to 75 liters / 24 hrs (42 to 52 ml / mm)	Diminution of upper urinary tract function as evidenced by creatinine clearance of 40 to 60 liters / 24 hrs (28 to 42 ml / mm)	Diminution of upper urinary tract function as evidenced by creatinine clearance below 40 liters / 24 hrs (28 ml / mm)
OR	OR	OR	OR
Intermittent symptoms and signs of upper urinary tract dysfunction not requiring continuous treatment or surveillance are present	Although creatinine clearance is greater than 75 liters / 24 hrs (52 ml / mm) symptoms and signs of upper urinary tract disease or dysfunction necessitate continuous surveillance and frequent treatment	Although creatinine clearance is 60 to 75 liters / 24 hrs (42 to 52 ml / mm) symptoms and signs of upper urinary tract disease or dysfunction are incompletely controlled by surgical or continuous medical treatment	Although creatinine clearance is 40 to 60 liters / 24 hrs (28 to 42 ml / mm) symptoms and signs of upper urinary tract disease or dysfunction persist despite surgery or continuous medical treatment

Note :- The individual with a Solitary Kidney, regardless of cause, should be rated as having 30 % impairment of the whole person. This value is to be combined with any other permanent impairment (including any impairment in the remaining Kidney) pertinent to the case under consideration.

The normal ranges of creatinine clearance are :-

Males : 130 to 200 litres / 24 hr (90 to 139 ml/min)
Females : 115 to 180 litres / 24 hr (80 to 125 ml/min)

Table 2. Urinary diversions

	Impairment of whole man %
Uretero-Intestinal Diversions	25
Cutaneous Ureterostomy Without Intubation	60
Neohrostomy or Intubated Ureterostomy	60

Note : These impairment values will need to be combined with that for the involved organ.

Example : A 48-years-old man was injured in an accident and developed hematuria. Radiologic studies revealed that the left kidney was damaged. The blood pressure was 150/90 mm Hg. No other abnormalities were noted. He was kept at bedrest in a hospital for a week and then discharged.

Six months later he began to complain of severe head-aches. The blood pressure was found to be 240/160 mm Hg. and malignant hypertensive retinopathy was noted.

Investigation revealed a creatinine clearance of 40 liters/ 24 hr (28 ml/min) and clear-cut evidence of left renovascular hypertension was found. The left kidney was removed. Biopsies from the right kidney revealed malignant hypertensive change. The histology of the left kidney revealed ischemia and juxtaglomerular hypertrophy.

Immediately after the operation, the blood pressure fell to 170/110 mm Hg and, during the next six months, leveled off at 155/95 mm Hg. The eyegrounds regressed to Grade II (Keith-Wagner) and creatinine clearance rose slowly and has levelled off at 58 litres/24 hr (40ml/min).

Diagnosis - Left nephrectomy for malignant hypertension due to posttraumatic renovascular ischemia of the left kidney: arteriolonephrosclerosis of the right kidney; and hypertensive vascular disease.

Impairment - 70% due to arteriolonephrosclerosis and 30 % due to nephrectomy, which combine to 80 % impairment of the whole man, which should be combined with an appropriate value for the cardiovascular impairment which in this case is 0 since the diastolic pressure is less than 100 mm Hg.

Table 3. Classes of Bladder Impairment

Class I - Impairment of Whole person- upto 25% A patient belongs in Class 1 when there are symptoms and signs of bladder disorder requiring intermittent treatment, but without intervening malfunction.

Class II - Impairment of Whole person- 26%-50%: A patient belongs in Class 2 when (a) there are symptoms and/ or signs of bladder disorder requiring continous treatment; OR (b) there is good bladder reflex activity BUT no voluntary control.

Class III - Impairment of Whole person- 51%-75%: A patient belongs in Class 3 when the bladder has poor reflex activity (intermittent dribbling) and no voluntary control.

Class IV - Impairment of Whole person - 76%-100%: A patientbelongs in Class 4 when there is no reflex or voluntary control of the bladder (continuous dribbling).

Example : A 47-years-old man developed such progressive urinary frequency that he was voiding at intervals of every 10 to 15 minutes day and night. The diagnosis of interstitial cystitis was established, but the usual treatment, bladder dilatation with various agents, was ineffective. The upper urinary tract was normal and uninfected. After a ureterosigmoidostomy he was able to resume his usual activities.

Diagnosis — Contracted fixed bladder requiring urinary diversion.

Impairment — 25% due to contracted fixed bladder and 25% due to ureterosigmoidostomy, which combine to 45% impairment of the whole person (41.25 -> take it to nearest 5% i.e. 45% impairment).

Note — The removal of the bladder for any reason and a resultant urinary diversion should be assigned a similar rating of impairment.

Table 4 Classes of Urethral Impairment

Class I - Impairment of Whole person - upto 25% : A patient belongs in Class 1 when symptoms and signs of urethral disorder are present which require intermittent therapy for control.

Class II - Impairment of Whole person - 26% - 50% : A patient belongs in Class 2 when there are symptoms and signs of urethral disorder which cannot be effectively controlled by treatment.

Example : As the result of an injury, a 27 year old man has a urethral stricture which requires dilatation every few weeks. Between dilatations he is entirely free of symptoms and has difficulty only when the urethra gradually constricts, at which time he notices ever increasing difficulty in voiding. There is no associated upper urinary tract infection.

Diagnosis: Traumatic urethral stricture.

Impairment : 25% impairment of the whole person.

Example : A 21 year old factory worker was crushed between a lift and a wall. His bony pelvis was fractured, his urethra was totally severed at the apex of the prostate, and the perineum was severely lacerated. Immediate reconstructive urethral surgery was unsuccessful, and one year after the accident a urinary diversion procedure was necessary (ureterosigmoidostomy) which resulted in hydronephrosis of the right kidney with repeated urinary tract infections. This diversion was subsequently converted to a conduit, and renal infection occurred only sporadically thereafter. He is now totally impotent. The pelvic fracture healed without evidence of musculoskeletal impairment, but because of his occasional urinary tract infections, he periodically is unable to perform some of the activities of daily living. Creatinine clearance is 70 liters/ 24 hr. (49 ml/min.).

Diagnosis: Severed urethra, hydronephrosis with recurring urinary tract infections, impotency.

Impairment : 50% due to severed urethra, 50% due to upper urinary tract impairment, 25% due to uretero ileostomy and 50% due to loss of sexual function, which combine to 95% impairment of the whole person.

4) MALE REPRODUCTIVE ORGANS

Note :

1. Impairment values calculated for each of these organs (listed under male reproductive system) is increased by 50% for patients less than 40 years and decreased by 50% for patients more than 65 years of age.

2. For impairment of urinary functions of penis the section on urethra has to be referred.

Table 5 Classes of Penile Impairment (Sexual function)

Class I : Impairment of Whole Man - upto 49% : A patient belongs in Class I when sexual function is affected adversely.

Class II : Impairment of Whole Man - 50% : A patient belongs in Class 2 when sexual function is totally lost.
Example : A 28 year old man suffered a fractured pelvis with wide separation of the symphysis pubis, perivesical and periprostatic hematoma and a tear into the prostatomembranous urethra. This responded well to reparative surgery without subsequent urinary difficulty. Erection and intercourse are possible, but sensation and ejaculation are absent.

Diagnosis : Posttraumatic urethral genital insufficiency.

Impairment : 40% impairment of the whole man which includes due consideration for the patient's age (25% + 50% of 25 = 37.5 = 40%).

Table 6 Classes of Scrotal Impairment

Class I : Impairment of Whole Man - upto 25% : A patient belongs in Class 1 when there are symptoms and signs of scrotal loss or disease and there is no evidence of testicular malfunction, although there may be testicular malposition.

Class II : Impairment of Whole Man - 26% - 50% : A patient belongs in Class 2 when (a) there are symptoms and signs of architectural alteration or disease of the scrotum such that the testes should be implanted in other than a scrotal position to preserve testicular function, and pain or discomfort is present with activity : OR (b) there is total loss of the scrotum.

Example : A 50 year old man has suffered extensive burns of the lower extremities, genitals and abdomen. Skin grafting to the abdomen and lower extremities was satisfactory; however, it was necessary to transplant testicles to the thighs to permit adequate skin coverage of the scrotal area.

Diagnosis : Burn ablation of the scrotum .

Impairment : 50% impairment of the whole man.

Note : In case of loss of sexual function or urinary function, appropriate values would have to be combined.

Table 7 Classes of Reproductive impairment

Class I - upto 49% - A patient belongs in class I when reproductive function is adversely affected.

Class II - 50% - A patient belongs in class II when reproductive function is completely lost.

Table 8 Classes of Impairment of Testes, Epididymides, Spermatic Cords

Class I : Impairment of Whole Man - upto 25% : A patient belongs in class 1 when (a symptoms and signs of testicular, epididymal and/or spermatic cord disease are present and there is anatomic alteration AND (b) continuous treatment is not required; AND (c) there are no abnormalities of seminal or hormonal function OR (d) Solitary testis is present.

Class II : Impairment of Whole Man - 26 - 35% : A patient belongs in Class 2 when (a) symptoms and signs of testicular, epididymal and/or spermatic cord disease are present and there is anatomic alteration AND (b) frequent or continuous treatment is required AND (C) there are detectable seminal or hormonal abnormalities.

Class III : Impairment of Whole Man - 36% - 50% : A patient belongs in Class 3 when trauma or disease produces bilateral anatomical loss or there is no detectable seminal or hormonal; function of testes, epididymides and/or spermatic cords.

Example : A 33 year old man had evidence of intereference with testicular blood supply after trauma. There was an acute onset of swelling of the testes, hydrocele formation and intense pain. One testis eventually became atrophic and the other diminished in size. Systemic hormonal changes are not apparent, but the semen analysis reveals definite oligospermia. Procreative efforts previously successful in producing offspring have been unavailing.
Diagnosis : Testicular atrophy and oligospermia.

Impairment : 45% impairment of the whole man, which includes due consideration for the patient's age. (30% + 15% = 45%)

Example : A 17 year old boy was injured in a farm machine accident. He sustained amputation of the scrotum and is contents.

Diagnosis: Traumatic gonadal ablation.

Impairment : 98% = 100%

Note : This patient's impairment is worked out as follows : for gonadal ablation - 50% impairment + 50% of 50% (considering patients age) = 75% for scrotal loss - 50% impairment + 50% of 50% (considering patients age) = 75% for loss of reproductive function - 50% impairment + 50% of 50% (considering patients age) = 75% combining all three = 98% bringing it to nearest 5% = 100%

Table 9 : Classes of Impairment due to Prostate and Seminal Vesicles

Class I : Impairment of Whole Man - 0% - 25% : A patient belongs in class 1 when (a) there are symptoms and signs of prostatic and/or seminal vesicular dysfunction or disease and (b) anatomic alteration is present AND (c) continuous treatment is not required.

Class II : Impairment of Whole Man - 26% - 35% : A patient belongs in Class 2 when (a) frequent severe symptoms and signs of prostatic and/or seminal vesicular dysfunction or disease are pesent, AND (b) anatomic alteration is present AND (c) continuous treatment is required.

Class III : Impairment of Whole Man - 36% - 50% : A patient belongs in Class 3 when there has been ablationof the prostate and/or seminal vesicles.

5) FEMALE REPRODUCTIVE SYSTEM

Table 10: Classes of Vulval - Vaginal Impairment

Class I : Impairment of Whole person - upto 25% : A patient belongs in Class 1 when (a) symptoms and signs of disease or deformity of the vulva and.or vagina are present which do not require continuous treatment, and (b) sexual intercourse is possible and (c) the vagina is adequate for childbirth during the premenopausal years.

Class II : Impairment of Whole Person - 25% - 35% : A patient belongs in class 2 when (a) symptoms and signs of disease or deformity of the vulva and/or vagina are present which require continuous treatment and (b) sexual intercourse is possible with varying degrees of difficulty and (c) during the premenopausal years adequacy for vaginal delivery is limited.

Class III : Impairment of Whole Person - 35% -50% : A patient belongs in Class 3 when (a) symptoms and signs of disease or deformity of the vulva and/or vagina are present which are not controlled by treatment and (b) sexual intercourse is not possible and (c) during the premenopausal years vaginal delivery is not possible.

Footnote : Of the conditions (a), (b), (c) under each class, if even one is satisfied in the higher class, then the impairment value should be from the higher class.

Example : A 30 years old woman para 2 was injured in an automobile accident, suffering severe traumatic laceration of the vagina, bladder and rectum, which resulted in a vesicorectovaginal fistula. The vaginal depth was restricted to 2 cm and a sinus tract of 5 mm diameter led to the cervix, providing escape for menstrual blood, feces and urine. Sexual intercourse was impossible and pregnancy was deemed imposible. The recommended surgery was refused by the patient. The patient develops bladder infection off and on requiring intermittent treatment.

Diagnosis: Vesicorectovaginal fistula with partial absence of vagina with intermittent bladder infection.
Impairment : 50% impairment of the whole person. This value should be combined with appropriate values for the associated bladder impairments i.e. 20% = 50 + 10 = 60%

Table 11: Classes of Cervical - Uterine Impairment

Class I - Impairment of Whole Person - upto 25% : A patient belongs in Class I when (a) symptoms and signs of disease or deformity of the cervix or uterus are present which do not require continuous treatment; OR (b) cervical stenosis, if present, requires no treatment; OR (c) there is anatomic loss of the cervix and/or uterus in the post-menopausal years.

Class II - Impairment of Whole Person - 25% - 35% : A patient belongs in Class 2 when (a) sympatoms and signs of disease or deformity of the cervix and/or uterus are present which require continuous treatment; OR (b) cervical stenosis, if present, requires periodic treatment.

Class III - Impairment of Whole Person - 35% - 50% : A patient belongs in Class 3 when (a) symptoms and signs of disease or deformity of the cervix and/or uterus are present which are not controlled by treatment, OR (b) cervical stenosis is complete, OR (c) anatomic or complete functional loss of the cervix and/or uterus occurs in premenopausal years.

Table 12 : Classes of Tubal-Ovarian Impairment

Class I - Impairment of Whole Person - upto 25% : A patient belongs in Class I when (a) symptoms and signs of disease or deformity of the fallopian tubes and/or ovaries are present which do not require continuous treatment ; OR (b) only one fallopian tube and/or ovary is functioning in the premenopausal years; OR (c) there is bilateral loss of function of the fallopian tubes and/or ovaries in the postmenopausal years.

Class II - impairment of Whole Person - 26% - 35% : A patient belongs in Class 2 when symptoms and signs of disease or deformity of the fallopian tubes and/or ovaries are present which require continuous treatment, but tubal patency persists and ovulation is possible.

Class III - Impairment of Whole Person - 36% - 50% : A patient belongs in Class 3 when (a) symptoms and signs of disease or deformity of the fallopian tubes and/or ovaries are present and there is total loss of tubal patency or total failure to produce ova in the premenopausal years: OR (b) bilateral loss of the fallopian tubes and/or ovaries occurs in the premenopausal years.

CHAPTER 9

THE DIGESTIVE SYSTEM

Percentage impairment due to loss of an organ (eg. splenectomy) or whole or part of any organ (eg. intestinal resections) should be minimum of 20%. Higher percentage may be given if the assessing doctor feels the need.

CLASSES OF IMPAIRMENT OF THE UPPER DIGESTIVE TRACT (OESOPHAGUS, STOMACH AND FIRST PORTION OF DUODENUM, SMALL INTESTINE, PANCREAS)

CLASS I Upto 25% Impairment	CLASS II 26%-50% Impairment	CLASS III 51%-75% Impairment	CLASS IV 76-100% Impairment
Symptoms and signs of organic upper digestive tract disease are present or there is anatomic loss or alteration	Symptoms and signs of organic upper digestive tract disease are present or there is anatomic loss or alteration	Symptoms and signs of organic upper digestive tract disease are present or there is anatomic loss or alteration	Symptoms and signs of organic or upper digestive tract disease present or there is anatomic loss or alteration
AND	AND	AND	AND
Continuous treatment is not required	Appropriate dietary restrictions and drugs are required for control of symptoms signs and or nutritional deficiency	Appropriate dietary restrictions and drugs do not completely control symptoms, signs and/or nutritional state	Symptoms are not controlled by treatment
AND	AND / OR	OR / AND	OR / AND
Weight can be maintained at the desirable level	Loss of weight below the "desirable weight" does not exceed 10%	There is 10 - 20% loss of weight below the desirable weight which is ascribable to a disorder of the upper digestive tract	There is greater than a 20% loss of weight which is ascribable to a disorder of the upper digestive tract
OR			
There are no sequelae after surgical procedures			

Example : A 59 years old woman complains of having had almost daily substernal pain and dysphagia for five years. She feels better when she limits her diet to soft foods. Her symptoms are more severe when she becomes upset about the status of her invalid husband.

Physical examinations reveals a woman of 5 ft. 7 in (1.70 meters) of medium frame, appearing older than her stated age. Her blood pressure is 145/90 mm Hg. She now weighs 118 lb (53.6 kg) which is 10 lb below her usual weight. Chest x-ray and EKG are normal. X-ray studies of the upper gastrointestinal tract reveal a cork-screw configuration (curling) of the oesophagus suggestive of diffuse spasm. This diagnosis is confirmed by oesophageal motility studies.

Diagnosis : Diffuse spasm of the oesophagus.

Impairment : 15% impairment of the whole person.

Example : The patient, a 58 year old man, 5 ft. 10 in (1.78 meters) in height has almost complete oesophageal obstruction due to corrosive acid injestion. Five years ago he had a resection of the oesophagogastric junction for cancer. Although there is no evidence of recurrence of the tumor, he has developed severe stenosing oesophagitis. Surgical correction has been attempted but was unsucessful. A gastrostomy tube is used for feeding. He previously maintained a weight of 150 lb (68.1 kg). He now weighs 110 lb (49.9 kg) Dilatation of the stricture is required about once a month to accommodate salivary secretions.

Diagnosis: Stenosing esophagitis.

Impairment : 95% impairment of the whole man {80% impairment for stenosing esophagitis combined with 60% for the gatrostomy and 20% for oesophagogastric resection (80% + 12% + 1.6% = 93.6% -> rounded to nearest 5% = 95%)}

Example : A 50 years old man had a gastric resection for corrosive acid ingestion two years ago. He now complains of episodes of light headedness sweating and palpitation occuring 15 minutes after meals. The symptoms are partially relieved by diet and by lying down. Since the operation his weight has decreased to approximately 15% below desirable weight.

Physical examination reveals a man weighing 100 lb (45.4 kg) and standing 5 ft 3 in (1.60 meters). A well healed upper abdominal scar is present. The remainder of the physical examination is not remarkable. Upper gastrointestinal x-rays reveal evidence of a 70% gastric resection and a normally functioning gastrojejunostomy without evidence of ulceration.

Diagnosis : Dumping syndrome (postgastrectomy).

Impairment : 75% impairment of the whole man (60% combined with 30% for gastrectomy = 72% = 75%)

Example : A 21 year old healthy man suffered a ruptured spleen in an automobile accident. A splenectomy was performed. His postoperative course was uneventful. He returned to his normal activities of living.

Diagnosis: Splenectomy for splenic rupture.

Impairment : 20% impairment of the whole man.

Example : Ten years ago a 45 year old man had a celiotomy for abdominal trauma. Approximately 30 cm of the terminal ileum was resected. The patient maintains normal nutrition on an unrestricted diet and has two to three soft stools daily. X-ray studies of the remaining small intestine are normal.

Diagnosis: Partial ileal resection . Impairment : 25% impairment of the whole man combined with 20% for removal of part of an organ = 25 + 15 = 40% impairment of whole man.

Example : A 35 year old 6 ft 3 in (1.90 meters) man of medium build required partial pancreatectomy for cyst formation and recurrent inflammation of the pancreas after being thrown against the steering wheel in an automobile accident. Despite treatment with pancreatic exocrine supplementation he notes intermittent diarrhea and decreased stamina. He now weighs 164 lb (74.5 kg) whereas he previously maintained a weight of 180 lb (81.7 kg) Epigastric and back pain are sufficiently severe to require hospitalisation once or twice a year. Steatorrhea is present.

Diagnosis :Chronic pancreatitis with exocrine insufficiency subsequent to trauma: post partial pancreatectomy.

Impairment : 50% impairment of the whole man combined with 20% for removal of part of an organ = 50 + 10 = 60% impairment of whole man.

CLASSES OF COLONIC & RECTAL IMPAIRMENT

CLASS I Upto 25% Impairment	CLASS II 26%-50% Impairment	CLASS III 51%-75% Impairment	CLASS IV 76-100% Impairment
Signs and symptoms of colonic or rectal disease are infrequent and of brief duration	There is objective evidence of colonic or rectal disease or anatomic loss or alteration	There is objective evidence of colonic or rectal disease or anatomic loss or alteration	There is objective evidence of colonic and rectal disease or anatomic loss or alteration
AND	AND	AND	AND
Limitation of activities, special diet or medication is not required	There are mild gastrointestinal symptoms with occasional disturbance of bowel function accompanied by moderate pain	There are moderate to severe exacerbations with disturbance of bowel habit, accompanied by periodic or continual pain	There are persistent disturbances of bowel function present at rest weight severe persistent pain
AND	AND	AND	AND
No systemic manifestations are present and weight and nutritional state can be maintained at a desirable level	Minimal restriction of diet or mild symptomatic therapy may be necessary	Restriction of activity, diet and drugs are required during attacks	Complete limitation of activity continued restriction of diet and medication do not entirely control the symptoms
OR	AND	AND	AND
There are no sequelae after surgical procedures	No impairment of nutrition results	There are constitutional manifestations (fever, anemia, weight loss)	There are constitutional manifestations (fever, weight loss and / or anemia) present
			AND
			here is no prolonged remission

CLASSES OF ANAL IMPAIRMENT

CLASS I Upto 25% Impairment	CLASS II 25%-35% Impairment	CLASS III 35%-50% Impairment
Signs of organic anal disease are present or there is anatomic loss or alteration	Signs of organic anal disease are present or there is anatomic loss or alteration	Signs of organic anal disease are present and there is anatomic loss or alteration
AND / OR	AND / OR	AND / OR
There is mild incontinence involving gas and/or liquid stool	Moderate but partial fecal incontinence is present requiring continual treatment	Complete fecal incontinence is present
AND / OR	AND / OR	AND / OR
Anal symptoms are mild, intermittent and controlled by treatment	Continual anal symptoms are present and incompletely controlled by treatment	Signs of organic anal disease are present and severe analy symptoms unreponsive or not amenable to therapy are present

Example : A 35 year old man has had to undergo colonic resection for perforation of colon due to trauma. He has been hospitalised on numerous occasions, requiring prolonged periods of bed rest and transfusions. He has been able to continue a sedentary occupation by restriction of other physical activity and adherence to a strict diet. Transfusions are used when he becomes anemic.

Diagnosis: Chronic recurring ulcerative colitis.

Impairment : 75% impairment of the whole man combined with 20% for colonic resection = 75 + 5 = 80% impairment of whole man.

Example : Ten years ago a 56 year old man developed a severe pararectal abscess which ruptured spontaneously. During the ensuing three years, multiple recurrent infections occured, with the opening of fistulous tracts in four other areas surrounding the anus. Surgical repair was undertaken in two stages, but necessitated incision and excision of substantial portions of the sphincter. Recovery was complicated by severe wound infection. Since this time the patient has had no recurrence of infection. However, he has had complete absence of fecal control. Although he practices daily rectal irrigations, he still soils himself almost daily. Examination discloses complete anatomic loss of sphincteric function.

Diagnosis : Total anal incontinence secondary to anatomic loss of sphincter, complete loss of anal function.
Impairment : 45% impairment of the whole man combined with 20% for excision of portions of the sphincter = 45 + 11 = 56% = 60%.

BILIARY TRACT IMPAIRMENT

CLASS I Upto 25% Impairment	CLASS II 26%-50% Impairment	CLASS III 51%-75% Impairment	CLASS IV 76-100% Impairment
There is an occasional episode of biliary tract dysfunction	There is recurrent biliary tract impairment irrespective of treatment	There is irreparable obstruction of the bile tract with recurrent cholangitis	There is persistent jaundice and progressive liver disease due to obstruction of the common bile duct

CLASSES OF LIVER IMPAIRMENT

CLASS I Upto 25% Impairment	CLASS II 26%-50% Impairment	CLASS III 51%-75% Impairment	CLASS IV 76-100% Impairment
There is objective evidence of persistent liver disease even though no symptoms of liver disease are present; and no history of ascites, jaundice, or bleeding oesophageal varices within five years;	There is objective evidence of chronic liver disease even though no symptoms of liver disease are present; and no history of ascites, jaundice, or bleeding oesophageal varices within five years	There is objective evidence of progressive chronic liver disease, or history of jaundice, ascites, or bleeding oesophageal or gastric varices within the past year;	There is objective evidence of progressive chronic liver disease, or persistent ascites or persistent jaundice or bleeding oesophageal or gastric varices with central nervous systems manifestations of hepatic insufficiency
AND / OR	AND / OR	AND / OR	AND / OR
Nutrition and strength are good	Nutrition and strength are good	Nutrition and strength may be affected	Nutritional state is poor
AND / OR	AND / OR	AND / OR	
Biochemical studies indicate minimal disturbance in liver function	Biochemical studies indicate more severe liver damage than Class I	There is intermittent ammonia or meat intoxication	
OR			
Primary disorders of bilirubin metabolism are present			
There is an occasional episode of biliary dysfunction	There is recurrent biliary tract impairment irrespective of treatment		

Example : A 48 year old man had hepatitis at age 20, followed by recurrences of jaundice at ages 32 and 40. For the past six months he has had an intermittently poor appetite and an increase in fatigability. He has noted a slight yellowing of the skin. He appears chronically ill and minimally jaundiced. Several spider angiomata are seen on his neck and thorax. The liver and spleen are slightly enlarged. No ascites or edema are present. Liver function studies reveal a normal blood count and urinalysis; serum bilirubin 2.8 mg 100 ml; serum albumin 3 gm 100 ml; serum globulin 4 gm 100 ml; SGOT 180 units, BSP 38% retention after 45 minutes. Examination of tissue obtained by needle biopsy shows postnecrotic cirrhosis with evidence of continuing active hepatitis.

Diagnosis : Chronic active hepatitis and postnecrotic cirrhosis.

Impairment : 65% impairment of the whole man.

This value has to be combined with that for the organ system primarily involved.

	Impairment of Whole person , %
Esophagotomy	60
Gastrostomy	60
Jejunostomy	60
Ileostomy	80
Colostomy	60

CLASSES OF IMPAIRMENT DUE TO INTESTINAL OBSTRUCTION

	CLASS I Upto 25%	CLASS II 26%-50%	CLASS III 51%-75%	CLASS IV 76-100%
Pain and vomiting or abd. distension or constipation	Once a year	2 or more times a year	Needed one hospital admission or more	Needed one reoperation or more

Criteria for Evaluating Permanent Impairment Related to Anemia

Class of impairment	Symptomatology and limitations of activity of daily living	Peripheral blood haemoglobin level in gm / 100 ml of blood	%age impairment of whole person
Class I	Minimal	9 or more	upto 25%
Class II	Moderate	7 or more	25% to 50%
Class III	Marked	5 or more	50% to 75%
Class IV	Severe	less than 5	75% to 100%

Note : It is expected that disability assessment would be required for cases of chronic anaemia not responding to therapy. In order to ascertain patient's haemoglobin level, two readings of percentage haemoglobin values would have to be obtained at an interval of one month. In this interval if patient becomes serious enough to require transfusion, it is not necessary to obtain the second value.

Criteria for Evaluating Permanent Impairment Related to Polycythemia :-

Class I - Impairment of Whole person - upto 30% : A patient with Symptoms or signs of Polycythemia belongs in Class 1 when the hemoglobin level is elevated but is maintained at a level less than 18 gm/100 ml of blood, with no or infrequent treatment.

Class II - Impairment of Whole person - 30% - 60% : Frequent treatment is required to maintain the peripheral blood hemoglobin level less than 18 gm/200 ml of blood.

Class III - Impairment of Whole person - 60% - 90% : Intensive treatment is required to maintain the peripheral blood hemoglobin level less than 20 gm/100 ml of blood.

Criteria for Evaluating Leukocyte Impairment :

Class I - Impairment of whole person - upto 25%

a) there are symptoms or signs of leukocyte abnormality AND
b) no or infrequent treatment is needed AND
c) all or most of the activities of daily living can be performed.

Class II -Impairment of whole person - 26 - 50%

a) there are symptoms and signs of leukocyte abnormality, AND
b) although continuous treatment is required, most to all of the activities of daily living can continue to be performed.

Class III -Impairment of whole person - 51% - 75%

a) there are symptoms and signs of leukocyte abnormality, AND
b) continuous treatment is required and
c) there is interference in the performance of activities of daily living

Class IV - Impairment of whole person - 76% - 100%

a) there are symptoms and signs of leukocyte abnormality and
b) continuous treatment is requried and
c) difficulty is experienced in the performance of the activities of daily living necessitating continuous care from others.

Criteria for Evaluating Permanent impairment of reticuloendothelial system :

Class I - Impairment of whole person - upto 25%

a) symptoms or signs of reticuloendothelial disease are present AND
b) the usual activities of daily living are performed with no or little difficulty.

Class II - Impairment of whole person - 26% - 50%

a) symptoms and signs of reticuloendothelial disease are present and
b) most of the activities of daily living can be performed with some assistance from others.

Class III - Impairment of whole person - 51% - 100%

a) symptoms and signs of reticuloendothelial disease are present
b) continuous treatement is needed, AND
c) the usual activities of daily living cannot be performed without assistance.

Note : If any malignancy is due to occupational exposure, 100% impairment should be awarded.
Criteria for Evaluating Platelet impairment:

Symptomotology Peripheral Platelet level per ml Impairment

Class I	Minimal	2-2.5 lakhs	upto 25%
Class II	Moderate	1 lakh-2lakh	26%-50%
Class III	Marked	50,000-1 lakh	51%-75%
Class IV	Severe	less than 50,000	76%-100%

CHAPTER 11

THE ENDOCRINE SYSTEM

Pituitary - Hypothalamus

Criteria for Evaluating Permanent Impairment of Pituitary - Hypothalamus

Class I : Impairment of Whole person - upto 25% : A patient with pituitary hypothalmic disease belongs in Class I when the disease can be effectively controlled by continuous treatment.

Class II : Impairment of Whole person - 26% - 50% : Patient with pituitary hypothalamic disease belongs in Class 2 when the symptoms and signs are inadequately controlled by treatment.

Class III : Impairment of Whole person - 51% - 100% : A patient with pituitary hypothalmic disease belongs in Class 3 when severe symptoms and signs persist despite treatment.

Example : A 40 year old woman had puerperal hemorphage followed by a postpartum infection at age 35. She then developed amenorrhea and noted loss of strength, change in character of skin, thinning of scalp and body hair and gradual loss of 10 lb (4.5 kg) in weight. She was moderately underweight and her face and skin appeared myxedematous. There was no axillary hair and scant pubic hair. Blood pressure was 90/70 mm. Hg. glucose tolerance curve was flat, urinary 17 ketosteroids were 1.5 mg./24 hr., and urinary gonadotropins were low. Substitution therapy with thyroid, cyclic estrogrens and cortisone has resulted in general improvement in strength, some increase in weight and a return of periodic vaginal bleeding. She frequently becomes fatigued during the performance of the usual activities of daily living.

Diagnosis : Postpartum hypopituitarism (Sheehan's syndrome). severe. Partially controlled by treatment.

Impairment : 50% impairment of the whole person.

Thyroid

Criteria for Evaluating Permanent Impairment of the Thyroid

Hypothyroidism

Class I : Impairment of Whole person - upto 25% : A patient belongs in Class I when (a) continuous thyroid therapy is required for correction of the thyroid insufficiency, or maintenance of normal thyroid anatomy, AND (b) there is no objective physical or laboratory evidence of inadequate replacement therapy.

Class II : Impairment of Whole person - 26% - 50% : A patient belongs in class 2 when (a) symptoms and signs of thyroid disease are present or there is anatomic loss or alteration AND (b) continuous thyroid therapy is required for correction of the confirmed thyroid insufficiency BUT (c) the presence of a disease process in another body system or systems permits only partial replacement of thyroid hormone.

Example : A 65 year old man has severe hypothyroidism with pronounced mental slowing loss of memory and apathy. He also has severe coronary sclerosis with angina pectoris, the latter being precipitated by walking 50ft. PBI is 0.5 ug% ; BMR is minus 25% Replacement with l-thyroxine in a dose larger than 0.05 mg per day causes definite aggravation of his angina even on repeated trials and careful dose advancement. Significant general debility from the hypothyroidism persists.

Diagnosis: Partially treated hypothyroidism.

Impairment : 50% impairment of the whole person due to hypothroidism. Appropriate value for cardiovscular impairment is 60%. Combining both values : 60% + (50/100) x (100-60) = 60% + 20% = 80% impairment of whole man.

Hyperthyroidism

Class I : Impairment of whole person - upto 25% : A patient belongs in Class 1 when hyperthyroidism is adequately controlled with medication.

Class II : Impairment of whole person - 26% to 50% : A patient belongs in Class 2 when hyperthyroidism is not controlled with medication.

Goitre

Class I : upto 25% - simple goitre
Class II : 26% to 50% - multinodular goitre
Class III : 51% to 75% - toxic nodular goitre

Parathyroids

Hyperparathyroidism is given an impairment value from 0% to 50% depending on the extent to which the patient's activities of daily living is affected. This value is to be combined with any other impairment value for e.g of the kidneys, bones.

Hypoparathyroidism

Classes of impairment due to Hypoparathyroidism

Class I : Impairment of Whole person - 0% - 25% : A patient belongs in class I when the parathyroids are functionally deficient, normal calcium levels are readily maitnained by replacement therapy and there are no symptoms.

Class II : Impairment of Whole person - 26% - 50% : A patient belongs in class 2 when the parathyroids are absent and the calcium level intermittently rises or falls from normal levels in spite of conscientious management by the patient and avaiable medical counsel. Symptoms may or may not be produced by the abnormal blood levels.

Example : A 35 year old man experienced tetany and laryngospasm several hours after a subtotal thyroidectomy. Serum calcium was 5.8 mg/100 ml Initial therapy with intravenous calcium and intramuscular parathyroid hormone was replaced by calcium gluconate in solution and calciferol (vitmin D) given orally. Twelve grams of former in divided doses and 6000 units of the latter were required daily to maintain a normal serum calcium. This therapy was continuous. Semimonthly determination of the serum calcium indicated little need for adjustment of dosage.

Diagnosis : Postoperative tetany, well controlled.

Impairment : 15% impairment of the whole person.

Example : A 37 year old man complained of weakness, leg and back aches and bone swellings. A mass in the neck was found, and roentgenograms revealed osteitis fibrosa cystica and nephrocalcinosis. A parathyroid carcinoma was removed. Postoperatively, the serum calcium was 12.8 mg/100 ml and rose to 18.5 mg/100 ml in four months. The weakness and leg pain are still present. Inoperable metastatic lesions are present in the chest and mediastinium. Despite radiation and supportive therapy, the symptoms and the hyperalcemia persist.

Diagnosis : Parathyroid carcinoma with functioning metastases.

Impairment : 100% impairment of the whole person (in all cases of occupationally caused malignancies, 100% impairment is given).

CHAPTER 12

VISUAL SYSTEM

The functions of the eye judged for assessing impairment are :

1. Central visual acuity
2. Visual fields.
3. Ocular Motility

To determine impairment of central visual acuity the patients distant and near visions are recorded and compared to a table which immediately provides percentage loss of central vision.

To determine loss of visual fields, the patients peripheral field is recorded on an ordinary visual field chart. The values obtained are compared with values provided in a standard table. Another table has been provided which equates loss of visual field to percentage loss.

The method to calculate extent of loss of visual fields in case of scotomas and enlargement of blind spot has also been provided.

To determine impairment of ocular motility, the results of separation of two images are plotted on a visual field chart. Percentage loss of ocular motility can be directly calculated from a figure provided.

After the percentage impairment of each of these functions has been calculated, the values are combined using the combing table. (Visual acuity and field are measured separately for each eye. For ocular motility, the value of the eye with greatest loss is considered) This value is now combined with that obtained for the other eye in a special manner to give impairment of visual system.

$$\frac{(3 \times \text{percent of impairment of better eye}) + \text{percent of Impairment of worse eye value}}{4} = \text{impairment of visual system}$$

A large table has been provided for this.

Using this value another table has to be referred to which provides values for percentage impairment of whole person. By this method, complete loss of vision in one eye, the other being normal leads to 24% impairment of whole person

Complete loss of vision in both eyes leads to 85% impairment of whole person. If ocular motility is impaired completely, i.e. there is complete loss of ability to perceive a single image (permanent diplopia), this condition is equivalent to loss of vision in one eye and impairment is 24% of whole person.

Criteria and Methods for Evaluation:

Central Visual Acuity - Illumination of the test chart should be at least 5 foot-candles (f.-c.), and the chart or reflecting surface should not be dirty or discolored from age. The test distances should be 20 ft. (6 m.) from distance and 14 in. (36 cm.) for near vision. Central vision should be measured and recorded for distance and near with and without correction. The use of contact lenses might further improve vision reduced by irregular astigmatism from corneal injury or disease.

The visual acuity notations for distance and near with corresponding percentages of loss of central vision which appear in table 1 are included solely to indicate the basic values used in developing table 2.

Simple addition of two percentages of loss corresponding to appropriate notations for distance and near does not provide the true percentage loss of central vision. In accordance with accepted principles, true loss of central vision is the mean of the two percentages (table 2).

Monocular aphakia is considered an additional visual handicap and, if present, is assigned a value of 50% decrease in the remaining corrected central vision (table 2).

To determine Loss of Central Vision in One Eye :

1. Measure and record central visual acuity for distance and near with and without corrective lenses.
2. Consult table 2 for corresponding loss of central vision depending on the presence of monocular aphakia.

Table 1 - Central Visual Acuity Notations
DISTANCE

Snellen		**Loss of central vision, %**
English	**Metric**	
20/16	6/5	0
20/20	6/6	0
20/25	6/7.5	5
20/32	6/10	10
20/40	6/12	15
20/50	6/15	25
20/64	6/20	35
20/80	6/24	40
20/100	6/30	50
20/125	6/38	60
20/160	6/48	70
20/200	6/60	80
20/300	6/90	85
20/400	6/120	90
20/800	6/240	95

NEAR

Snellen	Jaeger	Point	Loss of Central Vision, %
14/14	1-	3	0
14/18	2-	4	0
14/22	....	5	5
14/28	3	6	10
14/35	6	8	50
14/45	7-	9+	60
14/56	8	12	80
14/70	11	14	85
14/87	....	....	90
14/112	14	22	95
14/140	....	....	98

Table 2. - Loss of Central Vision

Snellen Rating for Distance	Snellen Rating for Near										
	14 14	14 18	14 22	14 28	14 35	14 45	14 56	14 70	14 87	14 112	14 140
20 16	0 50	0 50	3 52	5 53	25 63	30 65	40 70	43 72	45 73	48 74	49 75
20 20	0 50	0 50	3 52	5 53	25 63	30 65	40 70	43 72	45 73	48 74	49 75
20 25	3 52	3 52	5 53	8 54	28 64	33 67	43 72	45 73	48 74	50 75	52 76
20 32	5 53	5 53	8 54	10 55	30 65	35 68	45 73	48 74	50 75	53 77	54 77
20 40	8 54	8 54	10 55	13 57	33 67	38 69	48 74	50 75	53 77	55 78	57 79
20 50	13 57	13 57	15 58	18 59	38 69	43 72	53 77	55 78	58 79	60 80	62 81
20 64	18 59	18 59	20 60	23 62	43 72	48 74	58 79	60 80	63 82	65 83	67 84
20 80	20 60	20 60	23 62	25 63	45 73	50 75	60 80	63 82	65 83	68 74	69 85
20 100	25 63	25 63	28 64	30 65	50 75	55 78	65 83	68 84	70 85	73 87	74 87
20 125	30 65	30 65	33 67	35 68	55 78	60 80	70 85	73 87	75 88	78 89	79 90
20 160	35 68	35 68	38 69	40 70	60 80	65 83	75 89	78 89	80 90	83 91	84 92
20 200	40 70	40 70	43 72	45 73	65 83	70 85	80 90	83 91	85 93	88 94	89 95
20 300	43 72	43 72	45 73	48 74	68 84	73 87	83 91	85 93	88 94	90 95	92 96
20 400	45 73	45 73	48 74	50 75	70 82	75 88	85 93	88 94	90 95	93 97	94 97
20 800	48 74	48 74	50 75	53 77	73 87	78 89	88 94	90 95	93 97	95 98	97 99

Example - Without allowance for monocular aphakia : 14/56 for near and 20/200 for distance produces 80% loss of central vision. With allowance for monocular aphakia (applicable to corrected vision only): 14/56 for near and 20/200 for distance produces 90% loss of central vision.

Visual Fields - The extent of the visual field is determined by use of the usual perimetric methods with a white target which subtends a 0.5 degree angle (a 3 mm white disk at a distance of 330 mm.) under illumination of not less than 7 f.c. A 6/330 white disk should be used for aphakia. The test object is brought from the periphery to the seeing area. At least two peripheral fields should be obtained which agree within 15 degrees in each meridian. The reliability of the patient's responses should be noted. The result is plotted on an ordinary visual field chart on each of the eight 45-degree principal meridians.

The minimum normal extent of the visual field from the point of fixation is indicated in table 3.

These figures are somewhat less than the average normal, thus allowing for poor or delayed subjective responses or unusual prominence of brow or nose.

Table 3 - Minimal Normal Extent of Visual Field from Point of Fixation

		Degrees
Temporally	.....	85
Down temporally	.....	85
Down	.....	65
Down nasally	.....	50
Nasally	.....	60
Up nasally	.....	55
Up	.....	45
Up temporally	.....	55
Total	.....	500

The percentage of retained visual field in one eye is obtained by adding the number of degrees of the eight principal meridians given in table 3 for the 3/300 white isopter, which normally is 500 degrees, and dividing by five. Conversely, the percentage loss of visual field is obtained by adding the degrees lost (as measured from the norms in table 3) in each of the eight principal meridians and dividing the total by five. Where there is a loss of a quadrant or a half field, it is necessary to add the total of the loss in each meridian to half the sum of the two boundary meridians. Visual field loss can be calculated for other defects in a similar manner.

Although the extend of visual field loss cannot be determined accurately for scotomas, an approximation can be obtained by subtracting the width of the scotoma from the peripheral visual field value at those same meridians. A similar estimation of visual field loss can be applied to enlargement of the blind spot with use of a 2 mm. test object at a distance of 1 m. from a tangent screen with the patient wearing his corrective lenses. For example, a general enlargement of the blind spot of 5 degrees would result in a visual field loss of 8x5/5=8% loss. Because a central scotoma directly affects the central visual acuity, which is first evaluated, such visual field loss is not again used in the final calculation of visual loss.

To determine Loss of Visual Field :

1. Plot the extent of visual fields in each of the eight 45- degree meridians on an ordinary visual field chart.

2. (a) Determine the degrees lost by adding the degrees of visual field lost in each of the principal meridians (table 3). Example : A concentric contraction to 30 degrees.

Loss		Degrees
Temporally	.....	55
Down temporally	.....	55
Down	.....	35
Down nasally	.....	20
Nasally	.....	30
Up nasally	.....	25
Up	.....	15
Up temporally	.....	25
Total loss	.....	260

Table 4 - Loss of Visual Field

Total Degrees			Total Degrees			Total Degrees		
Lost	Retai-ned	Loss	Lost	Retai-ned	Loss	Lost	Retai-ned	Loss
0	500*	0	170	330	34	340	160	68
5	495	1	175	325	35	345	155	69
10	490	2	180	320	36	350	150	70
15	485	3	185	315	37	355	145	71
20	480	4	190	310	38	360	140	72
25	475	5	195	305	39	365	135	73
30	470	6	200	300	40	370	130	74
35	465	7	205	295	41	375	125	75
40	460	8	210	290	42	380	120	76
45	455	9	215	285	43	385	115	77
50	450	10	220	280	44	390	110	78
55	445	11	225	275	45	395	105	79
60	440	12	230	270	46	400	100	80
65	435	13	235	265	47	405	95	81
70	430	14	240	260	48	410	90	82
75	425	15	245	255	49	415	85	83
80	420	16	250	250	50	420	80	84
85	415	17	255	245	51	425	75	85
90	410	18	260	240	52	430	70	86
95	405	19	265	235	53	435	65	87
100	400	20	270	230	54	440	60	88
105	395	21	275	225	55	445	55	89
110	390	22	280	220	56	450	50	90
115	385	23	285	215	57	455	45	91
120	380	24	290	210	58	460	40	92
125	375	25	295	205	59	465	35	93
130	370	26	300	200	60	470	30	94
135	365	27	305	195	61	475	25	95
140	360	28	310	190	62	480	20	96
145	355	29	315	185	63	485	15	97
150	350	30	320	180	64	490	10	98
155	345	31	325	175	65	495	5	99
160	340	32	330	170	66	500	0	100
165	335	33	335	165	67			

* *Or More*

(b) If a half field is lost, add the degrees lost to half the sum of the two boundary meridians.

Example : Entire temporal field lost.

Loss		Degrees
Up temporally	.....	85
Temporally	.....	85
Down temporally	.....	55
Av. of up and down	.....	55
Total loss	.....	280

3. Consult table 4 to ascertain corresponding percentage loss of visual field.

Example : Total loss of 260 degrees = 52% loss of visual field.

Ocular Motility : Unless diplopia is present within 30 degrees of the center of fixation, it rarely causes significant visual loss except on looking downward. The extent of the diplopia in the various directions of gaze is determined on the perimeter at 330 mm. or on any tangent screen at a distance of 1 m. from the patient in each of the 45 degree meridians, with use of a small test light and without the addition of colored lenses or correcting prisms.

To determine Loss of Ocular Motility in one eye :

1. Plot the results of the separation of two images on a visual field chart.
2. Add the corresponding percentage loss of ocular motility caused by diplopia in various positions of gaze.

Example : Diplopia within the central 20 degrees = 100% loss of ocular motility.

Example : Diplopia on looking to the side from

20 to 30 degrees	=	20% loss of ocular motility
30 to 40 degrees	=	10% loss of ocular motility
		—30% loss of ocular motility

To determine impairment of the visual system :

1. Calculate separately and record for each eye.

a) percentage loss of central vision (CV)
b) percentage loss of visual field (VF)
c) percentage loss of ocular motility (OM)

2. Using combined values table, combine percentage loss of central vision with percentage loss of visual field in each eye separately. Record these values.

Example -

Right eye -		
loss of central vision	.....	56%
loss of visual field	.....	32%
(56 combined with 32 = 70)		70%
Left eye -		
loss of central vision	.....	46%
loss of visual field	.....	32%
(42 combined with 32 = 63)		63%

3. Again using the combined values table, combine percentage loss of ocular motility in eye with greatest loss with combined value for central vision and visual field in that eye.

Disregard loss of ocular motility in other eye.

Example - Right eye -

combined value of CV and VF	.....	70%
loss of ocular motility	.....	25%
(70 combined with 25 = 78)		78%

4. Consult table of combining formula to ascertain impairment of the visual system.

Example -

Impairment of right (worse) eye	.....	78%
Impairment of left (better) eye	.....	63%
Impairment of visual system		67%

Example -

Impairment of right (worse) eye	.....	90-100%
Impairment of left (better) eye	.....	0%
Impairment of visual system		25%

Note : Binocular aphakia is considered an additional visual handicap of 25% if evaluation has been based on corrected central vision. If, however, uncorrected central vision has been used in evaluation, allowance for aphakia has already been made.

5. Consult table 5 to ascertain impairment of whole man contributed by impairment of visual system.

Example :67% impairment of visual system = 63% impairment of whole man.

Table 5 - The Visual System

Impairment of Visual system, %	Impairment of Whole person, %	Impairment of Visual system, %	Impairment of Whole person, %	Impairment of Visual system, %	Impairment of Whole person, %
0	0	30	28	60	57
1	1	31	29	61	58
2	2	32	30	62	59
3	3	33	31	63	59
4	4	34	32	64	60
5	5	35	33	65	61
6	6	36	34	66	62
7	7	37	35	67	63
8	8	38	36	68	64
9	9	39	37	69	65
10	9	40	38	70	66
11	10	41	39	71	67
12	11	42	40	72	68
13	12	43	41	73	69
14	13	44	42	74	70
15	14	45	42	75	71
16	15	46	43	76	72
17	16	47	44	77	73
18	17	48	45	78	74
19	18	49	46	79	75
20	19	50	47	80	76
21	20	51	48	81	76
22	21	52	49	82	77
23	22	53	50	83	78
24	23	54	51	84	79
25	24	55	52	85	80
26	25	56	53	86	81
27	25	57	54	87	82
28	26	58	55	88	83
29	27	59	56	89	84
				90-100	85

The following is a list of occular conditions for which separate impairment values have been recommended. These may be combined with the values arrived at through the previous tables if the condition so demands.

1. Total loss of Binocular vision : 25%
2. Total loss of Colour perception : 5%
3. Total loss of light and dark adaptation : 5%
4. Accomodation (a) if unilateral and other eye is normal : 15%
   (b) if bilateral or if patient is already presbyopic and the difference between both eyes is > 1.5 D ——— 15%
   if < 1.5 D ——— 15%
5. Metamorphopsia : Total loss : 5%
6. Entropion : 10%
7. Ectropion : 5-10%
8. Epiphora : 10%
9. Lagophthalmos : 5%

CHAPTER 13

EAR, NOSE, THROAT AND RELATED STRUCTURES

1) Hearing :

BRIEF CLINICAL DETAILS

Occupational deafness always affects both ears . In the very early stage only the frequencies around 3,000 and 4,000 Hz are affected. This is the C5 dip. With time, freqencies on either side of 3,000 and 4,000 also get affected.

Early damage takes place in the outer hair cells. This leads to sensory hearing loss confirmed by presence of recruitment at this stage. As the damage progresses the inner hair cells also become involved,and then the supporting cells become damaged. Finally,nerve fibres are affected.

CALCULATION OF HEARING IMPAIRMENT

a) Guide to evaluation of impairment (in hearing)

- Pure tone audiometer is used.
- Simple average of hearing levels at the five frequencies 500, 1,000, 2,000, 3,000 and 4000 C.P.S. is used.
- Impairment is calculated on the basis that hearing impairment at these frequencies begins at 25dbs (lower fence) for each decibel loss above this 1.5% impairment is awarded upto a maximum of 100% (this is reached at 81.7 dbs impairment)
- After this, Binaural hearing impaitment is computed by the formula

$$\frac{(5\text{x percent of impairment of better ear}) + \text{percent of impairment of worse ear}}{6}$$

- The resulting percentage directly gives impairment of whole man.

Example

Mild Hearing Loss

	500 Hz	1,000 Hz	2,000 Hz	3,000 Hz	4000 Hz
Right ear	15	25	45	55	35
Left ear	20	30	50	60	40

1. R Ear $\quad \frac{15+25+45+55+35}{5} = \frac{175}{5} = 35\text{-dB Average}$

2. L Ear $\quad \frac{20+30+50+60+40}{5} = \frac{200}{5} = 40\text{-dB Average}$

Monaural Impairment

3. R Ear	35 - 25 = 10 dB X 1.5% = 15%
4. L Ear	40 - 25 = 15 dB X 1.5% = 22.5%
5. Better ear	15 X 5 =75
6. Poorer ear	22.5% X 1 = 22.5
Total	97.5 / 6 = 16.25% = 20%

PROFILE

Patient Bandu Shankar, a textile worker came to the clinic of the occupational health and safety centre with history of hearing loss noticed first in left ear and later in right ear. There is no history of highgrade fever suggestive of viral infection, or trauma or use of ototoxic drugs taken systemically or topically.

On examination: Ear - Bilaterally tympanic membrane intact and no evidence of infection and nose and throat are normal.

Audiogram shows bilateral severe sensorineural loss

	Hz 500	Hz 1000	Hz 2000	Hz 3000	Hz 4000
(Rt ear) db	75	75	70	70	80
(Lt ear) db	85	100	100	100	100

Diagnosis : Occupational loss of hearing with disability 70%.

2. Equilibrium

Class I - Impairment of Whole person - upto 25% : A paitent belongs in class 1 when (a) signs of peripheral vertigo are present and/or (b) the usual activities of daily living can be performed without assistance EXCEPT such activities involving personal and public safety as operating a motor vehicle or riding a bicyle.

Class II -Impairment of Whole person - 26% to 50% : A patient belongs in Class 2 when (a) signs of peripheral vertigo are present, and (b) the usual activities of daily living can NOT be performed without assistance EXCEPT such simple activites as self care, household duties, walking on the street, and riding in a motor vehicle operated by another person.

Class III - Impairment of Whole person - 51% to 75% : A patient belongs in Class 3 when (a) signs of peripheral vertigo are present and (b) the usual activities of daily living can NOT be performed without assistance EXCEPT self care.

Class IV - Impairment of Whole person - 76% to 100% : A patient belongs in Class 4 when (a) signs of peripheral vertigo are present, and (b) the usual activities of daily living can NOT be performed without assistance EXCEPT self care, and (c) confinement to the home or premises is necessary.

3. Respiration

The defects in air passages i.e. nares, nasal cavities, mouth, pharynx, larynx, trachea and bronchi can lead to impairment of respiration.

Occupationally caused air passage defects include ulceration of the nasal septum caused by chrome, bronchitis caused by metallic dusts, maxillary sinus carcinomas known to be more prevalent among carpenters and workers handling nickel, laryngeal carcinomas in workers exposed to asbestos etc. It may also be caused by surgery for any of these conditions.

CLASSES OF AIR PASSAGE DEFECTS

Class I : (upto 25% impairment of whole person) a) A recognised air passage defect exists b) Dyspnea does NOT occur at rest c) Dyspnea is NOT produced by walking or climbing stairs freely, performance of other usual activities of daily living, stress, prolonged exercise requiring intensive effort or similiar activity. d) Examination reveals ONE or more of the following : partial obstruction of oropharynx, laryngopharynx, larynx, upper trachea (to 4th ring) lower trachea, bronchi, paranasal sinuses : or complete obstruction of the nose, (bilateral) or nasopharynx.

Class II : (26% to 50% impairment of whole person) a) A recognised air passage defect exists b) Dyspnea does NOT occur at rest c) Dyspnea is NOT produced by walking freely on the level, climbing atleast one flight of ordinary stairs or performance of other usual activities of daily living. Dyspnea is produced by stress, prolonged exertion, hurrying, hill climbing, recreation except sedentary forms or similar activity d) Examination reveals ONE or more of the following : partial obstruction of oropharynx, laryngopharynx, larynx, upper trachea (to 4th ring) lower trachea bronchi, paranasal sinuses : or complete obstruction of the nose, (bilateral) or nasopharynx.

Class III : (51% - 75% impairment of whole person) a) A recognised air passage defect exists b) Dyspnea does NOT occur at rest c) Dyspnea is produced by walking more than 100 meters on the level or climbing one flight of ordinary stairs even with periods of rest ; performance of other usual activities of daily living stress, prolonged exertion, hurrying, hill climbing, recreation or similar activity d) Examination reveals ONE or more of the following : partial obstruction of oropharynx, laryngopharynx, larynx, upper trachea (to 4th ring) lower trachea or bronchi.

Class IV : (70-90% impairment of whole person) a) A recognised air passage defect exists b) Dyspnea occurs at rest, although patient is not necessarily bed ridden. c) Dyspnea is aggravated by the performance of any of the usual activities of daily living beyond personal cleansing, dressing, grooming or its equivalent. d) Examination reveals ONE or more of the following : partial obstruction of oropharynx, paranasal sinuses, laryngopharynx, larynx, upper trachea (to 4th ring), lower trachea or bronchi.

Note : Prophylactic restriction of activity such as strenuous completitive sport does not exclude patient from Class

1. Patient with successful permanent tracheostomy or stoma, should be rated at 50% impairment of the whole man since it falls in class
2. Also disability due to speech impairment would have to be combined.
3. Mastication and Deglutition

Interference with these functions usually results in dietary restrictions and these dietary restrictions are the criteria used to evaluate impairment

Such interference with mastication and deglutition may occur in cases in which surgery has been performed for cancers of oropharyns/nasopharynx/larynx (due to exposure to carcinogens at work) or for gastrointestinal ailments (occupation related)

These criteria are:

Impairment of whole person

A. The diet is limited to semi solid or soft foods 10% - 15%
B. The diet is limited to liquid foods 20% - 30%
C. Ingestion of food requires tube feeding or gastrostomy 40% - 60%

5. Olfaction and Taste

Partial loss of olfaction and taste sensation may be given upto 49% disability. Total loss of olfaction and taste sensation may be given 50% disability.

6. Speech

Patient may be requested to read out an appropriate paragraph. If illiterate, the assessment would have to be based on a lenghty conversation alone.

SPEECH CLASSIFICATION CHART

Audibility

Class I 0 - 20% Can produce speech of intensity sufficient for MOST of the needs of everyday speech communication, although this sometimes may require effort and occasionally may be beyond his capacity

Class II 21 - 40% Can produce speech of intensity sufficient for MANY of the needs of everyday speech communication. Is usually heard under average conditions however, may have difficulty in automobiles, buses, trains, stations, restaurants etc.

Class III 41 - 60% Can produce speech intensity sufficient for SOME of the needs of everyday speech communication, such as close conversation; however, has considerable difficulty in such noisy places as listed in II above; the voice tires rapidly and tends to become inaudible after few seconds

Class IV 61 - 80% Can produce speech of intensity sufficient for a FEW of the needs of everyday speech communication; can barely be heard by a close listener or over the telephone: perhaps may be able to whisper audibly, but has no voice.

Class V 81 - 100% Can produce speech of intensity sufficient for NONE of the needs of everyday speech communication

Intelligibility

Class I 0 - 20% Can perform MOST of the articulatory acts necessary for everyday speech communications, although listeners occasionally ask him to repeat and he may find it difficult or even impossible to produce a few phonetic units

Class II 21 - 40% Can perform MANY of the necessary articulatory acts for everyday speech communications. Can speak name, address etc., and be understood by a stranger but may numerous inaccuracies: sometimes appears to have difficulty articulating

Class III 41 - 60% Can perform SOME of the necessary articulatory acts for everyday speech communication; can usually converse with family and friends; however, strangers may find it difficult to understand him; may often be asked to repeat

Class IV 61 - 80% Can perform a FEW of the necessary articulatory acts for everyday speech communication; can produce some phonetic units, may have approximations for a few words such as names fo own family; however, unintelligible out of context

Class V 81 - 100% Can perform NONE of the articulartory acts necessary for everyday speech communications

Functional Efficiency

Class I 0 - 20% Can meet MOST of the demands of articulation and phonation for everyday speech compensation with adequate speed and ease though occasionally has to hesitate or speak slowly

Class II 21 - 40% Can meet MANY of the demands of articulation and phonation for everyday speech communication with adequate speed and ease but sometimes gives the impression of difficulty and speech may sometimes be discontinuous, interrupted, hesistant or slow

Class III 41 - 60% Can meet SOME of the demands of articulation and phonation for everyday speech communications with adequate speed and ease but often can. only sustain communicative speech for brief periods and gives the impression of being rapidly fatigued

Class IV 61 - 80% Can meet a FEW of the demands of articulation and phonation for everyday speech to communication with adequate speed and ease such as single words or short phrases, but cannot maintain speech, interrupted speech flow. appears labored, rate is impractically slow

Class V 81 - 100% Can meet NONE of the demands of articulation and phonation for everyday speech communication with adequate speed and ease

The degree of impairment of the speech function is equivalent to the greatest percentage of impairment as recorded in any ONE of the 3 columns of the classification chart.

Example : The speech capacity of patient is judged to be:

Audibility Class I-20% Intellligibility Class III-50% Functional Efficiency Class II-30% The speech impairment would be 50%

Assesment proforma for lower-extremity

Diagnosis

OPD No **Dept.**

Name **Age** **Sex**

Address

Mobility Component(Total value 90%)

	Joint	Component	Normal value (degrees)	Rt. side	Lt. side	Loss of % Rt. side	Loss of % Lt. side	Combined % loss a+b[(100-a)]/100 Rt	Lt	Combined value of % loss *0.30 Rt.	Lt	Combuning Value Rt.	Lt	% summary value for mobility compone-nt a+[b(90-a)]/90
ROM STRENGTH	Hip	1 Flexion-extension are 2 Rotation are 3 Abduction -Abduction are	0-140° 0-90° 0.90°											
	Knee	1 Flexion -Extension are	0-125°											
	Ankle & Foot	1.Dorsiflexion-Plantarflexion are 2.Inversion -Eversion are	0-70° 0-60°											
	Hip	1.Flexor Muscles 2.Extensor Muscles 3.External rotators 4.Internal rotators 5.Abductor Muscles 6.Abductor Muscles												
	Knee	1.Flexor Muscles 2.Extensor Muscles												
	Ankle & Foot	1.Dorsiflexor Muscles 2.Plantarflexor Muscles 3.Invertor Muscles 4.Evertor Muscles												

STABILITY COMPONENT (Total value 90%)

1. *Based on* SCALE METHOD

ITEM	1	2	Readings (Kgs) 3	Average W	Difference in body wt. D	D/Wx90
SCALE A (W1)						
SCALE B (W2)						
Total Body Wt. (W1+W2)						

2. *Based on* CLINICAL METHOD

- Walking on plain surface (10%) .....
- Walking on slope (10%) .....
- Climbing stairs (10%) .....
- Standing on both legs (10%) .....
- Standing on affected leg (10%) .....
- Squatting on floor (10%) .....
- Sitting cross-legged (10%) .....
- Kneeling (10%) .....
- Taking turns (10%) .....

TOTAL (90%) .....

Refer to literature for additional percentage for complications such as infection, deformity, etc.

Assesment proforma for upper-extremity

Diagnosis

OPD No **dept**

Name **Age** **Sex**

Address

Arm Component(Total value 90%)

	Arm Component	Component	Normal value (degrees)	Rt. side	Lt. side	Loss of % Rt. side	Loss of % Lt. side	Mean % loss Rt	Mean % loss Lt	Sum of % loss *0.30 Rt.	Sum of % loss *0.30 Lt.	Combining Value Rt.	Combining Value Lt.	% summary value for mobility compone-nt a+[b(90-a)]/90
ROM STRENGTH	Sjoulder	1.Flexion-extension are 2.Rotation are 3.Abduction -Abduction are	0-220° 0-180° 0.180°											
	Elbow	1.Flexion -Extension are 2.Supination-Pronation are	0-150° 0-180°											
	Wrist	1.Dorsiflexion-Palmararflexion are 2.Radial-Ulnar deviation are	0-160° 0-55°											
	Shoulder	1.Flexion 2.Extension 3.Rotation 4.External rotation 5.Internal rotation 6.Abduction 7.adduction												
	Elbow	1.Flexion 2.Extension 3.Pronation 4.Supination												
	Wrist	1.Dorsiflexion 2.Palmarflexion 3.Radial deviation 4.Ulnar deviation												

COOR DINATION	1. Lifting overhead objects remove and placing at same place	9%								
	2. Touching nose with end of extremities	9%								
	3. Eating Indian style	9%								
	4. Combing and plaiting	9%								
	5. Puting on a shirt/kurta	9%								
	6. Ablutions Indian Style	9%								
	7. Drinking glass of water	9%								
	8. Buttoning	9%								
	9. Tie nara / dhoti	9%								
	10. Writing	9%								

HAND COMPONENT (TOTAL VALUE 90%)

	1.Hand Component	Movement	Normal value								
PREHENSION	Opposition (8%)	1.Index 2.Middle 3.Ring 4.Little	2% 2% 2% 2%								
	B.Lateral pinch(5%)	Key holding	5%								
	C.Cylindricl grasp(6%)	a.Large Object (4") b.Small Object (1")	3% 3%								
	D.Spherical Grasp(6%)	a.Large Object (4") b.Small Object (1")	3% 3%								
	E.Hook grasp(5%)	Lifting bag	5%								
	2.Sensation 30%	1.Radial side 2.Ulnar side 3.Radial side 4.Ulnar side	4.8% 1.2% 1.2% 1.2%								
	3.Strength 30%	1.grip strength 2.Pinch strength	20% 10%								

Summary value is calculated fromarm and hand component values. Add 4% for dominant extremity. 10% additional weightage to be given in infection deformity, malalignment, contracture, etc.

Tables

Combined values of [A + B (90-A)/90] - Part 1-a(i)

A↓ B→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	24	25	26
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	17	18	19	20	21	22	23	24	25	26	27
4	5	6	7	8	9	10	11	12	13	14	15	15	16	17	18	19	20	21	22	23	24	25	26	27	28
5	6	7	8	9	10	11	12	13	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
6	7	8	9	10	11	12	13	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	27	28	29
7	8	9	10	11	12	13	13	14	15	16	17	18	19	20	21	22	23	24	25	25	26	27	28	29	30
8	9	10	11	12	13	13	14	15	16	17	18	19	20	21	22	23	23	24	25	26	27	28	29	30	31
9	10	11	12	13	13	14	15	16	17	18	19	20	21	22	22	23	24	25	26	27	28	29	30	31	31
10	11	12	13	14	14	15	16	17	18	19	20	21	22	22	23	24	25	26	27	28	29	30	30	31	32
11	12	13	14	15	15	16	17	18	19	20	21	22	22	23	24	25	26	27	28	29	29	30	31	32	33
12	13	14	15	15	16	17	18	19	20	21	22	22	23	24	25	26	27	28	28	29	30	31	32	33	34
13	14	15	16	16	17	18	19	20	21	22	22	23	24	25	26	27	28	28	29	30	31	32	33	34	34
14	15	16	17	17	18	19	20	21	22	22	23	24	25	26	27	28	28	29	30	31	32	33	33	34	35
15	16	17	17	18	19	20	21	22	22	23	24	25	26	27	27	28	29	30	31	32	32	33	34	35	36
16	17	18	18	19	20	21	22	23	23	24	25	26	27	28	28	29	30	31	32	32	33	34	35	36	37
17	18	19	19	20	21	22	23	23	24	25	26	27	28	28	29	30	31	32	32	33	34	35	36	36	37
18	19	20	20	21	22	23	24	24	25	26	27	28	28	29	30	31	32	32	33	34	35	36	36	37	38
19	20	21	21	22	23	24	25	25	26	27	28	28	29	30	31	32	32	33	34	35	36	36	37	38	39
20	21	22	22	23	24	25	25	26	27	28	29	29	30	31	32	32	33	34	35	36	36	37	38	39	39
21	22	23	23	24	25	26	26	27	28	29	29	30	31	32	32	33	34	35	36	36	37	38	39	39	40
22	23	24	24	25	26	27	27	28	29	30	30	31	32	33	33	34	35	36	36	37	38	39	39	40	41
23	24	24	25	26	27	27	28	29	30	30	31	32	33	33	34	35	36	36	37	38	39	39	40	41	42
24	25	25	26	27	28	28	29	30	31	31	32	33	34	34	35	36	36	37	38	39	39	40	41	42	42
25	26	26	27	28	29	29	30	31	31	32	33	34	34	35	36	37	37	38	39	39	40	41	42	42	43
26	27	27	28	29	30	30	31	32	32	33	34	35	35	36	37	37	38	39	40	40	41	42	42	43	44
27	28	28	29	30	30	31	32	33	33	34	35	35	36	37	37	38	39	40	40	41	42	42	43	44	44
28	29	29	30	31	31	32	33	34	34	35	36	36	37	38	38	39	40	40	41	42	42	43	44	45	45
29	30	30	31	32	32	33	34	34	35	36	36	37	38	38	39	40	41	41	42	43	43	44	45	45	46
30	31	31	32	33	33	34	35	35	36	37	37	38	39	39	40	41	41	42	43	43	44	45	45	46	47

Combined values of [A + B (90-A)/90] - Part 1-a(ii)

A↓ B→	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	45	46	47	48	49	50
1	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
2	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	46	47	48	49	50	51
3	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
4	29	30	31	32	33	34	35	36	36	37	38	39	40	41	42	43	44	45	46	47	47	48	49	50	51	52
5	30	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	47	48	49	50	51	52	53
6	30	31	32	33	34	35	36	37	38	39	40	41	41	42	43	44	45	46	47	48	48	49	50	51	52	53
7	31	32	33	34	35	36	37	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	54
8	32	33	34	34	35	36	37	38	39	40	41	42	43	44	44	45	46	47	48	49	49	50	51	52	53	54
9	32	33	34	35	36	37	38	39	40	40	41	42	43	44	45	46	46	47	48	49	50	51	52	53	54	54
10	33	34	35	36	37	38	38	39	40	41	42	43	43	44	45	46	47	48	49	50	50	51	52	53	54	55
11	34	35	36	36	37	38	39	40	41	42	43	43	44	45	46	47	48	48	49	50	51	52	53	54	54	55
12	35	35	36	37	38	39	40	41	41	42	43	44	45	46	47	48	48	49	50	51	51	52	53	54	55	56
13	35	36	37	38	39	40	40	41	42	43	44	45	46	46	47	48	49	49	50	51	52	53	54	55	55	56
14	36	37	38	38	39	40	41	42	43	44	44	45	46	47	48	49	49	50	51	52	52	53	54	55	56	57
15	37	37	38	39	40	41	42	42	43	44	45	46	47	47	48	49	50	51	52	52	53	54	55	55	56	57
16	37	38	39	40	41	41	42	43	44	45	46	46	47	48	49	50	51	51	52	53	53	54	55	56	57	58
17	38	39	40	41	41	42	43	44	45	45	46	47	48	49	49	50	51	52	53	53	54	55	56	56	57	58
18	39	40	40	41	42	43	44	44	45	46	47	48	48	49	50	51	52	52	53	54	54	55	56	57	58	58
19	40	40	41	42	43	43	44	45	46	46	47	47	48	49	50	51	51	52	53	53	54	55	56	57	57	58
20	40	41	42	43	43	44	45	46	46	47	48	49	49	50	50	51	52	53	53	54	55	55	56	57	58	59
21	41	42	42	43	44	45	46	46	47	48	49	49	50	51	51	52	52	53	54	55	55	56	57	58	59	59
22	42	42	43	44	45	45	46	47	48	48	49	50	51	51	52	53	54	54	55	56	56	57	58	58	59	60
23	42	43	44	45	45	46	47	48	48	49	50	51	51	52	53	54	54	55	56	56	57	58	58	59	59	60
24	43	44	45	45	46	47	47	48	49	50	50	51	52	53	53	54	55	55	56	57	57	58	59	60	60	61
25	44	44	45	46	47	47	48	49	50	50	51	52	52	53	54	55	55	56	57	57	58	59	59	60	61	62
26	44	45	46	47	47	48	49	49	50	51	52	52	53	54	54	55	56	56	57	58	58	59	60	61	61	62
27	45	46	47	47	48	49	49	50	51	51	52	53	54	54	55	56	56	57	58	58	59	60	60	61	62	62
28	46	47	47	48	49	49	50	51	51	52	53	53	54	55	55	56	57	57	58	59	59	60	61	62	62	63
29	47	47	48	49	49	50	51	51	52	53	53	54	55	55	56	57	57	58	59	59	60	61	61	62	63	63
30	47	48	49	49	50	51	51	52	53	53	54	55	55	56	57	57	58	59	59	60	61	61	62	63	63	

Combined values of [A + B (90-A)/90] - Part 1-a(iii)

A↓ B→	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
1	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
2	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	68	69	70	71	72	73	74	75
3	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	75
4	53	54	55	56	57	58	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
5	53	54	55	56	57	58	59	60	61	62	63	64	64	65	66	67	68	69	70	71	72	73	74	75	76
6	54	55	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	69	70	71	72	73	74	75	76
7	54	55	56	57	58	59	60	60	61	62	63	64	65	66	67	68	69	70	71	72	72	73	74	75	76
8	54	55	56	57	58	59	60	61	62	63	64	64	65	66	67	68	69	70	71	72	73	74	75	75	76
9	55	56	57	58	58	59	60	61	62	63	64	65	66	67	67	68	69	70	71	72	73	74	75	76	76
10	55	56	57	58	59	60	61	62	62	63	64	65	66	67	68	69	70	70	71	72	73	74	75	76	77
11	56	57	58	58	59	60	61	62	63	64	65	65	66	67	68	69	70	71	72	72	73	74	75	76	77
12	56	57	58	59	60	61	61	62	63	64	65	66	67	67	68	69	70	71	72	73	74	74	75	76	77
13	57	57	58	59	60	61	62	63	63	64	65	66	67	68	69	69	70	71	72	73	74	75	75	76	77
14	57	58	59	60	60	61	62	63	64	65	66	66	67	68	69	70	71	71	72	73	74	75	76	76	77
15	57	58	59	60	61	62	62	63	64	65	66	67	67	68	69	70	71	72	72	73	74	75	76	77	77
16	58	59	60	60	61	62	63	64	65	65	66	67	68	69	69	70	71	72	73	74	74	75	76	77	78
17	58	59	60	61	62	62	63	64	65	66	66	67	68	69	70	71	71	72	73	74	75	75	76	77	78
18	59	60	60	61	62	63	64	64	65	66	67	68	68	69	70	71	72	72	73	74	75	76	76	77	78
19	59	60	61	62	62	63	64	65	66	66	67	68	69	69	70	71	72	73	73	74	75	76	77	77	78
20	60	60	61	62	63	64	64	65	66	67	67	68	69	70	71	71	72	73	74	74	75	76	77	78	78
21	60	61	62	62	63	64	65	65	66	67	68	69	69	70	71	72	72	73	74	75	75	76	77	78	78
22	61	61	62	63	64	64	65	66	67	67	68	69	70	70	71	72	73	73	74	75	76	76	77	78	79
23	61	62	62	63	64	65	65	66	67	68	68	69	70	71	71	72	73	74	74	75	76	77	77	78	79
24	61	62	63	64	64	65	66	67	67	68	69	69	70	71	72	72	73	74	75	75	76	77	78	78	79
25	62	63	63	64	65	65	66	67	68	68	69	70	70	71	72	73	73	74	75	76	76	77	78	78	79
26	62	63	64	64	65	66	67	67	68	69	69	70	71	72	72	73	74	74	75	76	76	77	78	79	79
27	63	63	64	65	65	66	67	68	68	69	70	70	71	72	72	73	74	75	75	76	77	77	78	79	79
28	63	64	65	65	66	67	67	68	69	69	70	71	71	72	73	73	74	75	76	76	77	78	78	79	80
29	64	64	65	66	66	67	68	68	69	70	70	71	72	72	73	74	74	75	76	76	77	78	78	79	80
30	64	65	65	66	67	67	68	69	69	70	71	71	72	73	73	74	75	75	76	77	77	78	79	79	80

Combined values of [A + B (90-A)/90] - Part 1-a(iv)

A↓ B→	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
1	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
2	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
3	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
4	77	78	79	79	80	81	82	83	84	85	86	87	88	89	90
5	77	78	79	80	81	81	82	83	84	85	86	87	88	89	90
6	77	78	79	80	81	82	83	83	84	85	86	87	88	89	90
7	77	78	79	80	81	82	83	84	84	85	86	87	88	89	90
8	77	78	79	80	81	82	83	84	85	85	86	87	88	89	90
9	77	78	79	80	81	82	83	84	85	85	86	87	88	89	90
10	78	78	79	80	81	82	83	84	85	86	86	87	88	89	90
11	78	79	79	80	81	82	83	84	85	86	86	87	88	89	90
12	78	79	80	80	81	82	83	84	85	86	87	87	88	89	90
13	78	79	80	81	81	82	83	84	85	86	87	87	88	89	90
14	78	79	80	81	82	82	83	84	85	86	87	87	88	89	90
15	78	79	80	81	82	82	83	84	85	86	87	87	88	89	90
16	78	79	80	81	82	83	83	84	85	86	87	88	88	89	90
17	79	79	80	81	82	83	84	84	85	86	87	88	88	89	90
18	79	80	80	81	82	83	84	84	85	86	87	88	88	89	90
19	79	80	81	81	82	83	84	84	85	86	87	88	88	89	90
20	79	80	81	81	82	83	84	85	85	86	87	88	88	89	90
21	79	80	81	82	82	83	84	85	85	86	87	88	88	89	90
22	79	80	81	82	82	83	84	85	85	86	87	88	88	89	90
23	80	80	81	82	83	83	84	85	86	86	87	88	89	89	90
24	80	80	81	82	83	83	84	85	86	86	87	88	89	89	90
25	80	81	81	82	83	83	84	85	86	86	87	88	89	89	90
26	80	81	81	82	83	84	84	85	86	86	87	88	89	89	90
27	80	81	82	82	83	84	84	85	86	86	87	88	89	89	90
28	80	81	82	82	83	84	84	85	86	87	87	88	89	89	90
29	81	81	82	83	83	84	85	85	86	87	87	88	89	89	90
30	81	81	82	83	83	84	85	85	86	87	87	88	89	89	90

Combined values of [A + B (90-A)/90] - Part 1-b(i)

A↓ B→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
31	32	32	33	34	34	35	36	36	37	38	38	39	40	40	41	41	42	43	43	44	45	45	46	47	47
32	33	33	34	35	35	36	37	37	38	38	39	40	40	41	42	42	43	44	44	45	46	46	47	47	48
33	34	34	35	36	36	37	37	38	39	39	40	41	41	42	42	43	44	44	45	46	46	47	48	48	49
34	35	35	36	36	37	38	38	39	40	40	41	41	42	43	43	44	45	45	46	46	47	48	48	49	50
35	36	36	37	37	38	39	39	40	40	41	42	42	43	44	44	45	45	46	47	47	48	48	49	50	50
36	37	37	38	38	39	40	40	41	41	42	43	43	44	44	45	46	46	47	47	48	49	49	50	50	51
37	38	38	39	39	40	41	41	42	42	43	43	44	45	45	46	46	47	48	48	49	49	50	51	51	52
38	39	39	40	40	41	41	42	43	43	44	44	45	46	46	47	47	48	48	49	50	50	51	51	52	52
39	40	40	41	41	42	42	43	44	44	45	45	46	46	47	47	48	49	49	50	50	51	51	52	53	53
40	41	41	42	42	43	43	44	44	45	46	46	47	47	48	48	49	49	50	51	51	52	52	53	53	54
41	42	42	43	43	44	44	45	45	46	46	47	48	48	49	49	50	50	51	51	52	52	53	54	54	55
42	43	43	44	44	45	45	46	46	47	47	48	48	49	49	50	51	51	52	52	53	53	54	54	55	55
43	44	44	45	45	46	46	47	47	48	48	49	49	50	50	51	51	52	52	53	53	54	54	55	56	56
44	45	45	46	46	47	47	48	48	49	49	50	50	51	51	52	52	53	53	54	54	55	55	56	56	57
45	45	46	46	47	47	48	48	49	49	50	50	51	51	52	52	53	53	54	54	55	55	56	56	57	57
46	46	47	47	48	48	49	49	50	50	51	51	52	52	53	53	54	54	55	55	56	56	57	57	58	58
47	47	48	48	49	49	50	50	51	51	52	52	53	53	54	54	55	55	56	56	57	57	58	58	58	59
48	48	49	49	50	50	51	51	52	52	53	53	54	54	55	55	55	56	56	57	57	58	58	59	59	60
49	49	50	50	51	51	52	52	53	53	54	54	54	55	55	56	56	57	57	58	58	59	59	59	60	60
50	50	51	51	52	52	53	53	54	54	54	55	55	56	56	57	57	58	58	58	59	59	60	60	61	61
51	51	52	52	53	53	54	54	54	55	55	56	56	57	57	57	58	58	59	59	60	60	61	61	61	62
52	52	53	53	54	54	55	55	55	56	56	57	57	57	58	58	59	59	60	60	60	61	61	62	62	63
53	53	54	54	55	55	55	56	56	57	57	58	58	58	59	59	60	60	60	61	61	62	62	62	63	63
54	54	55	55	56	56	56	57	57	58	58	58	59	59	60	60	60	61	61	62	62	62	63	63	64	64
55	55	56	56	57	57	57	58	58	58	59	59	60	60	60	61	61	62	62	62	63	63	64	64	64	65
56	56	57	57	58	58	58	59	59	59	60	60	61	61	61	62	62	62	63	63	64	64	64	65	65	65
57	57	58	58	58	59	59	60	60	60	61	61	61	62	62	62	63	63	64	64	64	65	65	65	66	66
58	58	59	59	59	60	60	60	61	61	62	62	62	63	63	63	64	64	64	65	65	65	66	66	67	67
59	59	60	60	60	61	61	61	62	62	62	63	63	63	64	64	65	65	65	66	66	66	67	67	67	68
60	60	61	61	61	62	62	62	63	63	63	64	64	64	65	65	65	66	66	66	67	67	67	68	68	68

Combined values of [A + B (90-A)/90] - Part 1-b(ii)

A↓ B→	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
41	56	57	58	58	59	59	60	60	61	62	62	63	63	64	65	65	66	66	67	68	68	69	69	70	70
42	57	58	58	59	59	60	61	61	62	62	63	63	64	65	65	66	66	67	68	68	69	69	70	70	71
43	58	58	59	60	60	61	61	62	62	63	64	64	65	65	66	66	67	68	68	69	69	70	70	71	71
44	59	59	60	60	61	61	62	62	63	64	64	65	65	66	66	67	68	68	69	69	70	70	71	71	72
45	59	60	60	61	61	62	63	63	64	64	65	65	66	66	67	68	68	69	69	70	70	71	71	72	72
46	60	61	61	62	62	63	63	64	64	65	65	66	67	67	68	68	69	69	70	70	71	71	72	72	73
47	61	61	62	62	63	63	64	64	65	66	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73
48	62	62	63	63	64	64	65	65	66	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74
49	62	63	63	64	64	65	65	66	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74
50	63	63	64	64	65	65	66	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75
51	64	64	65	65	66	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75	75	75
52	64	65	65	66	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75	75	76	76
53	65	66	66	67	67	68	68	69	69	69	70	70	71	71	72	72	73	73	74	74	75	75	76	76	76
54	66	66	67	67	68	68	69	69	70	70	71	71	71	72	72	73	73	74	74	75	75	76	76	77	77
55	67	67	68	68	68	69	69	70	70	71	71	72	72	73	73	73	74	74	75	75	76	76	77	77	77
56	67	68	68	69	69	70	70	71	71	71	72	72	73	73	74	74	74	75	75	76	76	77	77	78	78
57	68	69	69	69	70	70	71	71	72	72	72	73	73	74	74	75	75	75	76	76	77	77	78	78	78
58	69	69	70	70	71	71	71	72	72	73	73	74	74	74	75	75	76	76	76	77	77	78	78	79	79
59	70	70	70	71	71	72	72	73	73	73	74	74	75	75	75	76	76	77	77	77	78	78	79	79	79
60	70	71	71	72	72	72	73	73	74	74	74	75	75	76	76	76	77	77	78	78	78	79	79	80	80
61	71	72	72	72	73	73	73	74	74	75	75	75	76	76	77	77	77	78	78	79	79	79	80	80	80
62	72	72	73	73	73	74	74	75	75	75	76	76	76	77	77	78	78	78	79	79	79	80	80	81	81
63	73	73	73	74	74	74	75	75	76	76	76	77	77	77	78	78	79	79	79	80	80	80	81	81	81
64	73	74	74	74	75	75	76	76	76	77	77	77	78	78	78	79	79	79	80	80	81	81	81	82	82
65	74	74	75	75	75	76	76	77	77	77	78	78	78	79	79	79	80	80	80	81	81	81	82	82	82
66	75	75	76	76	76	77	77	77	78	78	78	79	79	79	80	80	80	81	81	81	82	82	82	83	83
67	76	76	76	77	77	77	78	78	78	79	79	79	80	80	80	81	81	81	82	82	82	83	83	83	83
68	76	77	77	77	78	78	78	79	79	79	80	80	80	80	81	81	81	82	82	82	83	83	83	84	84
69	77	77	78	78	78	79	79	79	80	80	80	80	81	81	81	82	82	82	83	83	83	84	84	84	84
70	78	78	78	79	79	79	80	80	80	80	81	81	81	82	82	82	83	83	83	83	84	84	84	85	85
71	79	79	79	79	80	80	80	81	81	81	81	82	82	82	83	83	83	83	84	84	84	85	85	85	85
72	79	80	80	80	80	81	81	81	82	82	82	82	83	83	83	83	84	84	84	85	85	85	85	86	86
73	80	80	81	81	81	81	82	82	82	82	83	83	83	84	84	84	84	85	85	85	85	86	86	86	86
74	81	81	81	82	82	82	82	83	83	83	83	84	84	84	84	85	85	85	85	86	86	86	86	87	87
75	81	82	82	82	82	83	83	83	83	84	84	84	84	85	85	85	85	86	86	86	86	87	87	87	87
76	82	82	83	83	83	83	84	84	84	84	85	85	85	85	86	86	86	86	87	87	87	87	88	88	88
77	83	83	83	84	84	84	84	85	85	85	85	86	86	86	86	86	87	87	87	87	88	88	88	88	88
78	84	84	84	84	85	85	85	85	85	86	86	86	86	87	87	87	87	87	88	88	88	88	89	89	89
79	84	85	85	85	85	86	86	86	86	86	87	87	87	87	87	88	88	88	88	88	89	89	89	89	89
80	85	85	86	86	86	86	86	87	87	87	87	87	88	88	88	88	88	89	89	89	89	89	90	90	90

Combined values of [A + B (90-A)/90] - Part 1-b(iii)

A↓ B→	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
31	64	65	66	66	67	68	68	69	70	70	71	72	72	73	74	74	75	76	76	77	78	78	79	80	80
32	65	66	66	67	67	68	69	69	70	71	71	72	73	73	74	75	75	76	76	77	78	78	79	80	80
33	65	66	67	67	68	68	69	70	70	71	72	72	73	74	74	75	75	76	77	77	78	79	79	80	80
34	66	66	67	68	68	69	69	70	71	71	72	73	73	74	74	75	76	76	77	78	78	79	79	80	81
35	66	67	67	68	69	69	70	70	71	72	72	73	73	74	75	75	76	77	77	78	78	79	80	80	81
36	67	67	68	68	69	70	70	71	71	72	73	73	74	74	75	76	76	77	77	78	79	79	80	80	81
37	67	68	68	69	69	70	71	71	72	72	73	74	74	75	75	76	76	77	78	78	79	79	80	81	81
38	67	68	69	69	70	70	71	72	72	73	73	74	74	75	76	76	77	77	78	78	79	80	80	81	81
39	68	68	69	70	70	71	71	72	72	73	74	74	75	75	76	76	77	78	78	79	79	80	80	81	81
40	68	69	69	70	71	71	72	72	73	73	74	74	75	76	76	77	77	78	78	79	79	80	81	81	82
41	69	69	70	70	71	71	72	73	73	74	74	75	75	76	76	77	77	78	79	79	80	80	81	81	82
42	69	70	70	71	71	72	72	73	73	74	75	75	76	76	77	77	78	78	79	79	80	80	81	81	82
43	70	70	71	71	72	72	73	73	74	74	75	75	76	76	77	77	78	79	79	80	80	81	81	82	82
44	70	71	71	72	72	73	73	74	74	75	75	76	76	77	77	78	78	79	79	80	80	81	81	82	82
45	70	71	71	72	72	73	73	74	74	75	75	76	76	77	77	78	78	79	79	80	80	81	81	82	82
46	71	71	72	72	73	73	74	74	75	75	76	76	77	77	78	78	79	79	80	80	81	81	82	82	83
47	71	72	72	73	73	74	74	75	75	76	76	77	77	78	78	79	79	79	80	80	81	81	82	82	83
48	72	72	73	73	74	74	75	75	76	76	76	77	77	78	78	79	79	80	80	81	81	82	82	83	83
49	72	73	73	74	74	75	75	75	76	76	77	77	78	78	79	79	80	80	80	81	81	82	82	83	83
50	73	73	74	74	74	75	75	76	76	77	77	78	78	78	79	79	80	80	81	81	82	82	82	83	83
51	73	74	74	74	75	75	76	76	77	77	77	78	78	79	79	80	80	80	81	81	82	82	83	83	83
52	74	74	74	75	75	76	76	76	77	77	78	78	79	79	79	80	80	81	81	82	82	82	83	83	84
53	74	74	75	75	76	76	76	77	77	78	78	78	79	79	80	80	81	81	81	82	82	83	83	83	84
54	74	75	75	76	76	76	77	77	78	78	78	79	79	80	80	80	81	81	82	82	82	83	83	84	84
55	75	75	76	76	76	77	77	78	78	78	79	79	79	80	80	81	81	81	82	82	83	83	83	84	84
56	75	76	76	76	77	77	78	78	78	79	79	79	80	80	81	81	81	82	82	82	83	83	84	84	84
57	76	76	76	77	77	78	78	78	79	79	79	80	80	80	81	81	82	82	82	83	83	83	84	84	84
58	76	76	77	77	78	78	78	79	79	79	80	80	80	81	81	81	82	82	83	83	83	84	84	84	85
59	77	77	77	78	78	78	79	79	79	80	80	80	81	81	81	82	82	82	83	83	83	84	84	84	85
60	77	77	78	78	78	79	79	79	80	80	80	81	81	81	82	82	82	83	83	83	84	84	84	85	85

Combined values of [A + B (90-A)/90] - Part 1-b(iv)

A↓ B→	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
31	81	81	82	83	83	84	85	85	86	87	87	88	89	89	90
32	81	82	82	83	84	84	85	85	86	87	87	88	89	89	90
33	81	82	82	83	84	84	85	86	86	87	87	88	89	89	90
34	81	82	83	83	84	84	85	86	86	87	88	88	89	89	90
35	81	82	83	83	84	84	85	86	86	87	88	88	89	89	90
36	82	82	83	83	84	85	85	86	86	87	88	88	89	89	90
37	82	82	83	84	84	85	85	86	86	87	88	88	89	89	90
38	82	82	83	84	84	85	85	86	87	87	88	88	89	89	90
39	82	83	83	84	84	85	85	86	87	87	88	88	89	89	90
40	82	83	83	84	84	85	86	86	87	87	88	88	89	89	90
41	82	83	83	84	85	85	86	86	87	87	88	88	89	89	90
42	83	83	84	84	85	85	86	86	87	87	88	88	89	89	90
43	83	83	84	84	85	85	86	86	87	87	88	88	89	89	90
44	83	83	84	84	85	85	86	86	87	87	88	88	89	89	90
45	83	83	84	84	85	85	86	86	87	87	88	88	89	89	90
46	83	84	84	85	85	86	86	87	87	88	88	89	89	90	90
47	83	84	84	85	85	86	86	87	87	88	88	89	89	90	90
48	83	84	84	85	85	86	86	87	87	88	88	89	89	90	90
49	84	84	85	85	85	86	86	87	87	88	88	89	89	90	90
50	84	84	85	85	86	86	86	87	87	88	88	89	89	90	90
51	84	84	85	85	86	86	87	87	87	88	88	89	89	90	90
52	84	85	85	85	86	86	87	87	87	88	88	89	89	90	90
53	84	85	85	85	86	86	87	87	88	88	88	89	89	90	90
54	84	85	85	86	86	86	87	87	88	88	88	89	89	90	90
55	85	85	85	86	86	86	87	87	88	88	88	89	89	90	90
56	85	85	85	86	86	87	87	87	88	88	88	89	89	90	90
57	85	85	86	86	86	87	87	87	88	88	89	89	89	90	90
58	85	85	86	86	86	87	87	88	88	88	89	89	89	90	90
59	85	86	86	86	87	87	87	88	88	88	89	89	89	90	90
60	85	86	86	86	87	87	87	88	88	88	89	89	89	90	90

Combined values of [A + B (90-A)/90] - Part 1-c(i)

A↓ B→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
61	61	62	62	62	63	63	63	64	64	64	65	65	65	66	66	66	66	67	67	67	68	68	68	69	69
62	62	63	63	63	64	64	64	64	65	65	65	66	66	66	67	67	67	68	68	68	69	69	69	69	70
63	63	64	64	64	64	65	65	65	66	66	66	67	67	67	67	68	68	68	69	69	69	70	70	70	70
64	64	65	65	65	65	66	66	66	67	67	67	67	68	68	68	69	69	69	69	70	70	70	71	71	71
65	65	66	66	66	66	67	67	67	67	68	68	68	69	69	69	69	70	70	70	71	71	71	71	72	72
66	66	67	67	67	67	68	68	68	68	69	69	69	69	70	70	70	71	71	71	71	72	72	72	72	73
67	67	68	68	68	68	69	69	69	69	70	70	70	70	71	71	71	71	72	72	72	72	73	73	73	73
68	68	68	69	69	69	69	70	70	70	70	71	71	71	71	72	72	72	72	73	73	73	73	74	74	74
69	69	69	70	70	70	70	71	71	71	71	72	72	72	72	72	73	73	73	73	74	74	74	74	75	75
70	70	70	71	71	71	71	72	72	72	72	72	73	73	73	73	74	74	74	74	74	75	75	75	75	76
71	71	71	72	72	72	72	72	73	73	73	73	74	74	74	74	74	75	75	75	75	75	76	76	76	76
72	72	72	73	73	73	73	73	74	74	74	74	74	75	75	75	75	75	76	76	76	76	76	77	77	77
73	73	73	74	74	74	74	74	75	75	75	75	75	75	76	76	76	76	76	77	77	77	77	77	78	78
74	74	74	75	75	75	75	75	75	76	76	76	76	76	76	77	77	77	77	77	78	78	78	78	78	78
75	75	75	75	76	76	76	76	76	76	77	77	77	77	77	77	78	78	78	78	78	78	79	79	79	79
76	76	76	76	77	77	77	77	77	77	78	78	78	78	78	78	78	79	79	79	79	79	79	80	80	80
77	77	77	77	78	78	78	78	78	78	78	79	79	79	79	79	79	79	80	80	80	80	80	80	80	81
78	78	78	78	79	79	79	79	79	79	79	79	80	80	80	80	80	80	80	81	81	81	81	81	81	81
79	79	79	79	79	80	80	80	80	80	80	80	80	81	81	81	81	81	81	81	81	82	82	82	82	82
80	80	80	80	80	81	81	81	81	81	81	81	81	81	82	82	82	82	82	82	82	82	82	83	83	83
81	81	81	81	81	81	82	82	82	82	82	82	82	82	82	82	83	83	83	83	83	83	83	83	83	83
82	82	82	82	82	82	83	83	83	83	83	83	83	83	83	83	83	84	84	84	84	84	84	84	84	84
83	83	83	83	83	83	83	84	84	84	84	84	84	84	84	84	84	84	84	84	85	85	85	85	85	85
84	84	84	84	84	84	84	84	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	86	86	86
85	85	85	85	85	85	85	85	85	85	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86
86	86	86	86	86	86	86	86	86	86	86	86	87	87	87	87	87	87	87	87	87	87	87	87	87	87
87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	88	88	88	88	88	88	88	88	88	88
88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	89	89	89
89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89
90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90

Combined values of [A + B (90-A)/90] - Part 1-c(ii)

A↓ B→	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
61	69	70	70	70	71	71	71	72	72	72	73	73	73	74	74	74	75	75	75	75	76	76	76	77	77
62	70	70	71	71	71	72	72	72	73	73	73	74	74	74	74	75	75	75	76	76	76	77	77	77	78
63	71	71	71	72	72	72	73	73	73	73	74	74	74	75	75	75	76	76	76	76	77	77	77	78	78
64	72	72	72	72	73	73	73	74	74	74	74	75	75	75	76	76	76	76	77	77	77	78	78	78	78
65	72	72	73	73	73	74	74	74	74	75	75	75	76	76	76	76	77	77	77	77	78	78	78	79	79
66	73	73	73	74	74	74	75	75	75	75	76	76	76	76	77	77	77	77	78	78	78	79	79	79	79
67	74	74	74	74	75	75	75	75	76	76	76	76	77	77	77	77	78	78	78	78	79	79	79	80	80
68	74	75	75	75	75	76	76	76	76	77	77	77	77	78	78	78	78	79	79	79	79	79	80	80	80
69	75	75	76	76	76	76	76	77	77	77	77	78	78	78	78	79	79	79	79	79	80	80	80	80	81
70	76	76	76	76	77	77	77	77	78	78	78	78	78	79	79	79	79	80	80	80	80	80	81	81	81
71	76	77	77	77	77	78	78	78	78	78	79	79	79	79	79	80	80	80	80	80	81	81	81	81	82
72	77	77	78	78	78	78	78	79	79	79	79	79	80	80	80	80	80	81	81	81	81	81	82	82	82
73	78	78	78	78	79	79	79	79	79	80	80	80	80	80	81	81	81	81	81	81	82	82	82	82	82
74	79	79	79	79	79	80	80	80	80	80	80	81	81	81	81	81	81	82	82	82	82	82	83	83	83
75	79	79	80	80	80	80	80	80	81	81	81	81	81	81	82	82	82	82	82	82	83	83	83	83	83
76	80	80	80	81	81	81	81	81	81	81	82	82	82	82	82	82	83	83	83	83	83	83	83	84	84
77	81	81	81	81	81	81	82	82	82	82	82	82	82	83	83	83	83	83	83	83	84	84	84	84	84
78	81	82	82	82	82	82	82	82	83	83	83	83	83	83	83	83	84	84	84	84	84	84	84	85	85
79	82	82	82	83	83	83	83	83	83	83	83	84	84	84	84	84	84	84	84	84	85	85	85	85	85
80	83	83	83	83	83	83	84	84	84	84	84	84	84	84	84	85	85	85	85	85	85	85	85	85	86
81	84	84	84	84	84	84	84	84	84	84	85	85	85	85	85	85	85	85	85	85	86	86	86	86	86
82	84	84	84	85	85	85	85	85	85	85	85	85	85	85	86	86	86	86	86	86	86	86	86	86	86
83	85	85	85	85	85	85	85	86	86	86	86	86	86	86	86	86	86	86	86	86	87	87	87	87	87
84	86	86	86	86	86	86	86	86	86	86	86	86	87	87	87	87	87	87	87	87	87	87	87	87	87
85	86	86	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	87	88	88	88	88	88
86	87	87	87	87	87	87	87	87	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88
87	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	89	89	89	89	89
88	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89
89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	90	90	90	90	90
90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90

Combined values of [A + B (90-A)/90] - Part 1-c(iii)

A↓ B→	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
61	77	78	78	78	79	79	79	80	80	80	81	81	81	82	82	82	83	83	83	84	84	84	85	85	85
62	78	78	78	79	79	79	80	80	80	81	81	81	82	82	82	83	83	83	83	84	84	84	85	85	85
63	78	79	79	79	79	80	80	80	81	81	81	82	82	82	82	83	83	83	84	84	84	85	85	85	85
64	79	79	79	80	80	80	80	81	81	81	82	82	82	82	83	83	83	84	84	84	85	85	85	85	86
65	79	79	80	80	80	81	81	81	81	82	82	82	82	83	83	83	84	84	84	84	85	85	85	86	86
66	80	80	80	80	81	81	81	81	82	82	82	83	83	83	83	84	84	84	84	85	85	85	85	86	86
67	80	80	81	81	81	81	82	82	82	82	83	83	83	83	84	84	84	84	85	85	85	85	86	86	86
68	80	81	81	81	81	82	82	82	82	83	83	83	83	84	84	84	84	85	85	85	85	86	86	86	86
69	81	81	81	82	82	82	82	83	83	83	83	83	84	84	84	84	85	85	85	85	86	86	86	86	86
70	81	82	82	82	82	82	83	83	83	83	84	84	84	84	84	85	85	85	85	86	86	86	86	86	87
71	82	82	82	82	83	83	83	83	83	84	84	84	84	85	85	85	85	85	86	86	86	86	86	87	87
72	82	82	83	83	83	83	83	84	84	84	84	84	85	85	85	85	85	86	86	86	86	86	87	87	87
73	83	83	83	83	83	84	84	84	84	84	85	85	85	85	85	85	86	86	86	86	86	87	87	87	87
74	83	83	83	84	84	84	84	84	84	85	85	85	85	85	86	86	86	86	86	86	87	87	87	87	87
75	83	84	84	84	84	84	84	85	85	85	85	85	85	86	86	86	86	86	86	87	87	87	87	87	87
76	84	84	84	84	85	85	85	85	85	85	85	86	86	86	86	86	86	87	87	87	87	87	87	88	88
77	84	85	85	85	85	85	85	85	86	86	86	86	86	86	86	87	87	87	87	87	87	87	88	88	88
78	85	85	85	85	85	85	86	86	86	86	86	86	86	87	87	87	87	87	87	87	87	88	88	88	88
79	85	85	85	86	86	86	86	86	86	86	86	87	87	87	87	87	87	87	87	88	88	88	88	88	88
80	86	86	86	86	86	86	86	86	87	87	87	87	87	87	87	87	87	88	88	88	88	88	88	88	88
81	86	86	86	86	86	87	87	87	87	87	87	87	87	87	87	88	88	88	88	88	88	88	88	88	88
82	87	87	87	87	87	87	87	87	87	87	87	88	88	88	88	88	88	88	88	88	88	88	88	89	89
83	87	87	87	87	87	87	87	88	88	88	88	88	88	88	88	88	88	88	88	88	89	89	89	89	89
84	87	87	88	88	88	88	88	88	88	88	88	88	88	88	88	88	88	89	89	89	89	89	89	89	89
85	88	88	88	88	88	88	88	88	88	88	88	88	88	89	89	89	89	89	89	89	89	89	89	89	89
86	88	88	88	88	88	88	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89
87	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89
88	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	90	90	90	90	90	90	90	90
89	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90

Combined values of [A + B (90-A)/90] - Part 1-c(iv)

A↓ B→	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
61	85	86	86	86	87	87	87	88	88	88	89	89	89	90	90
62	86	86	86	87	87	87	88	88	88	88	89	89	89	90	90
63	86	86	86	87	87	87	88	88	88	88	89	89	89	90	90
64	86	86	87	87	87	87	88	88	88	89	89	89	89	90	90
65	86	86	87	87	87	87	88	88	88	89	89	89	89	90	90
66	86	87	87	87	87	88	88	88	88	89	89	89	89	90	90
67	86	87	87	87	87	88	88	88	88	89	89	89	89	90	90
68	87	87	87	87	88	88	88	88	89	89	89	89	90	90	90
69	87	87	87	87	88	88	88	88	89	89	89	89	90	90	90
70	87	87	87	88	88	88	88	88	89	89	89	89	90	90	90
71	87	87	87	88	88	88	88	89	89	89	89	89	90	90	90
72	87	87	88	88	88	88	88	89	89	89	89	89	90	90	90
73	87	88	88	88	88	88	88	89	89	89	89	89	90	90	90
74	88	88	88	88	88	88	89	89	89	89	89	89	90	90	90
75	88	88	88	88	88	88	89	89	89	89	89	89	90	90	90
76	88	88	88	88	88	89	89	89	89	89	89	90	90	90	90
77	88	88	88	88	89	89	89	89	89	89	89	90	90	90	90
78	88	88	88	89	89	89	89	89	89	89	89	90	90	90	90
79	88	88	89	89	89	89	89	89	89	89	90	90	90	90	90
80	88	89	89	89	89	89	89	89	89	89	90	90	90	90	90
81	89	89	89	89	89	89	89	89	89	89	90	90	90	90	90
82	89	89	89	89	89	89	89	89	89	90	90	90	90	90	90
83	89	89	89	89	89	89	89	89	90	90	90	90	90	90	90
84	89	89	89	89	89	89	89	90	90	90	90	90	90	90	90
85	89	89	89	89	89	89	90	90	90	90	90	90	90	90	90
86	89	89	89	90	90	90	90	90	90	90	90	90	90	90	90
87	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
88	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
89	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90

Combined values of [A + B (100-A)/100] - Part 2-a(i)

A↓ B→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	26
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	27
4	5	6	7	8	9	10	11	12	13	14	15	16	16	17	18	19	20	21	22	23	24	25	26	27	28
5	6	7	8	9	10	11	12	13	14	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
6	7	8	9	10	11	12	13	14	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	29
7	8	9	10	11	12	13	14	14	15	16	17	18	19	20	21	22	23	24	25	26	27	27	28	29	30
8	9	10	11	12	13	14	14	15	16	17	18	19	20	21	22	23	24	25	25	26	27	28	29	30	31
9	10	11	12	13	14	14	15	16	17	18	19	20	21	22	23	24	24	25	26	27	28	29	30	31	32
10	11	12	13	14	14	15	16	17	18	19	20	21	22	23	23	24	25	26	27	28	29	30	31	32	32
11	12	13	14	15	15	16	17	18	19	20	21	22	23	23	24	25	26	27	28	29	30	31	31	32	33
12	13	14	15	16	16	17	18	19	20	21	22	23	23	24	25	26	27	28	29	30	30	31	32	33	34
13	14	15	16	16	17	18	19	20	21	22	23	23	24	25	26	27	28	29	30	30	31	32	33	34	35
14	15	16	17	17	18	19	20	21	22	23	23	24	25	26	27	28	29	29	30	31	32	33	34	35	35
15	16	17	18	18	19	20	21	22	23	23	24	25	26	27	28	29	29	30	31	32	33	34	35	35	36
16	17	18	19	19	20	21	22	23	24	24	25	26	27	28	29	29	30	31	32	33	34	34	35	36	37
17	18	19	19	20	21	22	23	24	24	25	26	27	28	29	29	30	31	32	33	34	34	35	36	37	38
18	19	20	20	21	22	23	24	25	25	26	27	28	29	29	30	31	32	33	34	34	35	36	37	38	38
19	20	21	21	22	23	24	25	25	26	27	28	29	30	30	31	32	33	34	34	35	36	37	38	38	39
20	21	22	22	23	24	25	26	26	27	28	29	30	30	31	32	33	34	34	35	36	37	38	38	39	40
21	22	23	23	24	25	26	27	27	28	29	30	30	31	32	33	34	34	35	36	37	38	38	39	40	41
22	23	24	24	25	26	27	27	28	29	30	31	31	32	33	34	34	35	36	37	38	38	39	40	41	41
23	24	25	25	26	27	28	28	29	30	31	31	32	33	34	35	35	36	37	38	38	39	40	41	41	42
24	25	26	26	27	28	29	29	30	31	32	32	33	34	35	35	36	37	38	38	39	40	41	41	42	43
25	26	26	27	28	29	29	30	31	32	32	33	34	35	35	36	37	38	38	39	40	41	41	42	43	44
26	27	27	28	29	30	30	31	32	33	33	34	35	36	36	37	38	39	39	40	41	42	42	43	44	44
27	28	28	29	30	31	31	32	33	34	34	35	36	36	37	38	39	39	40	41	42	42	43	44	45	45
28	29	29	30	31	32	32	33	34	34	35	36	37	37	38	39	40	40	41	42	42	43	44	45	45	46
29	30	30	31	32	33	33	34	35	35	36	37	38	38	39	40	40	41	42	42	43	44	45	45	46	47
30	31	31	32	33	33	34	35	36	36	37	38	38	39	40	40	41	42	43	43	44	45	45	46	47	47
31	32	32	33	34	34	35	36	37	37	38	39	39	40	41	41	42	43	43	44	45	45	46	47	48	48
32	33	33	34	35	35	36	37	37	38	39	39	40	41	42	42	43	44	44	45	46	46	47	48	48	49
33	34	34	35	36	36	37	38	38	39	40	40	41	42	42	43	44	44	45	46	46	47	48	48	49	50
34	35	35	36	37	37	38	39	39	40	41	41	42	43	43	44	45	45	46	47	47	48	49	49	50	50
35	36	36	37	38	38	39	40	40	41	41	42	43	43	44	45	45	46	47	47	48	49	49	50	51	51
36	37	37	38	39	39	40	40	41	42	42	43	44	44	45	46	46	47	48	48	49	49	50	51	51	52
37	38	38	39	40	40	41	41	42	43	43	44	45	45	46	46	47	48	48	49	50	50	51	51	52	53
38	39	39	40	40	41	42	42	43	44	44	45	45	46	47	47	48	49	49	50	50	51	52	52	53	53
39	40	40	41	41	42	43	43	44	44	45	46	46	47	48	48	49	49	50	51	51	52	52	53	54	54
40	41	41	42	42	43	44	44	45	45	46	47	47	48	48	49	50	50	51	51	52	53	53	54	54	55

Combined values of [A + B (100-A)/100] - Part 2-a(ii)

A↓ B→	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
1	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	50
2	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
3	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	51
4	29	30	31	32	33	34	35	36	37	38	39	40	40	41	42	43	44	45	46	47	48	49	50	51	52
5	30	31	32	33	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	52
6	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	45	46	47	48	49	50	51	52	53
7	31	32	33	34	35	36	37	38	39	40	40	41	42	43	44	45	46	47	48	49	50	51	52	53	53
8	32	33	34	35	36	37	37	38	39	40	41	42	43	44	45	46	47	48	48	49	50	51	52	53	54
9	33	34	34	35	36	37	38	39	40	41	42	43	44	44	45	46	47	48	49	50	51	52	53	54	54
10	33	34	35	36	37	38	39	40	41	41	42	43	44	45	46	47	48	49	50	50	51	52	53	54	55
11	34	35	36	37	38	39	39	40	41	42	43	44	45	46	47	47	48	49	50	51	52	53	54	55	55
12	35	36	37	38	38	39	40	41	42	43	44	45	45	46	47	48	49	50	51	52	52	53	54	55	56
13	36	36	37	38	39	40	41	42	43	43	44	45	46	47	48	49	50	50	51	52	53	54	55	56	56
14	36	37	38	39	40	41	42	42	43	44	45	46	47	48	48	49	50	51	52	53	54	54	55	56	57
15	37	38	39	40	40	41	42	43	44	45	46	46	47	48	49	50	51	52	52	53	54	55	56	57	57
16	38	39	40	40	41	42	43	44	45	45	46	47	48	49	50	50	51	52	53	54	55	55	56	57	58
17	39	39	40	41	42	43	44	44	45	46	47	48	49	49	50	51	52	53	54	54	55	56	57	58	58
18	39	40	41	42	43	43	44	45	46	47	48	48	49	50	51	52	52	53	54	55	56	57	57	58	59
19	40	41	42	42	43	44	45	46	47	47	48	49	50	51	51	52	53	54	55	55	56	57	58	59	59
20	41	42	42	43	44	45	46	46	47	48	49	50	50	51	52	53	54	54	55	56	57	58	58	59	60
21	42	42	43	44	45	45	46	47	48	49	49	50	51	52	53	53	54	55	56	57	57	58	59	60	60
22	42	43	44	45	45	46	47	48	49	49	50	51	52	52	53	54	55	56	56	57	58	59	59	60	61
23	43	44	45	45	46	47	48	48	49	50	51	51	52	53	54	55	55	56	57	58	58	59	60	61	61
24	44	45	45	46	47	48	48	49	50	51	51	52	53	54	54	55	56	57	57	58	59	60	60	61	62
25	44	45	46	47	47	48	49	50	50	51	52	53	53	54	55	56	56	57	58	59	59	60	61	62	62
26	45	46	47	47	48	49	50	50	51	52	53	53	54	55	56	56	57	58	59	59	60	61	62	62	63
27	46	47	47	48	49	50	50	51	52	53	53	54	55	55	56	57	58	58	59	60	61	61	62	63	63
28	47	47	48	49	50	50	51	52	52	53	54	55	55	56	57	58	58	59	60	60	61	62	63	63	64
29	47	48	49	50	50	51	52	52	53	54	55	55	56	57	57	58	59	60	60	61	62	62	63	64	64
30	48	49	50	50	51	52	52	53	54	54	55	56	57	57	58	59	59	60	61	61	62	63	64	64	65
31	49	50	50	51	52	52	53	54	54	55	56	57	57	58	59	59	60	61	61	62	63	63	64	65	65
32	50	50	51	52	52	53	54	54	55	56	56	57	58	59	59	60	61	61	62	63	63	64	65	65	66
33	50	51	52	52	53	54	54	55	56	56	57	58	58	59	60	60	61	62	62	63	64	64	65	66	66
34	51	52	52	53	54	54	55	56	56	57	58	58	59	60	60	61	62	62	63	64	64	65	66	66	67
35	52	53	53	54	54	55	56	56	57	58	58	59	60	60	61	62	62	63	64	64	65	66	66	67	67
36	53	53	54	55	55	56	56	57	58	58	59	60	60	61	62	62	63	64	64	65	65	66	67	67	68
37	53	54	55	55	56	57	57	58	58	59	60	60	61	62	62	63	63	64	65	65	66	67	67	68	68
38	54	55	55	56	57	57	58	58	59	60	60	61	62	62	63	63	64	65	65	66	67	67	68	68	69
39	55	55	56	57	57	58	59	59	60	60	61	62	62	63	63	64	65	65	66	66	67	68	68	69	69
40	56	56	57	57	58	59	59	60	60	61	62	62	63	63	64	65	65	66	66	67	68	68	69	69	70

Combined values of [A + B (100-A)/100] - Part 2-a(iii)

A↓ B→	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
1	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
2	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	75
3	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
4	53	54	55	56	57	58	59	60	61	62	63	64	64	65	66	67	68	69	70	71	72	73	74	75	76
5	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	71	72	73	74	75	76
6	54	55	56	57	58	59	60	61	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	76
7	54	55	56	57	58	59	60	61	62	63	64	65	66	67	67	68	69	70	71	72	73	74	75	76	77
8	55	56	57	58	59	60	60	61	62	63	64	65	66	67	68	69	70	71	71	72	73	74	75	76	77
9	55	56	57	58	59	60	61	62	63	64	65	65	66	67	68	69	70	71	72	73	74	75	75	76	77
10	56	57	58	59	59	60	61	62	63	64	65	66	67	68	68	69	70	71	72	73	74	75	76	77	77
11	56	57	58	59	60	61	62	63	64	64	65	66	67	68	69	70	71	72	72	73	74	75	76	77	78
12	57	58	59	60	60	61	62	63	64	65	66	67	67	68	69	70	71	72	73	74	74	75	76	77	78
13	57	58	59	60	61	62	63	63	64	65	66	67	68	69	70	70	71	72	73	74	75	76	77	77	78
14	58	59	60	60	61	62	63	64	65	66	66	67	68	69	70	71	72	72	73	74	75	76	77	78	78
15	58	59	60	61	62	63	63	64	65	66	67	68	69	69	70	71	72	73	74	74	75	76	77	78	79
16	59	60	61	61	62	63	64	65	66	66	67	68	69	70	71	71	72	73	74	75	76	76	77	78	79
17	59	60	61	62	63	63	64	65	66	67	68	68	69	70	71	72	73	73	74	75	76	77	78	78	79
18	60	61	61	62	63	64	65	66	66	67	68	69	70	70	71	72	73	74	75	75	76	77	78	79	79
19	60	61	62	63	64	64	65	66	67	68	68	69	70	71	72	72	73	74	75	76	77	77	78	79	80
20	61	62	62	63	64	65	66	66	67	68	69	70	70	71	72	73	74	74	75	76	77	78	78	79	80
21	61	62	63	64	64	65	66	67	68	68	69	70	71	72	72	73	74	75	76	76	77	78	79	79	80
22	62	63	63	64	65	66	66	67	68	69	70	70	71	72	73	73	74	75	76	77	77	78	79	80	80
23	62	63	64	65	65	66	67	68	68	69	70	71	72	72	73	74	75	75	76	77	78	78	79	80	81
24	63	64	64	65	66	67	67	68	69	70	70	71	72	73	73	74	75	76	76	77	78	79	79	80	81
25	63	64	65	65	66	67	68	68	69	70	71	71	72	73	74	74	75	76	77	77	78	79	80	80	81
26	64	64	65	66	67	67	68	69	70	70	71	72	73	73	74	75	76	76	77	78	79	79	80	81	81
27	64	65	66	66	67	68	69	69	70	71	72	72	73	74	74	75	76	77	77	78	79	80	80	81	82
28	65	65	66	67	68	68	69	70	70	71	72	73	73	74	75	76	76	77	78	78	79	80	81	81	82
29	65	66	67	67	68	69	69	70	71	72	72	73	74	74	75	76	77	77	78	79	79	80	81	82	82
30	66	66	67	68	68	69	70	71	71	72	73	73	74	75	75	76	77	78	78	79	80	80	81	82	82
31	66	67	68	68	69	70	70	71	72	72	73	74	74	75	76	77	77	78	79	79	80	81	81	82	83
32	67	67	68	69	69	70	71	71	72	73	73	74	75	76	76	77	78	78	79	80	80	81	82	82	83
33	67	68	69	69	70	71	71	72	73	73	74	75	75	76	77	77	78	79	79	80	81	81	82	83	83
34	68	68	69	70	70	71	72	72	73	74	74	75	76	76	77	78	78	79	80	80	81	82	82	83	83
35	68	69	69	70	71	71	72	73	73	74	75	75	76	77	77	78	79	79	80	80	81	82	82	83	84
36	69	69	70	71	71	72	72	73	74	74	75	76	76	77	78	78	79	80	80	81	81	82	83	83	84
37	69	70	70	71	72	72	73	74	74	75	75	76	77	77	78	79	79	80	80	81	82	82	83	84	84
38	70	70	71	71	72	73	73	74	75	75	76	76	77	78	78	79	80	80	81	81	82	83	83	84	84
39	70	71	71	72	73	73	74	74	75	76	76	77	77	78	79	79	80	80	81	82	82	83	84	84	85
40	71	71	72	72	73	74	74	75	75	76	77	77	78	78	79	80	80	81	81	82	83	83	84	84	85

Combined values of [A + B (100-A)/100] - Part 2-a(iv)

A↓ B→	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
2	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
3	77	78	79	80	81	82	83	84	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
4	77	78	79	80	81	82	83	84	85	86	87	88	88	89	90	91	92	93	94	95	96	97	98	99	100
5	77	78	79	80	81	82	83	84	85	86	87	88	89	90	90	91	92	93	94	95	96	97	98	99	100
6	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	92	93	94	95	96	97	98	99	100
7	78	79	80	80	81	82	83	84	85	86	87	88	89	90	91	92	93	93	94	95	96	97	98	99	100
8	78	79	80	81	82	83	83	84	85	86	87	88	89	90	91	92	93	94	94	95	96	97	98	99	100
9	78	79	80	81	82	83	84	85	85	86	87	88	89	90	91	92	93	94	95	95	96	97	98	99	100
10	78	79	80	81	82	83	84	85	86	86	87	88	89	90	91	92	93	94	95	95	96	97	98	99	100
11	79	80	80	81	82	83	84	85	86	87	88	88	89	90	91	92	93	94	95	96	96	97	98	99	100
12	79	80	81	82	82	83	84	85	86	87	88	89	89	90	91	92	93	94	95	96	96	97	98	99	100
13	79	80	81	82	83	83	84	85	86	87	88	89	90	90	91	92	93	94	95	96	97	97	98	99	100
14	79	80	81	82	83	84	85	85	86	87	88	89	90	91	91	92	93	94	95	96	97	97	98	99	100
15	80	80	81	82	83	84	85	86	86	87	88	89	90	91	91	92	93	94	95	96	97	97	98	99	100
16	80	81	82	82	83	84	85	86	87	87	88	89	90	91	92	92	93	94	95	96	97	97	98	99	100
17	80	81	82	83	83	84	85	86	87	88	88	89	90	91	92	93	93	94	95	96	97	98	98	99	100
18	80	81	82	83	84	84	85	86	87	88	89	89	90	91	92	93	93	94	95	96	97	98	98	99	100
19	81	81	82	83	84	85	85	86	87	88	89	89	90	91	92	93	94	94	95	96	97	98	98	99	100
20	81	82	82	83	84	85	86	86	87	88	89	90	90	91	92	93	94	94	95	96	97	98	98	99	100
21	81	82	83	83	84	85	86	87	87	88	89	90	91	91	92	93	94	94	95	96	97	98	98	99	100
22	81	82	83	84	84	85	86	87	88	88	89	90	91	91	92	93	94	95	95	96	97	98	98	99	100
23	82	82	83	84	85	85	86	87	88	88	89	90	91	92	92	93	94	95	95	96	97	98	98	99	100
24	82	83	83	84	85	86	86	87	88	89	89	90	91	92	92	93	94	95	95	96	97	98	98	99	100
25	82	83	83	84	85	86	86	87	88	89	89	90	91	92	92	93	94	95	95	96	97	98	98	99	100
26	82	83	84	84	85	86	87	87	88	89	90	90	91	92	93	93	94	95	96	96	97	98	99	99	100
27	82	83	84	85	85	86	87	88	88	89	90	91	91	92	93	93	94	95	96	96	97	98	99	99	100
28	83	83	84	85	86	86	87	88	88	89	90	91	91	92	93	94	94	95	96	96	97	98	99	99	100
29	83	84	84	85	86	87	87	88	89	89	90	91	91	92	93	94	94	95	96	96	97	98	99	99	100
30	83	84	85	85	86	87	87	88	89	89	90	91	92	92	93	94	94	95	96	96	97	98	99	99	100
31	83	84	85	86	86	87	88	88	89	90	90	91	92	92	93	94	94	95	96	97	97	98	99	99	100
32	84	84	85	86	86	87	88	88	89	90	90	91	92	93	93	94	95	95	96	97	97	98	99	99	100
33	84	85	85	86	87	87	88	89	89	90	91	91	92	93	93	94	95	95	96	97	97	98	99	99	100
34	84	85	85	86	87	87	88	89	89	90	91	91	92	93	93	94	95	95	96	97	97	98	99	99	100
35	84	85	86	86	87	88	88	89	90	90	91	92	92	93	93	94	95	95	96	97	97	98	99	99	100
36	85	85	86	87	87	88	88	89	90	90	91	92	92	93	94	94	95	96	96	97	97	98	99	99	100
37	85	86	86	87	87	88	89	89	90	91	91	92	92	93	94	94	95	96	96	97	97	98	99	99	100
38	85	86	86	87	88	88	89	89	90	91	91	92	93	93	94	94	95	96	96	97	98	98	99	99	100
39	85	86	87	87	88	88	89	90	90	91	91	92	93	93	94	95	95	96	96	97	98	98	99	99	100
40	86	86	87	87	88	89	89	90	90	91	92	92	93	93	94	95	95	96	96	97	98	98	99	99	100

Combined values of [A + B (100-A)/100] - Part 2-b(i)

A↓ B→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
41	42	42	43	43	44	45	45	46	46	47	47	48	49	49	50	50	51	52	52	53	53	54	55	55	56
42	43	43	44	44	45	45	46	47	47	48	48	49	50	50	51	51	52	52	53	54	54	55	55	56	56
43	44	44	45	45	46	46	47	48	48	49	49	50	50	51	52	52	53	53	54	54	55	56	56	57	57
44	45	45	46	46	47	47	48	48	49	50	50	51	51	52	52	53	54	54	55	55	56	56	57	57	58
45	46	46	47	47	48	48	49	49	50	50	51	52	52	53	53	54	54	55	55	56	57	57	58	58	59
46	47	47	48	48	49	49	50	50	51	51	52	52	53	54	54	55	55	56	56	57	57	58	58	59	59
47	48	48	49	49	50	50	51	51	52	52	53	53	54	54	55	55	56	57	57	58	58	59	59	60	60
48	49	49	50	50	51	51	52	52	53	53	54	54	55	55	56	56	57	57	58	58	59	59	60	60	61
49	50	50	51	51	52	52	53	53	54	54	55	55	56	56	57	57	58	58	59	59	60	60	61	61	62
50	50	51	51	52	52	53	53	54	54	55	55	56	56	57	57	58	58	59	59	60	60	61	61	62	62
51	51	52	52	53	53	54	54	55	55	56	56	57	57	58	58	59	59	60	60	61	61	62	62	63	63
52	52	53	53	54	54	55	55	56	56	57	57	58	58	59	59	60	60	61	61	62	62	63	63	64	64
53	53	54	54	55	55	56	56	57	57	58	58	59	59	60	60	61	61	61	62	62	63	63	64	64	65
54	54	55	55	56	56	57	57	58	58	59	59	60	60	60	61	61	62	62	63	63	64	64	65	65	65
55	55	56	56	57	57	58	58	59	59	59	60	60	61	61	62	62	63	63	64	64	64	65	65	66	66
56	56	57	57	58	58	59	59	60	60	60	61	61	62	62	63	63	63	64	64	65	65	66	66	67	67
57	57	58	58	59	59	60	60	60	61	61	62	62	63	63	63	64	64	65	65	66	66	66	67	67	68
58	58	59	59	60	60	61	61	61	62	62	63	63	63	64	64	65	65	66	66	66	67	67	68	68	68
59	59	60	60	61	61	61	62	62	63	63	64	64	64	65	65	66	66	66	67	67	68	68	68	69	69
60	60	61	61	62	62	62	63	63	64	64	64	65	65	66	66	66	67	67	68	68	68	69	69	70	70
61	61	62	62	63	63	63	64	64	65	65	65	66	66	66	67	67	68	68	68	69	69	70	70	70	71
62	62	63	63	64	64	64	65	65	65	66	66	67	67	67	68	68	68	69	69	70	70	70	71	71	71
63	63	64	64	64	65	65	66	66	66	67	67	67	68	68	69	69	69	70	70	70	71	71	72	72	72
64	64	65	65	65	66	66	67	67	67	68	68	68	69	69	69	70	70	70	71	71	72	72	72	73	73
65	65	66	66	66	67	67	67	68	68	68	69	69	70	70	70	71	71	71	72	72	72	73	73	73	74
66	66	67	67	67	68	68	68	69	69	69	70	70	70	71	71	71	72	72	72	73	73	73	74	74	74
67	67	68	68	68	69	69	69	70	70	70	71	71	71	72	72	72	73	73	73	74	74	74	75	75	75
68	68	69	69	69	70	70	70	71	71	71	72	72	72	72	73	73	73	74	74	74	75	75	75	76	76
69	69	70	70	70	71	71	71	71	72	72	72	73	73	73	74	74	74	75	75	75	76	76	76	76	77
70	70	71	71	71	71	72	72	72	73	73	73	74	74	74	74	75	75	75	76	76	76	77	77	77	77
71	71	72	72	72	72	73	73	73	74	74	74	74	75	75	75	76	76	76	77	77	77	77	78	78	78
72	72	73	73	73	73	74	74	74	75	75	75	75	76	76	76	76	77	77	77	78	78	78	78	79	79
73	73	74	74	74	74	75	75	75	75	76	76	76	77	77	77	77	78	78	78	78	79	79	79	79	80
74	74	75	75	75	75	76	76	76	76	77	77	77	77	78	78	78	78	79	79	79	79	80	80	80	80
75	75	75	76	76	76	76	77	77	77	77	78	78	78	78	79	79	79	79	80	80	80	80	81	81	81
76	76	76	77	77	77	77	78	78	78	78	79	79	79	79	80	80	80	80	81	81	81	81	82	82	82
77	77	77	78	78	78	78	79	79	79	79	80	80	80	80	80	81	81	81	81	82	82	82	82	83	83
78	78	78	79	79	79	79	80	80	80	80	80	81	81	81	81	82	82	82	82	82	83	83	83	83	83
79	79	79	80	80	80	80	80	81	81	81	81	82	82	82	82	82	83	83	83	83	83	84	84	84	84
80	80	80	81	81	81	81	81	82	82	82	82	82	83	83	83	83	83	84	84	84	84	84	85	85	85

Combined values of [A + B (90-A)/90] - Part 1-b(ii)

A↓ B→	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
41	56	57	58	58	59	59	60	60	61	62	62	63	63	64	65	65	66	66	67	68	68	69	69	70	70
42	57	58	58	59	59	60	61	61	62	62	63	63	64	65	65	66	66	67	68	68	69	69	70	70	71
43	58	58	59	60	60	61	61	62	62	63	64	64	65	65	66	66	67	68	68	69	69	70	70	71	71
44	59	59	60	60	61	61	62	62	63	64	64	65	65	66	66	67	68	68	69	69	70	70	71	71	72
45	59	60	60	61	61	62	63	63	64	64	65	65	66	66	67	68	68	69	69	70	70	71	71	72	72
46	60	61	61	62	62	63	63	64	64	65	65	66	67	67	68	68	69	69	70	70	71	71	72	72	73
47	61	61	62	62	63	63	64	64	65	66	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73
48	62	62	63	63	64	64	65	65	66	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74
49	62	63	63	64	64	65	65	66	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74
50	63	63	64	64	65	65	66	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75
51	64	64	65	65	66	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75	75	75
52	64	65	65	66	66	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75	75	76	76
53	65	66	66	67	67	68	68	69	69	69	70	70	71	71	72	72	73	73	74	74	75	75	76	76	76
54	66	66	67	67	68	68	69	69	70	70	71	71	71	72	72	73	73	74	74	75	75	76	76	77	77
55	67	67	68	68	68	69	69	70	70	71	71	72	72	73	73	73	74	74	75	75	76	76	77	77	77
56	67	68	68	69	69	70	70	71	71	71	72	72	73	73	74	74	74	75	75	76	76	77	77	78	78
57	68	69	69	69	70	70	71	71	72	72	72	73	73	74	74	75	75	75	76	76	77	77	78	78	78
58	69	69	70	70	71	71	71	72	72	73	73	74	74	74	75	75	76	76	76	77	77	78	78	79	79
59	70	70	70	71	71	72	72	73	73	73	74	74	75	75	75	76	76	77	77	77	78	78	79	79	79
60	70	71	71	72	72	72	73	73	74	74	74	75	75	76	76	76	77	77	78	78	78	79	79	80	80
61	71	72	72	72	73	73	73	74	74	75	75	75	76	76	77	77	77	78	78	79	79	79	80	80	80
62	72	72	73	73	73	74	74	75	75	75	76	76	76	77	77	78	78	78	79	79	79	80	80	81	81
63	73	73	73	74	74	74	75	75	76	76	76	77	77	77	78	78	79	79	79	80	80	80	81	81	81
64	73	74	74	74	75	75	76	76	76	77	77	77	78	78	78	79	79	79	80	80	81	81	81	82	82
65	74	74	75	75	75	76	76	77	77	77	78	78	78	79	79	79	80	80	80	81	81	81	82	82	82
66	75	75	76	76	76	77	77	77	78	78	78	79	79	79	80	80	80	81	81	81	82	82	82	83	83
67	76	76	76	77	77	77	78	78	78	79	79	79	80	80	80	81	81	81	82	82	82	83	83	83	83
68	76	77	77	77	78	78	78	79	79	79	80	80	80	80	81	81	81	82	82	82	83	83	83	84	84
69	77	77	78	78	78	79	79	79	80	80	80	80	81	81	81	82	82	82	83	83	83	84	84	84	84
70	78	78	78	79	79	79	80	80	80	80	81	81	81	82	82	82	83	83	83	83	84	84	84	85	85
71	79	79	79	79	80	80	80	81	81	81	81	82	82	82	83	83	83	83	84	84	84	85	85	85	85
72	79	80	80	80	80	81	81	81	82	82	82	82	83	83	83	83	84	84	84	85	85	85	85	86	86
73	80	80	81	81	81	81	82	82	82	82	83	83	83	84	84	84	84	85	85	85	85	86	86	86	86
74	81	81	81	82	82	82	82	83	83	83	83	84	84	84	84	85	85	85	85	86	86	86	86	87	87
75	81	82	82	82	82	83	83	83	83	84	84	84	84	85	85	85	85	86	86	86	86	87	87	87	87
76	82	82	83	83	83	83	84	84	84	84	85	85	85	85	86	86	86	86	87	87	87	87	88	88	88
77	83	83	83	84	84	84	84	85	85	85	85	86	86	86	86	86	87	87	87	87	88	88	88	88	88
78	84	84	84	84	85	85	85	85	85	86	86	86	86	87	87	87	87	87	88	88	88	88	89	89	89
79	84	85	85	85	85	86	86	86	86	86	87	87	87	87	87	88	88	88	88	88	89	89	89	89	89
80	85	85	86	86	86	86	86	87	87	87	87	87	88	88	88	88	88	89	89	89	89	89	90	90	90

Combined values of [A + B (100-A)/100] - Part 2-b(iii)

A↓ B→	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
41	71	72	72	73	73	74	75	75	76	76	77	78	78	79	79	80	81	81	82	82	83	83	84	85	85
42	72	72	73	73	74	74	75	76	76	77	77	78	79	79	80	80	81	81	82	83	83	84	84	85	85
43	72	73	73	74	74	75	75	76	77	77	78	78	79	79	80	81	81	82	82	83	83	84	85	85	86
44	73	73	74	74	75	75	76	76	77	78	78	79	79	80	80	81	82	82	83	83	84	84	85	85	86
45	73	74	74	75	75	76	76	77	77	78	79	79	80	80	81	81	82	82	83	83	84	85	85	86	86
46	74	74	75	75	76	76	77	77	78	78	79	79	80	81	81	82	82	83	83	84	84	85	85	86	86
47	74	75	75	76	76	77	77	78	78	79	79	80	80	81	81	82	83	83	84	84	85	85	86	86	87
48	75	75	76	76	77	77	78	78	79	79	80	80	81	81	82	82	83	83	84	84	85	85	86	86	87
49	75	76	76	77	77	78	78	79	79	80	80	81	81	82	82	83	83	84	84	85	85	86	86	87	87
50	75	76	76	77	77	78	78	79	79	80	80	81	81	82	82	83	83	84	84	85	85	86	86	87	87
51	76	76	77	77	78	78	79	79	80	80	81	81	82	82	83	83	84	84	85	85	86	86	87	87	88
52	76	77	77	78	78	79	79	80	80	81	81	82	82	83	83	84	84	85	85	86	86	87	87	88	88
53	77	77	78	78	79	79	80	80	81	81	82	82	83	83	84	84	84	85	85	86	86	87	87	88	88
54	77	78	78	79	79	80	80	81	81	82	82	83	83	83	84	84	85	85	86	86	87	87	88	88	88
55	78	78	79	79	80	80	81	81	82	82	82	83	83	84	84	85	85	86	86	86	87	87	88	88	89
56	78	79	79	80	80	81	81	82	82	82	83	83	84	84	85	85	85	86	86	87	87	88	88	89	89
57	79	79	80	80	81	81	82	82	82	83	83	84	84	85	85	85	86	86	87	87	88	88	88	89	89
58	79	80	80	81	81	82	82	82	83	83	84	84	84	85	85	86	86	87	87	87	88	88	89	89	89
59	80	80	81	81	82	82	82	83	83	84	84	84	85	85	86	86	86	87	87	88	88	89	89	89	90
60	80	81	81	82	82	82	83	83	84	84	84	85	85	86	86	86	87	87	88	88	88	89	89	90	90
61	81	81	82	82	82	83	83	84	84	84	85	85	86	86	86	87	87	88	88	88	89	89	89	90	90
62	81	82	82	83	83	83	84	84	84	85	85	86	86	86	87	87	87	88	88	89	89	89	90	90	90
63	82	82	83	83	83	84	84	84	85	85	86	86	86	87	87	87	88	88	89	89	89	90	90	90	91
64	82	83	83	83	84	84	85	85	85	86	86	86	87	87	87	88	88	88	89	89	90	90	90	91	91
65	83	83	84	84	84	85	85	85	86	86	86	87	87	87	88	88	88	89	89	89	90	90	91	91	91
66	83	84	84	84	85	85	85	86	86	86	87	87	87	88	88	88	89	89	89	90	90	90	91	91	91
67	84	84	84	85	85	85	86	86	86	87	87	87	88	88	88	89	89	89	90	90	90	91	91	91	92
68	84	85	85	85	86	86	86	87	87	87	88	88	88	88	89	89	89	90	90	90	91	91	91	92	92
69	85	85	85	86	86	86	87	87	87	88	88	88	89	89	89	89	90	90	90	91	91	91	92	92	92
70	85	86	86	86	86	87	87	87	88	88	88	89	89	89	89	90	90	90	91	91	91	92	92	92	92
71	86	86	86	87	87	87	88	88	88	88	89	89	89	90	90	90	90	91	91	91	92	92	92	92	93
72	86	87	87	87	87	88	88	88	89	89	89	89	90	90	90	90	91	91	91	92	92	92	92	93	93
73	87	87	87	88	88	88	88	89	89	89	89	90	90	90	91	91	91	91	92	92	92	92	93	93	93
74	87	88	88	88	88	89	89	89	89	90	90	90	90	91	91	91	91	92	92	92	92	93	93	93	93
75	88	88	88	88	89	89	89	89	90	90	90	90	91	91	91	91	92	92	92	92	93	93	93	93	94
76	88	88	89	89	89	89	90	90	90	90	91	91	91	91	92	92	92	92	93	93	93	93	94	94	94
77	89	89	89	89	90	90	90	90	91	91	91	91	91	92	92	92	92	93	93	93	93	94	94	94	94
78	89	89	90	90	90	90	91	91	91	91	91	92	92	92	92	93	93	93	93	93	94	94	94	94	94
79	90	90	90	90	91	91	91	91	91	92	92	92	92	92	93	93	93	93	93	94	94	94	94	95	95
80	90	90	91	91	91	91	91	92	92	92	92	92	93	93	93	93	93	94	94	94	94	94	95	95	95

Combined values of [A + B (100-A)/100] - Part 2-b(iv)

A↓ B→	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
41	86	86	87	88	88	89	89	90	91	91	92	92	93	94	94	95	95	96	96	97	98	98	99	99	100
42	86	87	87	88	88	89	90	90	91	91	92	92	93	94	94	95	95	96	97	97	98	98	99	99	100
43	86	87	87	88	89	89	90	90	91	91	92	93	93	94	94	95	95	96	97	97	98	98	99	99	100
44	87	87	88	88	89	89	90	90	91	92	92	93	93	94	94	95	96	96	97	97	98	98	99	99	100
45	87	87	88	88	89	90	90	91	91	92	92	93	93	94	94	95	96	96	97	97	98	98	99	99	100
46	87	88	88	89	89	90	90	91	91	92	92	93	94	94	95	95	96	96	97	97	98	98	99	99	100
47	87	88	88	89	89	90	90	91	92	92	93	93	94	94	95	95	96	96	97	97	98	98	99	99	100
48	88	88	89	89	90	90	91	91	92	92	93	93	94	94	95	95	96	96	97	97	98	98	99	99	100
49	88	88	89	89	90	90	91	91	92	92	93	93	94	94	95	95	96	96	97	97	98	98	99	99	100
50	88	88	89	89	90	90	91	91	92	92	93	93	94	94	95	95	96	96	97	97	98	98	99	99	100
51	88	89	89	90	90	91	91	92	92	93	93	94	94	95	95	96	96	97	97	98	98	99	99	100	100
52	88	89	89	90	90	91	91	92	92	93	93	94	94	95	95	96	96	97	97	98	98	99	99	100	100
53	89	89	90	90	91	91	92	92	92	93	93	94	94	95	95	96	96	97	97	98	98	99	99	100	100
54	89	89	90	90	91	91	92	92	93	93	94	94	94	95	95	96	96	97	97	98	98	99	99	100	100
55	89	90	90	91	91	91	92	92	93	93	94	94	95	95	95	96	96	97	97	98	98	99	99	100	100
56	89	90	90	91	91	92	92	93	93	93	94	94	95	95	96	96	96	97	97	98	98	99	99	100	100
57	90	90	91	91	91	92	92	93	93	94	94	94	95	95	96	96	97	97	97	98	98	99	99	100	100
58	90	90	91	91	92	92	92	93	93	94	94	95	95	95	96	96	97	97	97	98	98	99	99	100	100
59	90	91	91	91	92	92	93	93	93	94	94	95	95	95	96	96	97	97	98	98	98	99	99	100	100
60	90	91	91	92	92	92	93	93	94	94	94	95	95	96	96	96	97	97	98	98	98	99	99	100	100
61	91	91	91	92	92	93	93	93	94	94	95	95	95	96	96	96	97	97	98	98	98	99	99	100	100
62	91	91	92	92	92	93	93	94	94	94	95	95	95	96	96	97	97	97	98	98	98	99	99	100	100
63	91	91	92	92	93	93	93	94	94	94	95	95	96	96	96	97	97	97	98	98	99	99	99	100	100
64	91	92	92	92	93	93	94	94	94	95	95	95	96	96	96	97	97	97	98	98	99	99	99	100	100
65	92	92	92	93	93	93	94	94	94	95	95	95	96	96	96	97	97	98	98	98	99	99	99	100	100
66	92	92	93	93	93	94	94	94	95	95	95	96	96	96	97	97	97	98	98	98	99	99	99	100	100
67	92	92	93	93	93	94	94	94	95	95	95	96	96	96	97	97	97	98	98	98	99	99	99	100	100
68	92	93	93	93	94	94	94	95	95	95	96	96	96	96	97	97	97	98	98	98	99	99	99	100	100
69	93	93	93	93	94	94	94	95	95	95	96	96	96	97	97	97	98	98	98	98	99	99	99	100	100
70	93	93	93	94	94	94	95	95	95	95	96	96	96	97	97	97	98	98	98	98	99	99	99	100	100
71	93	93	94	94	94	94	95	95	95	96	96	96	97	97	97	97	98	98	98	99	99	99	99	100	100
72	93	94	94	94	94	95	95	95	96	96	96	96	97	97	97	97	98	98	98	99	99	99	99	100	100
73	94	94	94	94	95	95	95	95	96	96	96	96	97	97	97	98	98	98	98	99	99	99	99	100	100
74	94	94	94	95	95	95	95	96	96	96	96	97	97	97	97	98	98	98	98	99	99	99	99	100	100
75	94	94	94	95	95	95	95	96	96	96	96	97	97	97	97	98	98	98	98	99	99	99	99	100	100
76	94	94	95	95	95	95	96	96	96	96	97	97	97	97	98	98	98	98	99	99	99	99	100	100	100
77	94	95	95	95	95	96	96	96	96	97	97	97	97	97	98	98	98	98	99	99	99	99	100	100	100
78	95	95	95	95	96	96	96	96	96	97	97	97	97	98	98	98	98	98	99	99	99	99	100	100	100
79	95	95	95	96	96	96	96	96	97	97	97	97	97	98	98	98	98	99	99	99	99	99	100	100	100
80	95	95	96	96	96	96	96	97	97	97	97	97	98	98	98	98	98	99	99	99	99	99	100	100	100

Combined values of [A + B (100-A)/100] - Part 2-b(v)

A↓ B→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
81	81	81	82	82	82	82	82	83	83	83	83	83	83	84	84	84	84	84	85	85	85	85	85	86	86
82	82	82	83	83	83	83	83	83	84	84	84	84	84	85	85	85	85	85	85	86	86	86	86	86	86
83	83	83	84	84	84	84	84	84	85	85	85	85	85	85	86	86	86	86	86	86	87	87	87	87	87
84	84	84	84	85	85	85	85	85	85	86	86	86	86	86	86	87	87	87	87	87	87	88	88	88	88
85	85	85	85	86	86	86	86	86	86	86	87	87	87	87	87	87	88	88	88	88	88	88	88	89	89
86	86	86	86	87	87	87	87	87	87	87	88	88	88	88	88	88	88	89	89	89	89	89	89	89	89
87	87	87	87	88	88	88	88	88	88	88	88	89	89	89	89	89	89	89	89	90	90	90	90	90	90
88	88	88	88	88	89	89	89	89	89	89	89	89	90	90	90	90	90	90	90	90	91	91	91	91	91
89	89	89	89	89	90	90	90	90	90	90	90	90	90	91	91	91	91	91	91	91	91	91	92	92	92
90	90	90	90	90	90	91	91	91	91	91	91	91	91	91	91	92	92	92	92	92	92	92	92	92	92
91	91	91	91	91	91	92	92	92	92	92	92	92	92	92	92	92	93	93	93	93	93	93	93	93	93
92	92	92	92	92	92	92	93	93	93	93	93	93	93	93	93	93	93	93	94	94	94	94	94	94	94
93	93	93	93	93	93	93	93	94	94	94	94	94	94	94	94	94	94	94	94	94	94	95	95	95	95
94	94	94	94	94	94	94	94	94	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
95	95	95	95	95	95	95	95	95	95	95	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96
96	96	96	96	96	96	96	96	96	96	96	96	96	97	97	97	97	97	97	97	97	97	97	97	97	97
97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	98	98	98	98	98	98	98	98	98
98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98
99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Combined values of [A + B (100-A)/100] - Part 2-b(iv)

A↓ B→	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
81	86	86	86	87	87	87	87	87	87	88	88	88	88	88	89	89	89	89	89	90	90	90	90	90	90
82	87	87	87	87	87	88	88	88	88	88	88	89	89	89	89	89	90	90	90	90	90	90	91	91	91
83	87	88	88	88	88	88	88	89	89	89	89	89	89	90	90	90	90	90	90	91	91	91	91	91	91
84	88	88	88	89	89	89	89	89	89	90	90	90	90	90	90	91	91	91	91	91	91	92	92	92	92
85	89	89	89	89	89	90	90	90	90	90	90	91	91	91	91	91	91	91	92	92	92	92	92	92	92
86	90	90	90	90	90	90	90	91	91	91	91	91	91	91	92	92	92	92	92	92	92	93	93	93	93
87	90	91	91	91	91	91	91	91	91	92	92	92	92	92	92	92	92	93	93	93	93	93	93	93	93
88	91	91	91	91	92	92	92	92	92	92	92	92	93	93	93	93	93	93	93	93	94	94	94	94	94
89	92	92	92	92	92	92	93	93	93	93	93	93	93	93	93	94	94	94	94	94	94	94	94	94	94
90	93	93	93	93	93	93	93	93	93	93	94	94	94	94	94	94	94	94	94	94	95	95	95	95	95
91	93	93	94	94	94	94	94	94	94	94	94	94	94	95	95	95	95	95	95	95	95	95	95	95	95
92	94	94	94	94	94	94	95	95	95	95	95	95	95	95	95	95	95	95	96	96	96	96	96	96	96
93	95	95	95	95	95	95	95	95	95	95	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96
94	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	97	97	97	97	97	97	97	97	97
95	96	96	96	96	96	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97
96	97	97	97	97	97	97	97	97	97	97	97	97	98	98	98	98	98	98	98	98	98	98	98	98	98
97	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98
98	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Combined values of [A + B (100-A)/100] - Part 2-b(vii)

A↓ B→	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
81	91	91	91	91	91	92	92	92	92	92	93	93	93	93	93	94	94	94	94	94	94	95	95	95	95
82	91	91	92	92	92	92	92	92	93	93	93	93	93	94	94	94	94	94	94	95	95	95	95	95	95
83	92	92	92	92	92	93	93	93	93	93	93	94	94	94	94	94	94	95	95	95	95	95	95	96	96
84	92	92	92	93	93	93	93	93	93	94	94	94	94	94	94	95	95	95	95	95	95	96	96	96	96
85	93	93	93	93	93	93	94	94	94	94	94	94	94	95	95	95	95	95	95	95	96	96	96	96	96
86	93	93	93	94	94	94	94	94	94	94	95	95	95	95	95	95	95	96	96	96	96	96	96	96	96
87	94	94	94	94	94	94	94	95	95	95	95	95	95	95	95	96	96	96	96	96	96	96	96	97	97
88	94	94	94	94	95	95	95	95	95	95	95	95	96	96	96	96	96	96	96	96	97	97	97	97	97
89	95	95	95	95	95	95	95	95	95	96	96	96	96	96	96	96	96	96	97	97	97	97	97	97	97
90	95	95	95	95	95	96	96	96	96	96	96	96	96	96	96	97	97	97	97	97	97	97	97	97	97
91	96	96	96	96	96	96	96	96	96	96	96	97	97	97	97	97	97	97	97	97	97	97	98	98	98
92	96	96	96	96	96	96	97	97	97	97	97	97	97	97	97	97	97	97	98	98	98	98	98	98	98
93	97	97	97	97	97	97	97	97	97	97	97	97	97	97	98	98	98	98	98	98	98	98	98	98	98
94	97	97	97	97	97	97	97	97	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98
95	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	99	99	99	99	99
96	98	98	98	98	98	98	98	98	98	98	98	98	99	99	99	99	99	99	99	99	99	99	99	99	99
97	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
98	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99
99	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Combined values of [A + B (100-A)/100] - Part 2-b(viii)

A↓ B→	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
81	95	96	96	96	96	96	97	97	97	97	97	98	98	98	98	98	98	99	99	99	99	99	100	100	100
82	96	96	96	96	96	97	97	97	97	97	97	98	98	98	98	98	98	99	99	99	99	99	100	100	100
83	96	96	96	96	97	97	97	97	97	97	98	98	98	98	98	98	99	99	99	99	99	99	100	100	100
84	96	96	96	97	97	97	97	97	97	98	98	98	98	98	98	99	99	99	99	99	99	99	100	100	100
85	96	97	97	97	97	97	97	97	98	98	98	98	98	98	98	99	99	99	99	99	99	100	100	100	100
86	97	97	97	97	97	97	97	98	98	98	98	98	98	98	99	99	99	99	99	99	99	100	100	100	100
87	97	97	97	97	97	98	98	98	98	98	98	98	98	99	99	99	99	99	99	99	99	100	100	100	100
88	97	97	97	97	98	98	98	98	98	98	98	98	99	99	99	99	99	99	99	99	100	100	100	100	100
89	97	97	98	98	98	98	98	98	98	98	98	99	99	99	99	99	99	99	99	99	100	100	100	100	100
90	98	98	98	98	98	98	98	98	98	98	99	99	99	99	99	99	99	99	99	99	100	100	100	100	100
91	98	98	98	98	98	98	98	98	99	99	99	99	99	99	99	99	99	99	99	100	100	100	100	100	100
92	98	98	98	98	98	98	99	99	99	99	99	99	99	99	99	99	99	99	100	100	100	100	100	100	100
93	98	98	98	99	99	99	99	99	99	99	99	99	99	99	99	99	99	100	100	100	100	100	100	100	100
94	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	100	100	100	100	100	100	100	100	100
95	99	99	99	99	99	99	99	99	99	99	99	99	99	99	99	100	100	100	100	100	100	100	100	100	100
96	99	99	99	99	99	99	99	99	99	99	99	99	100	100	100	100	100	100	100	100	100	100	100	100	100
97	99	99	99	99	99	99	99	99	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
98	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
99	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

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Facial Disability Index for a Patient with Facial Neuromuscular Dysfunction

Overview: The Facial Disability Index can be used to evaluate the impairment a patient has because of a facial neuromuscular disorder. This can be used over time to monitor the course the condition and any response to interventions. The authors are from the University of Pittsburgh.

Subscores:

(1) physical function

(2) social functioning and well-being

Responses are based on the level of functioning experienced during te past month.

Physical functioning:

> (1) How much difficulty did you have keeping food in your mouth moving food around in your mouth or getting food stuck in your cheek while eating?
>
> (2) How much did you have drinking from a cup?
>
> (3) How much difficulty did you have saying specific sounds while speaking?
>
> (4) How much difficulty did you have with your eye tearing excessively or becoming dry?
>
> (5) How much difficulty did you avhe with brushing your teeth or rinsing your mouth?

Responses	**Points**
usually did with no difficulty	5
usually did with a little difficulty	4
usually did with some difficulty	3
usually did with much difficulty	2
usually did not do because of health	1
usually did not do for other reason	0
not applicable	NA

subscore for physical function =

= SUM(points for questions 1 to 5)

Social Functioning and Well-Being Questions:

> (6) How much of the time have you felt calm and peaceful?
>
> (7) How much of the time did you isolate yourself from people around you?
>
> (8) How much of the time did you get irritable towards those around you?

(9) How often did you wake up early or wake up several times during your nighttime sleep?

(10) How often has your facial function kept you from going out to eat shop or participate in family or social activities?

Responses	Positive Points	Negative Points
none of the time (no night in #9)	6	1
a little bit of the time (a few nights in #9)	5	2
some of the time (some nights in #9)	4	3
a good bit of the time (a good number of nights in #9)	3	4
most of the time (most nights in #9)	2	5
all of the time (every night in #9)	1	6
not applicable	NA	NA

positive direction: 7 8 9 10

negative direction: 6

subscore for social functioning and well-being = SUM(points for questions 6 to 10)

Interpretation:

• minimum score for physical functioning: 0

• maximum score for physical functioning: 25

• minimum score for social and well-being: 5

• maximum score for social and well-being: 30

physical functioning score as percent functional ability = ((total subscore) – (number of questions answered)) / (number of questions answered) * (100 / 4)

where: The minimum percent physical functioning is (-25%) if the patient did not do any of the activities for "other reasons". This is if the instructions given are followed. However if it is assumed that these items are not applicable then everything works fine. Social functioning and well-being score as percent functional ability = ((total subscore) – (number of questions answered)) / (number of questions answered) * (100 / 5)

References:

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Facial Disability Index

Patient Name: _____ Date: _____

Please **circle** the most appropriate response to the following questions related to problems associated with the function of your facial muscles. For each question, consider your function **during the past month:**

Physical Function

1. How much difficulty did you have keeping your food in your mouth, moving food around in your mouth, or getting food stuck in your cheek while eating?

   Usually did with:
   5 – no difficulty
   4 – a little difficulty
   3 – some difficulty
   2 – much difficulty

   Usually did not eat because:
   1 – of health
   0 – of other reasons

2. How much difficulty did you have drinking from a cup?

   Usually did with:
   5 – no difficulty
   4 – a little difficulty
   3 – some difficulty
   2 – much difficulty

   Usually did not drink because:
   1 – of health
   0 – of other reasons

3. How much difficulty did you have saying specific sounds while speaking?

   Usually did with:
   5 – no difficulty
   4 – a little difficulty
   3 – some difficulty
   2 – much difficulty

   Usually did not speak because:
   1 – of health
   0 – of other reasons

4. How much difficulty did you have with your eye tearing excessively or becoming dry?

   Usually did with:
   5 – no difficulty
   4 – a little difficulty
   3 – some difficulty
   2 – much difficulty

   Usually did not tear up because:
   1 – of health
   0 – of other reasons

5. How much difficulty did you have with brushing your teeth or rinsing your mouth?

   Usually did with:
   5 – no difficulty
   4 – a little difficulty
   3 – some difficulty
   2 – much difficulty

   Usually did not brush or rinse because:
   1 – of health
   0 – of other reasons

Social Function

6. How much of the time have you felt calm and peaceful?
   6 – all of the time
   5 – most of the time
   4 – a good bit of the time
   3 – some of the time
   2 – a little bit of the time
   1 – none of the time

7. How much of the time did you isolate yourself from people around you?
   1 – all of the time
   2 – most of the time
   3 – a good bit of the time
   4 – some of the time
   5 – a little bit of the time
   6 – none of the time

8. How much of the time did you get irritable toward those around you?
   1 – all of the time
   2 – most of the time
   3 – a good bit of the time
   4 – some of the time
   5 – a little bit of the time
   6 – none of the time

9. How often did you wake up early or wake up several times during your nighttime sleep?
   1 – all of the time
   2 – most of the time
   3 – a good bit of the time
   4 – some of the time
   5 – a little bit of the time
   6 – none of the time

10. How often has your facial function kept you from going out to eat, shop, or participate in family or social activities?
    1 – all of the time
    2 – most of the time
    3 – a good bit of the time
    4 – some of the time
    5 – a little bit of the time
    6 – none of the time

DO NOT COMPLETE THIS SECTION

To be completed by a Cornerstone Physical Therapy staff member

Scoring:

Physical Function

$$\frac{\text{Total Score (questions 1-5)-N}}{\text{N}} \times \frac{100}{4}$$

Social Function

$$\frac{\text{Total Score (questions 6-10)-N}}{\text{N}} \times \frac{100}{5}$$

N = number of questions answered

FACIAL DISABILITY INDEX (FDI)

Name: _____ Date: _____

Please choose the most appropriate response to the following questions related to problems associated with the function of your facial muscles.
For each question, consider your function **during the past month**.

Office Use Only
Score / Goal

Physical Function

1. How much difficulty did you have keeping food in your mouth, moving food around your mouth, or getting food stuck in your cheek?
Usually did with:
5 = No difficulty
4 = A little difficulty
3 = Some difficulty
2 = Much difficulty
1 = Usually did not eat because of health
0 = Usually did not eat because of other reasons

1. _____

2. How much difficulty did you have drinking from a cup?
Usually did with:
5 = No difficulty
4 = A little difficulty
3 = Some difficulty
2 = Much difficulty
1 = Usually did not eat because of health
0 = Usually did not eat because of other reasons

2. _____

3. How much difficulty did you have saying specific sounds while speaking?
Usually did with:
5 = No difficulty
4 = A little difficulty
3 = Some difficulty
2 = Much difficulty, slurring most of speech
1 = Usually did not eat because of health
0 = Usually did not eat because of other reasons

3. _____

4. How much difficulty did you have with your eye tearing excessively or becoming dry?
Usually did with:
5 = No difficulty
4 = A little difficulty
3 = Some difficulty
2 = Much difficulty
1 = Usually did not eat because of health
0 = Usually did not eat because of other reasons

4. _____

5. How much difficulty did you have with brushing your teeth or rinsing your mouth?
Usually did with:
5 = No difficulty
4 = A little difficulty
3 = Some difficulty
2 = Much difficulty
1 = Usually did not eat because of health
0 = Usually did not eat because of other reasons

5. _____

Total:

_____

(____ - 5) / 5 x 25 = _____ Physical Score

For office use only

(____ - 5) / 5 x 25 = _____ Physical Score Goal

Please Turn Over for Part 2

Facial Disability Index – Part 2

Please choose the most appropriate response to the following questions related to problems associated with the function of your facial muscles.
For each question, consider your function **during the past month**.

Office Use Only
Score / Goal

Social / Well-being Function

6. How much time have you felt calm and peaceful?

6 = All of the time
5 = Most of the time
4 = A good bit of the time
3 = Some of the time
2 = A little bit of the time
1 = None of the time

6. _____

7. How much of the time did you isolate yourself from people around you?

1 = All of the time
2 = Most of the time
3 = A good bit of the time
4 = Some of the time
5 = A little bit of the time
6 = None of the time

7. _____

8. How much of the time did you get irritable toward those around you?

1 = All of the time
2 = Most of the time
3 = A good bit of the time
4 = Some of the time
5 = A little bit of the time
6 = None of the time

8. _____

9. How often did you wake up early or wake up several times during your nighttime sleep?

1 = Every night
2 = Most nights
3 = A good number of nights
4 = Some nights
5 = A few nights
6 = No nights

9. _____

10. How often has your facial function kept you from going out to eat, shop, or participate in family or social activities?

1 = All of the time
2 = Most of the time
3 = A good bit of the time
4 = Some of the time
5 = A little bit of the time
6 = None of the time

10. _____

Total:

_____

For office use only

(____ - 5) / 5 x 20 = _____ Social/Wellbeing Score

(____ - 5) / 5 x 20 = _____ Social/Wellbeing Score Goal

Physical (_____) + Social (_____) = (_____/ 200) total FDI Score

Physical (_____) + Social (_____) = (_____/ 200) total FDI Score Goal

FOOT/ANKLE DISABILITY INDEX

Name:_____ Date:_____

Please read: This questionnaire has been designed to give the Physical Therapist information as to how your foot/ankle pain has affected your ability to manage everday life. Please answer by marking the one box which most closely applies to you.

SECTION 1 – PAIN INTENSITY
____ I have no pain in my foot/pain
____ The pain in my foot/ankle is intermittent or mild and does not limit my activity
____ The pain in my foot/ankle is intermittent but limits my activity
____ The pain in my foot/ankle is constant and moderately limits my activity
____ The pain in my foot/ankle is constant and severely limtis my activity
____ The pain in my foot/ankle is constant and I am unable to do anything

SECTION 2 – STANDING
____ I can stand as long as I want to
____ I am able to stand for over 60 minutes before symptoms increase
____ I am able to stand 31-60 minutes before symptoms increase
____ I am able to stand 11-30 minutes before symptoms increase
____ I am only able to stand for very short periods: 10 minutes or less
____ I am unable to stand for any length of time

SECTION 3- WALKING/WEIGHT BEARING TOLERANCE
____ I can walk normally without assistive devices
____ I can walk without assistive devices, but only for 31-60 minutes
____ I can walk without assistive devices, but only for 30 minutes or less
____ I can walk as far as I need but I must use assistive devices
____ I must use assistive devices and can bear only partial weight on my injured foot
____ I must use assistive devices and can bear minimal to no weight on my injured foot

SECTION 4 – CLIMBING STAIRS
____ I am able to go up & down stairs normally
____ I am able to go up & down stairs step over step if I go slowly
____ I am able to go up & down stairs step over step but only a limited number at a time
____ I am able to go up & down stairs but only one at a time
____ I am able to go up & down a limited number of stairs and only one at a time
____ I am unable to use stairs

SECTION 5 – SWELLING
____ I have no swelling with my highest level of activity
____ I have minimal swelling only after my highest level of activity
____ I have no swelling with normal daily activity
____ I have minimal swelling after simple activity
____ I have almost constant swelling but it can be controlled by medication/rest/ice/compression/elevation
____ I have constant swelling without relief foot/ankle

SECTION 6 – WORK
____ I can do as much work as I want to.
____ I can do my usual work, but it increases my foot/ankle pain.
____ I can do most, but not all, of my usual work because of my foot/ankle pain.
____ I can do about half of my usual work because of foot/ankle pain.
____ I can only do minimal work because of my foot/ankle pain.
____ I can't do any work at all because of my foot/ankle pain.

SECTION 7 – DRIVING
____ I can drive my car as long as I want without any foot/ankle pain.
____ I can drive my car as long as I want, but it increases pain in my foot/ankle
____ I can drive my car 31-60 minutes before my foot/ankle pain gets worse
____ I can drive my car 11-30 minutes before my foot/ankle pain gets worse
____ I can drive my car for only 10 minutes or less before my foot/ankle foot/ankle pain gets worse.
____ I am unable to drive my car because of my foot/ankle pain.

SECTION 8 – SLEEPING
____ I have no trouble sleeping
____ My sleep is slightly disturbed by foot/ankle pain. (It wakes me up 1 time/night)
____ My sleep is mildly disturbed by foot/ankle pain. (It wakes me up 2 times/night)
____ My sleep is moderately disturbed by foot/ankle pain (It wakes me 3-4 times/night)
____ My sleep is greatly disturbed by foot/ankle pain (It wakes me 5-6 times/night)
____ My sleep is completely disturbed by foot/ankle pain (It wakes me 7-8 times/night or more)

SECTION 9 – HOUSE & YARD WORK
____ I have no foot/ankle limitations with house or yard work
____ I am able to do all house & yard work necessary if I take a few breaks.
____ I am able to do all house & yard work necessary, but it increases my foot/ankle pain
____ I am able to do some, but not all, house & yard work; it increases my foot/ankle pain
____ I am able to do only the minimum of house & yard work because of my foot/ankle pain
____ I am unable to do any house or yard work because of my foot/ankle pain

SECTION 10 – RECREATION/SPORTS
____ I am able to engage in all my recreation/sports activities with no foot/ankle symptoms
____ I am able to engage in all my recreation/sports activities with some symptoms in my foot/ankle
____ I am able to engage in most, but not all, of my usual recreation/sports activities because of symptoms in my foot/ankle
____ I am able to engage in a few of my usual recreation/sports activities because of symptoms in my foot/ankle
____ I can hardly do any recreation/sports activities because of symptoms in my foot/ankle
____ I am unable to do any recreation/sports activities because of my symptoms

Please mark an "x" on the line below indicating the level of pain you have had in the past 24 hours.

no pain at all _____ worst possible pain _____/50 = _____%

SAPPHIRE PHYSICAL THERAPY

The Foot and Ankle Disability Index (FADI) Score and Sports Module

Patient Name: _____ Date: _____

Please answer every question with one response that most closely describes your condition within the past week by marking the appropriate number in the box. If the activity in question is limited by something other than your foot or ankle, mark N/A.

0 Unable to do
1 Extreme difficulty
2 Moderate difficulty
3 Slight difficulty
4 No difficulty

Standing		Walking up hills	
Walking on even ground		Walking down hills	
Walking on even ground without shoes		Going up stairs	
Walking on uneven ground		Going down stairs	
Stepping up and down curves		Squatting	
Sleeping		Coming up to your toes	
Walking initially		Walking 5 minutes or less	
Walking approximately 10 minutes		Walking 15 minutes or greater	
Home responsibilities		Activities of Daily Living	
Personal Care		Light to moderate work (standing, walking)	
Heavy work (push/pulling, climbing, carrying)		Recreational activities	

Sports Module:

Running		Jumping	
Landing		Squatting and stopping quickly	
Cutting, lateral movements		Low-impact activities	
Ability to perform activity with your normal technique		Ability to participate in your desired sports as long as you would like	

Pain related to the foot and ankle:

0 Unbearable
1 Severe Pain
2 Moderate Pain
3 Mild Pain
4 No Pain

General level of pain		Pain at rest	
Pain during your normal activity		Pain first thing in the morning	

Office Use Only: Score: ____/136 points (FADI 104 points & SPORTS 32 points; No Disability 136)
Number of PT Sessions: _____ Gender: M F Age: _____
ICD-9 Code: PT Initials:

The Foot and Ankle Disability Index (FADI) Score and Sports Module

Reference for Score: Martin, R. L., Burdett, R. G., Irrgang, J. J. (1999). Development of the Foot and Ankle Disbaility Index (FADI). J Orthop Sports Phys Ther, 29:
http://www.orthopaedicscore.com/scorepages/foot_and_ankle_disability_index_fadi.html
retrieved 02/08/2010

Hale, S. A., & Hertel, J. (2005). Reliability and Sensitivity of the Foot and Ankle Disability Index in Subjects with Chronic Ankle Instability. J Athl Train, 40(1):35-40.
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1088343/?tool=pubmed retrieved 02/08/2010

Intraclass correlation coefficient (ICC) at one week: FADI 0.89, FADI Sport 0.84

Objective: assess functional limitations related to foot and ankle conditions.
Diagnosis: **chronic ankle instability (CAI)**

The FADI and FADI Sport are 1) reliable in detecting functional limitations in subjects with chronic ankle instability, 2) sensitive to differences between healthy subjects and subjects with CAI, and 3) responsive to improvement in function after rehabilitation in subjects with CAI.

Ankle sprains account for 15-45% of all sports injuries. 10-30% of these athletes will develop CAI.

Total Possible points: 136 (FADI 104 points & SPORTS 32 points)
Lower the number the greater the disability

MDC: ?

Woodstock Rehab & Fitness
Elbow / Wrist / Hand Disability Index

Name: _____ **Date:** _____

This questionnaire has been designed to give your Physical Therapist information as to how your elbow / wrist / hand pain has affected your ability to manage in everyday life. Please answer every section and mark only ONE box which best applies to you at this moment.

SECTION 1 – PAIN INTENSITY

- o I have no pain in my elbow/wrist/hand.
- o The pain in my elbow/wrist/hand is intermittent or mild.
- o The pain in my elbow/wrist/hand is mild but constant.
- o The pain in my elbow/wrist/hand is constant and moderately limits use of that arm.
- o The pain is my elbow/wrist/hand is constant and severely limits use of that arm.
- o The pain is my elbow/wrist/hand is constant, and I am unable to use that arm.

SECTION 2 – NUMBNESS and TINGLING

- o I have no numbness or tingling in my elbow/wrist/hand.
- o The numbness or tingling in my elbow/wrist/hand is intermittent.
- o The numbness or tingling in my elbow/wrist/hand is constant but does not limit use of that arm.
- o The numbness or tingling in my elbow/wrist/hand is constant and moderately limits use of that arm.
- o The numbness or tingling in my elbow/wrist/hand is constant and severely limits use of that arm.
- o Due to constant numbness or tingling in my elbow/wrist/hand, I am unable to use that arm.

SECTION 3 – PERSONAL CARE (Washing, Dressing, etc.)

- o I can look after myself normally without any symptoms.
- o I can look after myself normally, but it causes increased symptoms.
- o It is uncomfortable to look after myself, and I am slow and careful.
- o I can only partially use my elbow/wrist/hand and sometimes use my other elbow/wrist/hand instead.
- o I can only partially use my elbow/wrist/hand and mostly use my other elbow/wrist/hand instead
- o I am unable to use my elbow/wrist/hand for any personal care and always use my other elbow/wrist/hand instead.

SECTION 4 - STRENGTH

- o I can lift the heaviest weights I need to without symptoms.
- o I can lift heavy weights, but it increases my elbow/wrist/hand symptoms.
- o My elbow/wrist/hand symptoms prevent me from lifting more than moderate-weights (example: a gallon of milk).
- o My elbow/wrist/hand symptoms prevent me from safely lifting more than light-weights (example: a dish or book).
- o I frequently drop even light objects due to weakness in my elbow/wrist/hand.
- o I avoid lifting anything with my involved hand.

SECTION 5 – WRITING / TYPING TOLERANCE

- o I can write or type as long as I need to without symptoms.
- o I can write or type for as long as I want, but it increases my symptoms.
- o I can write or type for 31-60 minutes before my elbow/wrist/hand symptoms increase.
- o I can write or type for 11-30 minutes before my elbow/wrist/hand symptoms increase.
- o I can write or type for only 10 minutes or less before my elbow/wrist/hand symptoms increase.
- o I am unable to write or type using my involved elbow/wrist/hand.

SECTION 6 - WORK

- o I can do as much work as I want to.
- o I can do all of my usual work, but it increases my symptoms.
- o I can do most, but not all, of my usual work because of my symptoms.
- o I can do about half of my usual work because of my symptoms.
- o I can hardly do any work at all because of my elbow/wrist/hand symptoms.
- o I cannot do any work at all because of my elbow/wrist/hand symptoms.

SECTION 7 - DRIVING

- o I can drive my car without any elbow/wrist/hand symptoms.
- o I can drive my car as long as I want, but it increases my symptoms.
- o I can drive my car for 31-60 minutes before my elbow/wrist/hand symptoms increase.
- o I can drive my car for 11-30 minutes before by elbow/wrist/hand symptoms increase.
- o I can drive my car for only 10 minutes or less before my elbow/wrist/hand symptoms increase.
- o I am unable to use that arm for driving.

SECTION 8 - SLEEPING

- o I have no trouble sleeping.
- o My sleep is slightly disturbed by elbow/wrist/hand symptoms. (It wakes me 1 time during the night.)
- o My sleep is mildly disturbed by elbow/wrist/hand symptoms. (It wakes me 2 times during the night.)
- o My sleep is moderate disturbed by elbow/wrist/hand symptoms. (It wakes me 3-4 times during the night.)
- o My sleep is greatly disturbed by elbow/wrist/hand symptoms. (It wakes me 5-6 times during the night.)
- o My sleep is completely disturbed by elbow/wrist/hand symptoms. (It wakes me 7-8 times during the night or more.)

SECTION 9 – HOUSE AND YARD WORK

- o I have no elbow/wrist/hand limitations with house or yard work.
- o I am able to do all house and yard work necessary if I take breaks.
- o I am able to do all house and yard work necessary, but increases my elbow/wrist/hand symptoms.
- o I am able to do some, but not all, house and yard work; it increases my elbow/wrist/hand symptoms.
- o I am able to do only the minimum of house and yard work because of my elbow/wrist/hand symptoms.
- o I am unable to do any house or yard work because of my symptoms.

SECTION 10 – RECREATION and SPORTS

- o I am able to engage in all my recreational/sport activities with no elbow/wrist/hand symptoms.
- o I am able to engage in all my recreation/sports activities with some symptoms in my elbow/wrist/hand.
- o I am able to engage in most, but not all of my usual recreation/sports activities because of symptoms in my elbow/wrist/hand.
- o I am able to engage in a few of my usual recreation/sports activities because of symptoms in my elbow/wrist/hand.
- o I can hardly do any recreation/sports activities because of symptoms in my elbow/wrist/hand.
- o I am unable to do any recreation/sports activities because of symptoms in my elbow/wrist/hand.

Please mark an "X" on the line below which represents the amount of pain you have had in the past 24 hours. The scale is from no pain at all to worst pain possible.

No pain at all _____ **Worst pain possible**

SCORE: /50 %

Elbow / Wrist / Hand Functional Assessment

Name: _____ **Date:** _____

Instructions: When your elbow / wrist / hand hurts, you may find it hard to do some of the things you usually do. The list below contains some sentences people have used to describe themselves when they have elbow / wrist / hand pain. Some sentences may describe you today. When you read a sentence that describes you today, put an "**X**" in the box beside it. If it does not describe you today, leave the space beside it blank. ***Check only sentences that describe you today.***

- o I stay home most of the time because of my elbow / wrist / hand.
- o When I sit, I change position frequently to get my elbow / wrist / hand comfortable.
- o Because of my elbow / wrist / hand, I am not doing any of the jobs that I usually do around the house.
- o Because of my elbow / wrist / hand, I lie down and rest more often.
- o Because of my elbow / wrist / hand, I have difficulty getting out of an easy chair.
- o I get dressed more slowly than usual because of my elbow / wrist / hand.
- o Because of my elbow / wrist / hand, I try to get other people to do things for me.
- o My elbow / wrist / hand is painful almost all of the time.
- o Running is difficult because of my elbow / wrist / hand.
- o My appetite is not good because of my elbow / wrist / hand.
- o I have trouble putting my shoes and socks on because of my elbow / wrist / hand.
- o I walk only short distances because of my elbow / wrist / hand.
- o I sleep less because of my elbow / wrist / hand.
- o Because of my elbow / wrist / hand pain, I get dressed with help from someone else.
- o I sit down for most of the day, because of my elbow / wrist / hand.
- o Because of my elbow / wrist / hand, it takes me longer to get going in the mornings.
- o Because of my elbow / wrist / hand pain, I am more irritable and bad tempered with people than usual.
- o I need to modify my fitness activities because of my elbow / wrist / hand.

STANFORD PATIENT EDUCATION RESEARCH CENTER

Stanford HAQ 8-Item Disability Scale

Please check (✓) the **one** best answer for your abilities.

At this moment, are you able to:	**Without ANY difficulty**	**With SOME difficulty**	**With MUCH difficulty**	**UNABLE to do**
1. Dress yourself, including tying shoelaces and doing buttons?	❑	❑	❑	❑
2. Get in and out of bed?	❑	❑	❑	❑
3. Lift a full cup or glass to your mouth?	❑	❑	❑	❑
4. Walk outdoors on flat ground?	❑	❑	❑	❑
5. Wash and dry your entire body?	❑	❑	❑	❑
6. Bend down to pick up clothing from the floor?	❑	❑	❑	❑
7. Turn faucets on and off?	❑	❑	❑	❑
8. Get in and out of a car?	❑	❑	❑	❑

Scoring

Score the number circled for each item. If more than one consecutive number is circled for one item, code the higher number (more difficulty). If responses are not consecutive, code as blank. The disability index is the mean of the eight items. If more than 2 items are blank, do not score the index.

Characteristics

Tested on 611 subjects with chronic disease.

No. of items	Observed Range	Mean	Standard Deviation	Internal Consistency Reliability	Test-Retest Reliability
1	0-1.88	0.384	0.409	.85	NA

Source of Psychometric Data

Stanford/Garfield Kaiser Chronic Disease Dissemination Study. Psychometrics reported in: Lorig KR, Sobel, DS, Ritter PL, Laurent, D, Hobbs, M. Effect of a self-management program on patients with chronic disease. *Effective Clinical Practice*, 4, 2001,pp. 256-262.

Comments

This is a short version of the 22-item disability scale in the Stanford Health Assessment Questionnaire. The 8-item scale was originally developed in Spanish. We have replaced the numbers with check boxes on the print version. It should be noted that the items have been chosen as they represent use of every major joint in the body. While closely related to an ADL scale this is not an ADL scale but rather a disability scale. This scale is available in Spanish.

References

Lorig KR, Sobel, DS, Ritter PL, Laurent, D, Hobbs, M. Effect of a self-management program on patients with chronic disease. *Effective Clinical Practice*, 4, 2001,pp. 256-262.

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STANFORD PATIENT EDUCATION RESEARCH CENTER

Spanish Stanford HAQ 20-Item Disability Scale

Por favor marque la respuesta que mejor describa sus habilidades usuales (comunes) durante la semana pasada.

¿Actualmente puede Ud:	**Sin ninguna dificultad**	**Con alguna dificultad**	**Con mucha dificultad**	**No puedo hacerlo**
Vestirse y arreglarse				
1. Vestirse, incluyendo amarrarse los zapatos y abrocharse (abotonarse)?	❑	❑	❑	❑
2. Lavarse la cabeza?	❑	❑	❑	❑
Lavantarse				
3. Levantarse de una silla que no tiene brazos?	❑	❑	❑	❑
4. Acostarse y levantarse de la cama?	❑	❑	❑	❑
Comer				
5. Cortar su comida con cuchillo y tenedor?	❑	❑	❑	❑
6. Levantar hasta su boca una taza o vaso lleno?	❑	❑	❑	❑
7. Abrir un cartón nuevo de leche?	❑	❑	❑	❑
Caminar				
8. Caminar al aire libre en terreno plano ?	❑	❑	❑	❑
9. Subir cinco escalones (gradas)?	❑	❑	❑	❑

Por favor marque cualquier ayuda o aparato que Ud. usa regularmente para estas actividades:

- ❑ Bastón
- ❑ Aparato para caminar (andador)
- ❑ Muletas
- ❑ Silla de ruedas
- ❑ Aparatos o instrumentos para vestirse
- ❑ Utensilios hechos especialmente para Ud.
- ❑ Silla hecha especialmente para Ud.
- ❑ Otro (especifique): _____

Por favor marque las categorías para las cuales necesita regularmente ayuda de otra persona:

- ❑ Vestirse y arreglarse
- ❑ Levantarse
- ❑ Comer
- ❑ Caminar

Por favor marque la respuesta que mejor describa sus habilidades usuales (comunes) durante la semana pasada.

¿Actualmente puede Ud:	**Sin ninguna dificultad**	**Con alguna dificultad**	**Con mucha dificultad**	**No puedo hacerlo**
Higiene				
10. Bañarse y secarse todo el cuerpo?	❑	❑	❑	❑
11. Bañarse en la tina del baño? (bañadera o bañera)?	❑	❑	❑	❑
12. Sentarse y levantarse del inodoro (excusado)?	❑	❑	❑	❑
Alcanzar				
13. Alcanzar y bajar algo que pese 5 libras, de una altura sobre su cabeza?	❑	❑	❑	❑
14. Agacharse para recoger ropa del piso?	❑	❑	❑	❑
Agarrar				
15. Abrir la puerta del auto (carro)?	❑	❑	❑	❑
16. Abrir frascos que ya han sido abiertos?	❑	❑	❑	❑
17. Abrir y cerrar las llaves del agua (los grifos)?	❑	❑	❑	❑
Actividades				
18. Hacer sus compras?	❑	❑	❑	❑
19. Subir y bajar del auto (carro)?	❑	❑	❑	❑
20. Hacer sus tareas domésticas (quehaceres) o trabajar en el jardín?	❑	❑	❑	❑

Por favor marque cualquier ayuda o aparato que Ud. usa regularmente para estas actividades:

- ❑ Asiento elevado para el inodoro/excusado
- ❑ Asiento para tina de baño (bañera)
- ❑ Agarradera para la tina del baño (bañera)
- ❑ Abridor de frascos que han sido anteriormente abiertos
- ❑ Aparatos con extensión para el baño
- ❑ Aparatos con extensión para alcanzar
- ❑ Otro (especifique:) _____

Por favor marque las categorías para las cuales necesita regularmente ayuda de otra persona:

- ❑ Higiene
- ❑ Alcanzar
- ❑ Agarrar y abrir cosas
- ❑ Hacer compras (quehaceres) tareas domésticas

Scoring

Score the number circled for each item. If more than one consecutive number is circled for one item, code the higher number (more difficulty). If responses are not consecutive, code as blank.

Each of the 8 categories is coded as a separate unit (Vestirse y arreglarse/Dressing and grooming, Levantarse/Arising, Comer/Eating, Caminar/Walking, Higiene/Hygiene, Alcanzar/Reach, Agarrar/Grip, Actividades/Activities). Each category's score is the highest score for any of the questions within the category (greatest difficulty). For example, in the "Comer" category, there are three answers (one for each item). If "Cortar su comida con cuchillo y tenedor" is marked as "1", "Levantar hasta su boca una taza o vaso lleno" is marked as "0", and "Abrir un cartón nuevo de leche" is marked as "0", then the score for the "Eating" category would be "1" (the response indicating the greatest difficulty within the category).

Each category is coded as above, however, if any "aids or devices" (ayuda o aparato) and/or "help from another person" (ayuda de otra persona) items at the bottom of each page are checked, the category to which they apply is adjusted upward to "2". If the basic score is already "2" or "3", the score remains unchanged. "Aids or devices" and "help from another person" can only change a category's score to "2"; they do not change the score to a "1" or a "3".

The categories to which specific devices apply:

- Bastón/Cane (Caminar/Walking)
- Aparato para caminar (andador)/Walker (Caminar/Walking)
- Muletas/Crutches (Caminar/Walking)
- Silla de ruedas/Wheelchair (Caminar/Walking)
- Aparatos o instrumentos para vestirse/Devices used for dressing (Vestirse y arreglarse/Dressing and grooming)
- Utensilios hechos especialmente para Ud./Built up or special utensils (Comer/Eating)
- Silla hecha especialmente para Ud./Built up or special chair (Levantarse/Arising)
- Asiento elevado para el inodoro/excusado/Raised toilet seat (Higiene/Hygiene)
- Asiento para tina de baño (bañera)/Bathtub seat (Higiene/Hygiene)
- Agarradera para la tina del baño (bañera)/Bathtub bar (Higiene/Hygiene)
- Abridor de frascos que han sido anteriormente abiertos/Jar opener (Agarrar/Grip)
- Aparatos con extensión para el baño/Long-handled appliances for bathroom (Higiene/Hygiene)
- Aparatos con extensión para alcanzar/Long-handled appliances for reach (Alcanzar/Reach)
- Otro/Other (Judge whether it is a special device designed for the task, not one that is normally used by people without disability.

The score for the disability index is the mean of the eight category scores. If more than two of the categories, or 25%, are missing, do not score the scale. If fewer than 2 of the categories is missing, divide the sum of the categories by the number of answered categories. Alternately, you can score the index without using the aids and devices questions (leaving the aids and devices off the questionnaire). The higher score indicates greater disability.

Characteristics

We have not tested this scale in Spanish.

Source of Psychometric Data

We have not tested this scale in Spanish.

Comments

This is a translation of the Stanford Health Assessment Questionnaire Disability scale. Reproduced with permission. We have been using the shorter, 8-item adapted HAQ Disability scale in our studies, and have not done testing on the 20-item scale. It should be noted that the items have been chosen as they represent use of every major joint in the body. While closely related to an ADL scale this is not an ADL scale but rather a disability scale.

References

González V, Stewart A, Ritter P, Lorig K, Translation and validation of arthritis outcome measures into Spanish. *Arthritis and Rheumatism*, 38(10),1995, pp.1429-1446.

Fries JF, Spitz P, Kraines RG, & Holman HR, Measurement of patient Outcomes in arthritis. *Arthritis and Rheumatism*, 23, 1980, pp.137-145.

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HEALTH ASSESSMENT OUTCOMES INDICATORS (HAOI)

COLORADO CHAPTER ANNUAL CONFERENCE

5 NOVEMBER 2005

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JULIE WHITMAN, PT, DSC
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Health Assessment Outcome Indicators

General Health Screening Form & General Health Assessment

- General Health Screening Form
- SF-36 and scoring information

Generic Pain and Patient Global Rating of Change Screening Forms

- Pain Scale with Pain Diagram
- Pain Faces
- Pain Intensity & Patient Specific Functional Scale Clinic Tools
- Pain Disability Index (PDI)
- Global Rating of Change Scale (GROC)
- UAB Pain Behavior Scale (generic) and Waddell's Screening (low back pain)

Region (Specific)

- Orthopedic Outcome Measures- Self Reports Summary List
- Ankle Joint Functional Assessment Tool (AJFAT) and score sheet
- Foot Function Index (FFI; analog and numeric forms)
- Foot and Ankle Ability Measure (FAAM) and score sheet
- Lower Extremity Functional Scale (LEFS)
- Knee Outcome Survey Activities of Daily Living Scale and score sheet
- Knee Outcome Survey Sports Scale and score sheet
- Western Ontario & McMaster Universities (WOMAC) osteoarthritis index and score sheet
- Hip Outcome Score for Activities of Daily Living
- Oswestry Disability Index (ODI) and score sheet
- Fear Avoidance Behavior Questionnaire (FAB-Q)
- Modified Zung
- Modified Somatic Perception Questionnaire (MSPQ) and score sheet
- Neck Disability Index (NDI) and score sheet
- Shoulder Pain and Disability Index (SPADI)
- Disabilities of the Arm, Shoulder, and Hand (DASH) long and quick forms
- Fibromyaligia Impact Questionnaire

Patient Specific Screening Forms

- Patient Specific Functional Scale (PSFS)

Other Tools

- Alcoholism (CAGE) Questions
- DSM IV Screening Checklist for Depression and score sheet
- Center of Epidemiological Studies Depression (CES-D) Scale
- Work APGAR and score sheet
- Beck Anxiety Disorder
- Henry-Eckert Performance Assessment Tool
- Home Exercise Program Compliance Documentation

HEALTH ASSESSMENT OUTCOMES INDICATORS (HAOI)

GENERAL HEALTH SCREENING FORM AND GENERAL HEALTH ASSESSMENT

WHMC Physical Therapy Patient Questionnaire

CONSENT: I understand that my diagnosis & treatment plan will be discussed during my appointment and that I have the right to question and/or refuse any treatment offered._____(Sign)

Do you have any barriers to learning? Yes / No If "Yes", please list? _____

_____

Gender: M / F
Age:_____
Smoker: Yes / No
Pregnant: Yes / No
Occupation:_____

Do you exercise at least 3 days per week? Yes / No

Past Surgical History (list &date): _____

_____

Current Medications: _____

_____

Past Medical History: Please circle each condition that you have been told you have (or had).

Cancer	Diabetes	Kidney Disease	Liver Disease	Stroke
High Blood Pressure	Heart Disease	Angina/Chest Pain	Ulcers	Fibromyalgia
Osteoporosis	Osteoarthritis	Rheumatoid Arthritis	Sexually Transmitted Disease	
Allergies/Asthma	Lung Disease	Have you had a recent illness (explain if yes)? _____		

Do you take blood thinners? Yes / No Are you allergic to latex? Yes / No

Other:

Currently I am experiencing (circle all that apply):

Fever/chills/sweats	Poor balance (falls)		
Unexplained weight loss	Numbness or Tingling	Changes in appetite	Difficulty swallowing
Depression	Shortness of breath	Dizziness	Headaches
Changes in bowel or bladder function		Nausea /Vomiting	Increased pain at night

How are you able to sleep at night? ☐ Fine ☐ Moderate Difficulty ☐ Only with medication

During the past month, have you often been bothered by feeling down, depressed, or hopeless? Yes / No

During the past month, have you often been bothered by little interest or pleasure in doing things? Yes / No

What date (approximately) did your present pain start?_____

How (gradually, suddenly, injury)?_____

My symptoms are currently (circle one): Getting better / About the same / Getting worse

What treatments have you received for this problem so far?_____

_____

What makes your symptoms better?_____

What makes your symptoms worse?_____

Have you had an x-ray, MRI, or other imaging study for this problem? Yes / No

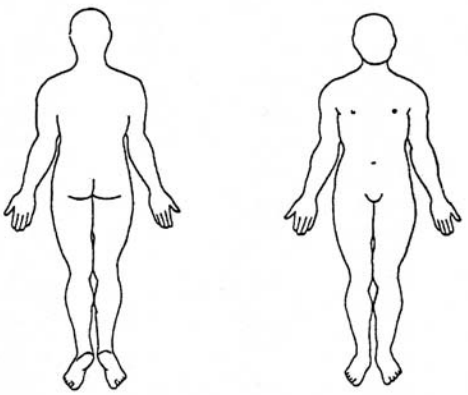
Name: **Date:**

Social Security #: **Phone number(s):**

TURN OVER

Body Chart:
Please mark the areas where you feel pain on the chart to the right.

For the therapist
+ / - Cough/Sneeze
+ / - Saddle Anesth.
+ / - Bwl/Bldr Chnge
+ / - Numb/Ting.



On the scales below, please circle the number which best represents the average level of pain you have experienced over the last 48 hours:

No Pain 0 1 2 3 4 5 6 7 8 9 10 **Worst Pain Imaginable**

Please circle the number below which best represents your overall average level of function:

Cannot do anything 0 1 2 3 4 5 6 7 8 9 10 **Able to do everything**

What are your personal goals for therapy at this time? _____

_____

Aggravating Factors: Identify up to 3 important activities that you are unable to do or are having difficulty with as a result of your problem. List them below:

1)_____

2)_____

3)_____

Below for the Therapist:
Rating:_____
Rating:_____
Rating:_____
AVG:_____

Therapist Use

Unable to perform activity 0 1 2 3 4 5 6 7 8 9 10 **Able to perform activity at same level as before your (injury or problem)**

Health Status Questionnaire (SF-36)

Instructions: This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. Answer every question by filling in the appropriate square. If you are unsure about how to answer a question, please give the best answer you can. If you need to change an answer, draw a line through your original answer and then fill in the correct circle. Please place your initials and date by any change you make.

1. In general, would you say your health is: (mark only one)
   - ☐ 1 Excellent
   - ☐ 2 Very Good
   - ☐ 3 Good
   - ☐ 4 Fair
   - ☐ 5 Poor

2. Compared to one year ago, how would you rate your health in general **now**? (mark only one)
   - ☐ 1 Much better than 1 year ago
   - ☐ 2 Somewhat better than 1 year ago
   - ☐ 3 About the same than 1 year ago
   - ☐ 4 Somewhat worse than 1 year ago
   - ☐ 5 Much worse than 1 year ago

The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much? (fill in only one square on each line)

	Yes, Limited a Lot 1	Yes, Limited a Little 2	No, Not Limited At All 3
3. **Vigorous activities** such as running, lifting heavy objects, or participating in strenuous sports.	☐	☐	☐
4. **Moderate activities** such as moving a table, pushing a vacuum cleaner, bowling, or playing golf.	☐	☐	☐
5. Lifting or carrying groceries.	☐	☐	☐
6. Climbing **several** flights of stairs.	☐	☐	☐
7. Climbing **one** flight of stairs.	☐	☐	☐
8. Bending, kneeling, stooping.	☐	☐	☐
9. Walking **more than a mile**.	☐	☐	☐
10. Walking **several blocks**.	☐	☐	☐
11. Walking **one block**.	☐	☐	☐
12. Bathing or dressing yourself.	☐	☐	☐

Health Status Questionnaire (SF-36)

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**? (fill in only one square on each line)

	Yes$_1$	No$_2$
13. Cut down the **amount of time** you spent on work or other activities.	☐	☐
14. **Accomplished less** than you would like.	☐	☐
15. Were limited in the **kind** of work or other activities.	☐	☐
16. Had **difficulty** performing the work or other activities (e.g., it took extra effort)	☐	☐

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)? (fill in only one square on each line)

	Yes$_1$	No$_2$
17. Cut down the **amount of time** you spent on work or other activities.	☐	☐
18. **Accomplished less** than you would like.	☐	☐
19. Didn't do work or other activities as **carefully** as usual?	☐	☐

20. During the **past 4 weeks**, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups? (mark only one)

☐$_1$ Not at all
☐$_2$ Slightly
☐$_3$ Moderately
☐$_4$ Quite a bit
☐$_5$ Extremely

21. How much bodily pain have you had during the past 4 weeks? (mark only one)

☐$_1$ None
☐$_2$ Very mild
☐$_3$ Mild
☐$_4$ Moderate
☐$_5$ Severe
☐$_6$ Very severe

Health Status Questionnaire (SF-36)

22. During the past 4 weeks how much did pain interfere with your normal work (including both work outside the home and housework)? (mark only one)
    - ☐ 1 Not at all
    - ☐ 2 A little bit
    - ☐ 3 Moderately
    - ☐ 4 Quite a Bit
    - ☐ 5 Extremely

These questions are about how you feel and how things have been with you during the **past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling.

How much time during the past 4 weeks…(fill in only one square on each line)

	All of the Time 1	Most of the Time 2	A Good Bit of the Time 3	Some of the Time 4	A Little of the Time 5	None of the Time 6
23. Did you feel full of pep?	☐	☐	☐	☐	☐	☐
24. Have you been a very nervous person?	☐	☐	☐	☐	☐	☐
25. Have you felt so down in the dumps that nothing could cheer you up?	☐	☐	☐	☐	☐	☐
26. Have you felt calm and peaceful?	☐	☐	☐	☐	☐	☐
27. Did you have a lot of energy?	☐	☐	☐	☐	☐	☐
28. Have you felt downhearted and blue?	☐	☐	☐	☐	☐	☐
29. Did you feel worn out?	☐	☐	☐	☐	☐	☐
30. Have you been a happy person?	☐	☐	☐	☐	☐	☐
31. Did you feel tired?	☐	☐	☐	☐	☐	☐

Health Status Questionnaire (SF-36)

32. During the **past 4 weeks**, how much of the time has your **physical health or emotional problems** interfered with your social activities (like visiting with friends, relatives, etc.)? (mark only one)

☐$_1$ All of the time
☐$_2$ Most of the time
☐$_3$ Some of the time
☐$_4$ A little of the time
☐$_5$ None of the time

How **TRUE** or **FALSE** is **each** of the following statements for you? (fill in only one circle on each line)

	Definitely True$_1$	Mostly True$_2$	Don't Know$_3$	Mostly False$_4$	Definitely False$_5$
33. I seem to get sick a little easier than other people.	☐	☐	☐	☐	☐
34. I am as healthy as anybody I know.	☐	☐	☐	☐	☐
35. I expect my health to get worse.	☐	☐	☐	☐	☐
36. My health is excellent.	☐	☐	☐	☐	☐

To be filled out by examiner:

Date: _____(mm/dd/yyyy)

Score:

Scoring the SF-36

1	Excellent
2	Very good
3	Good
4	Fair
5	Poor

1	2	3
Yes, Limited A Lot	Yes, Limited A Little	No, Not Limited At All

1	2
Yes	No

1	2	3	4	5
Definitely True	Mostly True	Don't Know	Mostly False	Definitely False

Note: The above methodology applies to the other questions on the SF-36 with a similar scale, although the descriptions for each level may vary slightly.

HEALTH ASSESSMENT OUTCOMES INDICATORS (HAOI)

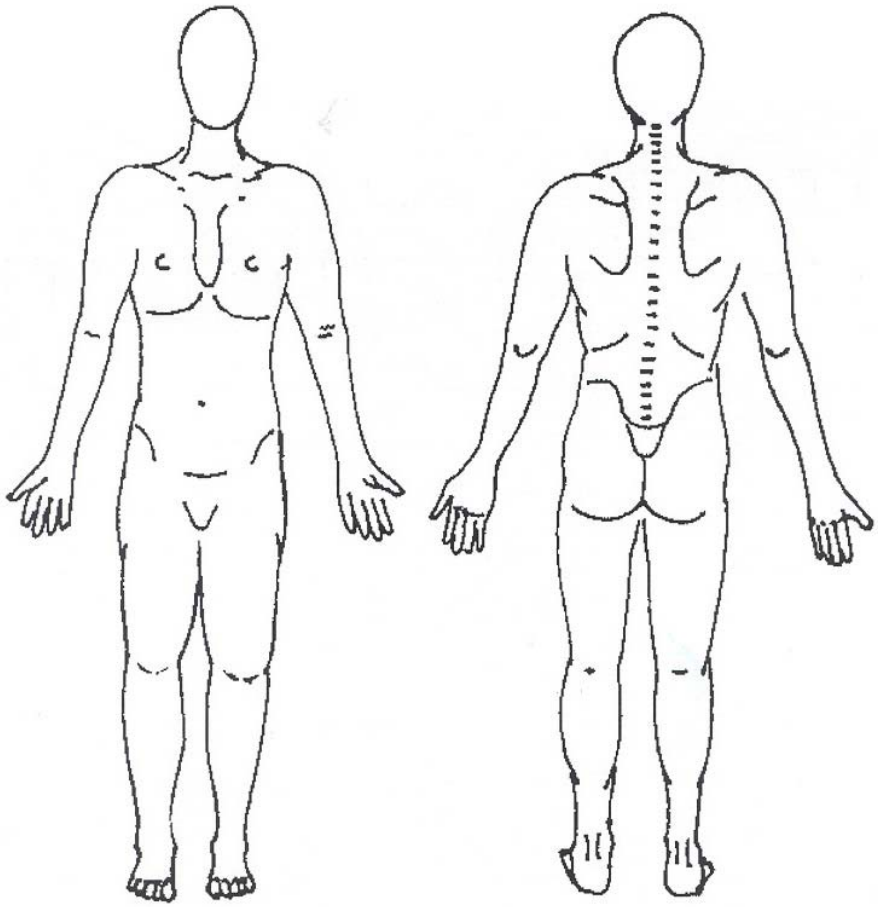
GENERIC PAIN AND PATIENT GLOBAL RATING OF CHANGE SCREENING FORMS

Pain Diagram and Pain Rating

Name:_____ Date:_____/_____/_____
mm dd yy

Please use the diagram below to indicate the symptoms you have experienced over the past 24 hours. Use the key to indicate the type of symptoms.

Key: Pins and Needles = 000000 Stabbing = / / / / / /
Burning = xxxxxx Deep Ache = zzzzzz



Please rate your current level of pain on the following scale (check one):

0 1 2 3 4 5 6 7 8 9 10
(no pain) (worst imaginable pain)

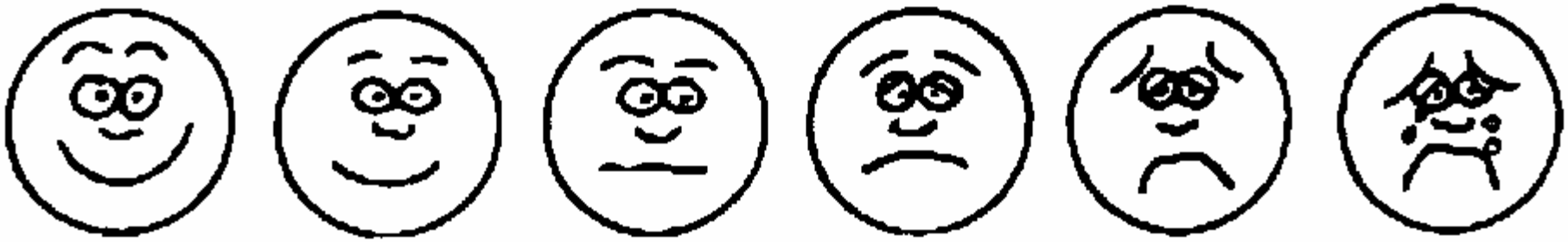
Please rate your worst level of pain in the last 24 hours on the following scale (check one):

0 1 2 3 4 5 6 7 8 9 10
(no pain) (worst imaginable pain)

Please rate your best level of pain in the last 24 hours on the following scale (check one):

0 1 2 3 4 5 6 7 8 9 10
(no pain) (worst imaginable pain)

How Much Does It Hurt?



No Pain

Hurts as much as you can imagine

Instructions for use of pain faces

- Explain to child that each face is for a person who feels happy because he has no pain (hurt) or sad because he has some or a lot of pain.
  - Face 0: Very happy because he doesn't hurt at all
  - Face 1: Hurts just a little bit
  - Face 2: Hurts a little more
  - Face 3: Hurts even more
  - Face 4: Hurts a whole lot
  - Face 5: Hurts as much as you can imagine, although you don't have to be crying to feel this bad
- Ask the child to choose the face that best describes how he/she is feeling
- Can be utilized in both children, non-English speakers, or those that speak English as a second language.
- Wong DL & Baker CM found that children ages 3-18 preferred the faces scale over the other scales but that no one scale demonstrated superiority in validity or reliability.

- Whaley L, Wong DL. Nursing care of infants and children, 3rd edition, 1987. St. Louis: Mosby Co.
- Wong DL, Baker CM. Pain in children: Comparison of assessment scales. Pediatric Nursing, 1988: 14(1): 9-17.

Functional Scale

0 1 2 3 4 5 6 7 8 9 10

Unable to perform activity

Able to perform activity at pre-injury levels

Pain Intensity

0 1 2 3 4 5 6 7 8 9 10

No Pain

Worse Imaginable Pain

Adult Functional & Pain Scales

Functional Scale

- I'm going to ask you to identify up to 3 important activities that you are unable to do or have difficulty with as a result of your problem
- List the three activities and ask them to rate it between 0-10. 0: Unable to perform the activity, 10: Performing at pre-injury levels
- At Follow-Up, When I assessed you on (date) you told me that you had difficulty with (read 1,2,3)
- Today, do you still have difficulty with 1(pnt score), 2 (pnt score), 3 (pnt score). Re-score at each follow-up

Pain Scale

- Please score your pain on a scale from 0-10. 0: No Pain, 10: Worse imaginable pain
- Can ask how bad has your pain been over the last 24 hours?
- Can ask what is your pain at your best? At your worst?
- Can ask what is your pain at rest? With activity?
- For rheumatological patients you can utilize the pain scale with a 24 hour slant – am pain, evening pain
- For orthopaedic post-operative patients you can ask pain at rest? Pain with range of motion?
- BOTTOM LINE – JUST BE CONSISTANT WHEN YOU ASK!

Pain Disability Index[1]

Section 1: To be completed by patient _____AD _____Non-Active Duty

Name:_____ Age:_____ Date:_____

Occupation:_____ Number of days of pain:_____(this episode)

Section 2: To be completed by patient

The rating scales below are designed to measure the degree to which several aspects of your life are presently disrupted by chronic pain. In other words, we would like to know how much your pain is preventing you from doing what you would normally do, or from doing it as well as you normally would.

For each of the seven categories of life activity listed, we would like you to score each question on a scale from 0 (no disability) to 10 (total disability) which describes the level of disability you typically experience. A score of 0 means no disability at all and a score of 10 signifies that all of the activities which you would normally be involved have been totally disrupted or prevented by your pain.

Pain Scale: 0= No Disability 10=Total Disability

	1.	***Family/Home Responsibilities.*** This category refers to activities related to the home or family. It includes chores and duties performed around the house (e.g., yard work) and errands or favors fro other family members 9eg, driving the children to school).		
	2.	***Recreation.*** This category include hobbies, sports, and other similar leisure time activities.		
	3.	***Social Activity.*** This category refers to activities which involve participation with friends and acquaintances other than family members. It includes parties, theater, concerts, dining out, and other social functions.		
	4.	***Occupation***. This category refers to activities that are a part of or directly related to one's job. This include nonpaying jobs as well, such as that of a housewife or volunteer worker.		
	5.	Sexual Behavior. This category refers to the frequency and quality of one's sex life.		
	6.	***Self Care.*** This category includes activities which involve personal maintenance and independent daily living (e.g., taking a shower, driving, getting dressed, etc).		
	7.	***Life-Support Activity.*** This category refers to basic life-supporting behaviors such as eating, sleeping, and breathing.		

Section 3: To be completed by provider.

SCORE:_____out of 70 **Initial** **F/U ___ weeks** **Discharge**

Number of treatment sessions:_____ **Gender:** Male Female

Diagnosis/ICD-9 Code:_____

[1] Adapted from Tait RC, Pollard A, Margolis RB, Duckro PN, Krause SJ. The Pain Disability Index: Psychometric and Validity Data. Arch Phys Med Rehabil 1987; 68: 438-441.

GLOBAL RATING

Patient ID:_____ Date:_____/_____/_____
mm dd yy

Please rate the overall condition of your back ***from the time that you began treatment until now*** (check only one):

- ☐ A very great deal worse
- ☐ A great deal worse
- ☐ Quite a bit worse
- ☐ Moderately worse
- ☐ Somewhat worse
- ☐ A little bit worse
- ☐ A tiny bit worse (almost the same)
- ☐ About the same
- ☐ A very great deal better
- ☐ A great deal better
- ☐ Quite a bit better
- ☐ Moderately better
- ☐ Somewhat better
- ☐ A little bit better
- ☐ A tiny bit better (almost the same)

UAB Pain Behavior Scale

- Vocal complaints: verbal
- Vocal complaints: nonverbal (moans, groans, grasps, etc)
- Down-time because of pain (none; 0-60 min; ≥ 60 min/day)
- Facial grimaces
- Standing posture (normal; mildly impaired; distorted)
- Mobility: walking (normal; mild limp or impairment; marked limp or labored walking)
- Body language (clutching, rubbing site of pain)
- Use of visible physical supports (corset, stick, crutches, lean on furniture, TENS – none; occasional; dependent, constant use)
- Stationary movement (sit or stand still; occasional shift of position; constant movement or shifts of position)
- Medication (none; non-narcotic as prescribed; demands for increased dose or frequency, narcotics, analgesic abuse)

Score each items as follows: none, 0; occasional, 0.5; frequent, 1. This gives a score of 0-10

Richards JS et al, Assessing pain behavior: the UAB pain behavior scale. Pain 14: 393-398.

Waddell's Illness Behavior's Symptoms and Signs:

Illness Behavior: Behavioral Symptoms:	Nonorganic or Behavioral Signs
1. Pain at tip of the tailbone 2. Whole leg pain 3. Whole leg numbness 4. Whole leg giving way 5. Complete absence of any spells with very little pain in the past year 6. Intolerance of, or reactions to, many treatments 7. Emergency admission to hospital with simple backache	1. Tenderness (nonanatomic and/or superficial) 2. Simulation tests (axial loading/simulated rotation) 3. Distraction tests (SLR) 4. Regional changes (weakness, sensory)

Waddell's Spectrum of Clinical Symptoms and Signs:

	Physical Disease	Illness Behavior
Pain		
Pain Drawing	Localized – Anatomic	Nonanatomic, Regional, Magnified
Pain Adjectives	Sensory	Emotional
Symptoms		
Pain	Musculoskeletal or Neurologic distribution	Whole leg pain, coccydynia
Numbness	Dermatomal	Whole leg numbness
Weakness	Myotomal	Whole leg giving way
Time Pattern	Varies with time and activity	Never free of pain
Response to Treatment	Variable benefit	Intolerance of treatments/Emergency hospitalizations
Signs		
Tenderness	Musculoskeletal distribution	Superficial/ nonanatomic
Axial Loading	Neck Pain	Low back pain
Simulated Rotation	Nerve Root Pain (possible)	Low back pain
SLR	If limited – Also limited with distraction	Marked improvement with distraction
Motor /Sensory	Myotomal/Dermatomal	Regional, jerky, giving way

Waddell G. The Back Pain Revolution: Churchill & Livingstone

HEALTH ASSESSMENT OUTCOMES INDICATORS (HAOI)

REGION SPECIFIC SCREENING FORMS

Orthopedic Outcome Measures – Self-Reports

SCALE	RANGE	NO DISABILITY	RELIABILITY	ERROR*	MDC**
FFI	0-100	0	0.87	5#	7#
LEFS	0-80	80	0.94	5	9
ADLS	0-100	100	0.97	9.7#	8.4#
Functional Knee (based on ADLS)	0-100	0	NA	NA	NA
SPADI	0-100	0	0.64-0.91	NR	NR
Oswestry	0-100	0	0.83-0.91	11	16
FABQ	0-96	0 (ND)	NR	NR	NR
NDI	0-50	0	r=0.89	5	7
PDI	0-70	0	Cronbach's alpha .871	NR	NR
Global Rating	0-100	100	NR	NR	NR
PSFS	0-10	0	NR/NA	1.7	2.4

* Error = SEM with 90% confidence bounds
** MDC= MDC with 905 confidence bounds
# Calculated from data from the article – not reported in the article
NR – Not Reported
NA – Not Assessed – form adapted for our use.
ND – Does not assess disability – assesses fear avoidance

Orthopedic Outcome Measures – Self-Reports

SCALE	RANGE	NO DISABILITY	RELIABILITY	ERROR*	MDC**
FFI	0-100	0	0.87	5#	7#
LEFS	0-80	80	0.94	5	9
ADLS	0-100	100	0.97	9.7#	8.4#
Functional Knee (based on ADLS)	0-100	0	NA	NA	NA
SPADI	0-100	0	0.64-0.91	NR	NR
Oswestry	0-100	0	0.83-0.91	11	16
FABQ	0-96	0 (ND)	NR	NR	NR
NDI	0-50	0	r=0.89	5	7
PDI	0-70	0	Cronbach's alpha .871	NR	NR
Global Rating	0-100	100	NR	NR	NR
PSFS	0-10	0	NR/NA	1.7	2.4

* Error = SEM with 90% confidence bounds
** MDC= MDC with 905 confidence bounds
# Calculated from data from the article – not reported in the article
NR – Not Reported
NA – Not Assessed – form adapted for our use.
ND – Does not assess disability – assesses fear avoidance

Ankle Joint Functional Assessment Tool (AJFAT)

Section 1: To be completed by patient _____AD _____Non-Active Duty

Name:_____ Age:_____ Date:_____

Occupation:_____ How long have you had ankle problems:_____

Section 2: To be completed by patient

This questionnaire has been designed to give your therapist information as to how your ankle problems have affected your functional ability. Please answer every question by placing a check on the line that best describes your injured ankle compared with the non-injured side. Check only 1 answer for each question, choosing the answer that best describes your injured ankle. We realize you may feel that two of the statements may describe your condition, but **please check only the line which most closely describes your current condition**.

1. How would you describe the level of pain you experience in your ankle?

_____Much less than the other ankle
_____Slightly less than the other ankle
_____Equal in amount to the other ankle
_____ Slightly more than the other ankle
_____ Much more than the other ankle

2. How would you describe any swelling in your ankle?

_____Much less than the other ankle
_____Slightly less than the other ankle
_____Equal in amount to the other ankle
_____ Slightly more than the other ankle
_____ Much more than the other ankle

3. How would you describe the ability of your ankle when walking on uneven surfaces?

_____Much less than the other ankle
_____Slightly less than the other ankle
_____Equal in ability to the other ankle
_____ Slightly more than the other ankle
_____ Much more than the other ankle

4. How would you describe the overall feeling of stability of your ankle?

_____Much less stable than the other ankle
_____Slightly less stable than the other ankle
_____Equal in stability to the other ankle
_____ Slightly more stable than the other ankle
_____ Much more stable than the other ankle

5. How would you describe the overall feeling of strength of your ankle?

_____Much less strong than the other ankle
_____Slightly less strong than the other ankle
_____Equal in strength to the other ankle
_____ Slightly stronger than the other ankle
_____ Much stronger than the other ankle

6. How would you describe your ankle's ability when you descend stairs?

_____Much less than the other ankle
_____Slightly less than the other ankle
_____Equal in amount to the other ankle
_____ Slightly more than the other ankle
_____ Much more than the other ankle

Section 2 (con't): To be completed by patient

7. How would you describe your ankle's ability when you jog?

_____Much less than the other ankle
_____Slightly less than the other ankle
_____Equal in amount to the other ankle
_____ Slightly more than the other ankle
_____ Much more than the other ankle

8. How would you describe your ankle's ability to "cut," or change directions, when running?

_____Much less than the other ankle
_____Slightly less than the other ankle
_____Equal in amount to the other ankle
_____ Slightly more than the other ankle
_____ Much more than the other ankle

9. How would you describe the overall activity level of your ankle?

_____Much less than the other ankle
_____Slightly less than the other ankle
_____Equal in amount to the other ankle
_____ Slightly more than the other ankle
_____ Much more than the other ankle

10. Which statement best describes your ability to sense your ankle beginning to "roll over"?

_____Much later than the other ankle
_____Slightly later than the other ankle
_____At the same time as the other ankle
_____ Slightly sooner than the other ankle
_____ Much sooner than the other ankle

11. Compared with the other ankle, which statement best describes your ability to respond to your ankle beginning to "roll over"?

_____Much later than the other ankle
_____Slightly later than the other ankle
_____At the same time as the other ankle
_____ Slightly sooner than the other ankle
_____ Much sooner than the other ankle

12. Following a typical incident of your ankle "rolling," which statement best describes the time required to return to activity?

_____ More than 2 days
_____ 1 to 2 days
_____ More than 1 hour and less than 1 day
_____ 15 minutes to 1 hour
_____ Almost immediately

Section 3: To be completed by physical therapist/provider

SCORE:_____ out of 48 possible points (higher better) **Initial** **2 weeks** **Discharge**

Number of treatment sessions:_____ **Gender:** Male Female

Diagnosis/ICD-9 Code:_____

[1] Adapted from: Rozzi SL, et al. Balance Training for Persons With Functionally Unstable Ankles. JOSPT 1999; 29 (8): 478-486 [Prepared July 1999]

Ankle Joint Functional Assessment Tool (AJFAT)

Section 1: To be completed by patient _____AD _____Non-Active Duty

Name:_____ Age:_____ Date:_____

Occupation:_____ How long have you had ankle problems:_____

Section 2: To be completed by patient

This questionnaire has been designed to give your therapist information as to how your ankle problems have affected your functional ability. Please answer every question by placing a check on the line that best describes your injured ankle compared with the non-injured side. Check only 1 answer for each question, choosing the answer that best describes your injured ankle. We realize you may feel that two of the statements may describe your condition, but **please check only the line which most closely describes your current condition**.

1. How would you describe the level of pain you experience in your ankle?

__**4**___Much less than the other ankle
__**3**___Slightly less than the other ankle
__**2**___Equal in amount to the other ankle
__**1**___ Slightly more than the other ankle
__**0**___ Much more than the other ankle

2. How would you describe any swelling in your ankle?

__**4**___Much less than the other ankle
__**3**___Slightly less than the other ankle
__**2**___Equal in amount to the other ankle
__**1**___ Slightly more than the other ankle
__**0**___ Much more than the other ankle

3. How would you describe the ability of your ankle when walking on uneven surfaces?

__**0**___Much less than the other ankle
__**1**___Slightly less than the other ankle
__**2**___Equal in ability to the other ankle
__**3**___ Slightly more than the other ankle
__**4**___ Much more than the other ankle

4. How would you describe the overall feeling of stability of your ankle?

__**0**___Much less stable than the other ankle
__**1**___Slightly less stable than the other ankle
__**2**___Equal in stability to the other ankle
__**3**___ Slightly more stable than the other ankle
__**4**___ Much more stable than the other ankle

5. How would you describe the overall feeling of strength of your ankle?

__**0**___Much less strong than the other ankle
__**1**___Slightly less strong than the other ankle
__**2**___Equal in strength to the other ankle
__**3**___ Slightly stronger than the other ankle
__**4**___ Much stronger than the other ankle

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__**1**___Slightly less than the other ankle
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__**4**___ Much more than the other ankle

Section 2 (con't): To be completed by patient

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__**1**___Slightly less than the other ankle
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__**4**___ Much more than the other ankle

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__**0**___Much less than the other ankle
__**1**___Slightly less than the other ankle
__**2**___Equal in amount to the other ankle
__**3**___ Slightly more than the other ankle
__**4**___ Much more than the other ankle

9. How would you describe the overall activity level of your ankle?

__**0**___Much less than the other ankle
__**1**___Slightly less than the other ankle
__**2**___Equal in amount to the other ankle
__**3**___ Slightly more than the other ankle
__**4**___ Much more than the other ankle

10. Which statement best describes your ability to sense your ankle beginning to "roll over"?

__**0**___Much later than the other ankle
__**1**___Slightly later than the other ankle
__**2**___At the same time as the other ankle
__**3**___ Slightly sooner than the other ankle
__**4**___ Much sooner than the other ankle

11. Compared with the other ankle, which statement best describes your ability to respond to your ankle beginning to "roll over"?

__**0**___Much later than the other ankle
__**1**___Slightly later than the other ankle
__**2**___At the same time as the other ankle
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__**4**___ Much sooner than the other ankle

12. Following a typical incident of your ankle "rolling," which statement best describes the time required to return to activity?

__**0**___ More than 2 days
__**1**___ 1 to 2 days
__**2**___ More than 1 hour and less than 1 day
__**3**___ 15 minutes to 1 hour
__**4**___ Almost immediately

Section 3: To be completed by physical therapist/provider

SCORE:_____ out of 48 possible points (higher better) **Initial** **2 weeks** **Discharge**

Pre-Training Unstable Ankles: 17.11 +/- 3.44 Non-Injured Ankles: 22.92 +/- 5.22

Post-Training Unstable Ankles: 25.78 +/- 3.80 Non-Injured Ankles: 29.15 +/- 5.27

(No statistical difference between post training scores! The rest of comparisons are statistically significant.)

[1] Adapted from: Rozzi SL, et al. Balance Training for Persons With Functionally Unstable Ankles. JOSPT 1999; 29 (8): 478-486 [Prepared July 1999]

FOOT FUNCTION INDEX
INSTRUCTIONS TO PATIENTS

You will be asked to make an up and down mark (|) at the point on the horizontal line which best indicates the amount of pain or difficulty you have had ***over the past week*** because of your plantar fasciitis.

NOTE:

1. If you put your mark at the left end of the line, i.e.

No pain _____ Worst pain imaginable

then you are indicating that you have no pain.

2. If you put your mark at the right end of the line, i.e.

No pain _____ Worst pain imaginable

then you are indicating that your pain is extreme.

3. Please note:

a) that the further to the **right** you place your mark, the **more** pain or difficulty you are experiencing.

b) that the further to the **left** you place your mark, the **less** pain or difficulty you are experiencing.

c) please do not place your mark outside of the end markers.

d) if the question does not apply to you, leave the line blank and go on to the next line.

Please note that you are to complete the questionnaire with respect to the pain, or difficulty, or decrease in activity caused by your foot problem. You should think about your plantar fasciitis when answering the questionnaire, that is, you should indicate the severity of your pain, the difficulty with activities, and the modification of your activity that you feel is caused by the problem with your foot or feet ***over the past week***. If both feet are involved, think of the most involved foot when marking your responses.

If you have any questions while completing this questionnaire, please ask for assistance.

Modified from Budiman-Mak E, Conrad KJ, Roach K. The foot function index: A measure of foot pain and disability. J Clin Epidemiology. 4(6):561-570, 1991

FOOT FUNCTION INDEX

Name:_____ Last 4 ss#:_____ Date:_____

Please place a mark **like this** ———————— at the point on the line that best indicates your answer.

Part I: Answer all the following questions related to your pain and activities ***over the past week***.

How severe is your foot pain:

1. In the morning upon taking your first step?	No pain	_____	Worst pain imaginable
2. When walking?	No pain	_____	Worst pain imaginable
3. When standing?	No pain	_____	Worst pain imaginable
4. How is your foot pain at the end of the day?	No pain	_____	Worst pain imaginable
5. How severe is your pain at its worst?	No pain	_____	Worst pain imaginable

Modified from Budiman-Mak E, Conrad KJ, Roach K. The foot function index: A measure of foot pain and disability. J Clin Epidemiology. 4(6):561-570, 1991

Part 2: Answer all the following questions related to your pain and activities ***over the past week***.
How much difficulty did you have:

1. When walking in the house?	No difficulty	_____	So difficult unable to do
2. When walking outside?	No difficulty	_____	So difficult unable to do
3. When walking four blocks?	No difficulty	_____	So difficult unable to do
4. When climbing stairs?	No difficulty	_____	So difficult unable to do
5. When descending stairs?	No difficulty	_____	So difficult unable to do
6. When standing tip toe?	No difficulty	_____	So difficult unable to do
7. When getting up from a chair?	No difficulty	_____	So difficult unable to do
8. When climbing curbs?	No difficulty	_____	So difficult unable to do
9. When running or fast walking?	No difficulty	_____	So difficult unable to do

Part 3: Answer all the following questions related to your pain and activities ***over the past week***.
How much of the time did you:

1. Use an *assistive device indoors?	None of the time	_____	All of the time
2. Use an *assistive device outdoors?	None of the time	_____	All of the time
3. Limit physical activities?	None of the time	_____	All of the time

*An assistive device is a cane, walker, crutches etc...

Foot Function Index[1]

Section 1: To be completed by patient _____AD _____Non-Active Duty

Name:_____ Age:_____ Date:_____

Occupation:_____ Number of days of foot pain:_____(this episode)

Section 2: To be completed by patient

This questionnaire has been designed to give your therapist information as to how your foot pain has affected your ability to manage in every day life. For the following questions, we would like you to score each question on a scale from 0 (no pain) to 10 (worst pain imaginable) that best describes your foot **over the past WEEK**. Please read each question and place a number from 0-10 in the corresponding box.

Pain Scale: 0= No Pain 10=Worst Pain Imaginable

	1.	In the morning upon taking your first step?		
	2.	When walking?		
	3.	When standing?		
	4.	How is your pain at the end of the day?		
	5.	How severe is your pain at its worst?		

Answer all of the following questions related to your pain and activities **over the last WEEK**, how much difficulty did you have? ***Disability Scale: 0= No Difficulty 10= So Difficult unable to do***

	6.	When walking in the house?		
	7.	When walking outside?		
	8.	When walking four blocks?		
	9.	When climbing stairs?		
	10.	When descending stairs?		
	11.	When standing tip toe?		
	12.	When getting up from a chair?		
	13.	When climbing curbs?		
	14.	When running or fast walking?		

Answer all the following questions related to your pain and activities **over the past WEEK**. How much of the time did you: ***Disability Scale: 0= None of the time 10= All of the time***

	15.	Use an assistive device (cane, walker, crutches, etc) indoors?		
	16.	Use an assistive device (cane, walker, crutches, etc) outdoors?		
	17.	Limit physical activities?		

Section 3: To be completed by physical therapist/provider

SCORE:_____/170 x100= _____% (SEM 5, MDC 7) **Initial** **F/U at ___ wks** **Discharge**

Number of treatment sessions:_____ **Gender:** Male Female

Diagnosis/ICD-9 Code:_____

[1] Adapted from Budiman-Mak E, Conrad KJ, Roach K. The foot function index: A measure of foot pain and disability. J Clin Epidemiology. 4(6): 561-70, 91.

Foot and Ankle Ability Measure (FAAM)

Please answer **every question** with one response that most closely describes to your condition within the past week.
If the activity in question is limited by something other than your foot or ankle mark not applicable (N/A).

	No difficulty	Slight difficulty	Moderate difficulty	Extreme difficulty	Unable to do	N/A
Standing	□	□	□	□	□	□
Walking on even ground	□	□	□	□	□	□
Walking on even ground without shoes	□	□	□	□	□	□
Walking up hills	□	□	□	□	□	□
Walking down hills	□	□	□	□	□	□
Going up stairs	□	□	□	□	□	□
Going down stairs	□	□	□	□	□	□
Walking on uneven ground	□	□	□	□	□	□
Stepping up and down curbs	□	□	□	□	□	□
Squatting	□	□	□	□	□	□
Coming up on your toes	□	□	□	□	□	□
Walking initially	□	□	□	□	□	□
Walking 5 minutes or less						
Walking approximately 10 minutes	□	□	□	□	□	□
Walking 15 minutes or greater	□	□	□	□	□	□

Because of your **foot and ankle** how much difficulty do you have with:

	No difficulty at all	Slight difficulty	Moderate difficulty	Extreme difficulty	Unable to do	N/A
Home Responsibilities	□	□	□	□	□	□
Activities of daily living	□	□	□	□	□	□
Personal care	□	□	□	□	□	□
Light to moderate work (standing, walking)	□	□	□	□	□	□
Heavy work (push/pulling, climbing, carrying)	□	□	□	□	□	□
Recreational activities	□	□	□	□	□	□

How would you rate your current level of function during your usual activities of daily living from 0 to 100 with 100 being your level of function prior to your foot or ankle problem and 0 being the inability to perform any of your usual daily activities?

□□□.0 %

FAAM Sports Scale

Because of your **foot and ankle** how much difficulty do you have with:

	No difficulty at all	Slight difficulty	Moderate difficulty	Extreme difficulty	Unable to do	N/A
Running	☐	☐	☐	☐	☐	☐
Jumping	☐	☐	☐	☐	☐	☐
Landing	☐	☐	☐	☐	☐	☐
Starting and stopping quickly	☐	☐	☐	☐	☐	☐
Cutting/lateral movements	☐	☐	☐	☐	☐	☐
Low impact activities	☐	☐	☐	☐	☐	☐
Ability to perform activity with your normal technique	☐	☐	☐	☐	☐	☐
Ability to participate in your desired sport as long as you would like	☐	☐	☐	☐	☐	☐

How would you rate your current level of function during your sports related activities from 0 to 100 with 100 being your level of function prior to your foot or ankle problem and 0 being the inability to perform any of your usual daily activities?

☐☐☐.0 %

Overall, how would you rate your current level of function?

☐ Normal ☐ Nearly normal ☐ Abnormal ☐ Severely abnormal

Scoring the Foot and Ankle Ability Measure

The ADL subscale is 4 (no difficulty) to 0 (unable to do). A "n/a" marked items are not scored. The score on each item is added together. The number of questions with a scorable response is multiplied by 4 to get the highest potential score. If all questions are answered, the highest possible score is 84. If one question is not answered, the highest possible score is 80, if two questions are not answered, the highest possible score is 76, etc. The total score for the items is divided by the highest possible score and multiplied by 100 to obtain a percentage. Higher scores indicate higher levels of function.

The Sports subscale is scored separately but the same as above. If all questions are answered, the highest possible score is 32.

Info on the paper

Jay and I are finally finishing the final paper. The title is: "Evidence of Validity for the Foot and Ankle Ability Measure (FAAM)" We are going to submit it to Foot and Ankle with the next few weeks.

As for the type of patients included, it should be valid for a general outpatient orthopaedic population. Specifically the demographics of the 243 subjects used to validate the FAAM are as follows:

Subjects had an average age of 42.5 (SD15.6, range 9-86) with the following diagnoses: joint/limb pain (n=102), sprains/strains (n=71), fractures (n=33), plantar fasciitis (n=27) and bunion (n=4).

LOWER EXTREMITY FUNCTIONAL SCALE[1]

Section 1: To be completed by patient _____AD _____Non-Active Duty

Name:_____ Age:_____ Date:_____

Occupation:_____ Onset of knee pain:_____(this episode)

Section 2: To be completed by patient

We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

Today do you, or would you have difficulty at all with: (Circle one number on each line)

	Extreme Difficulty or Unable to Perform Activity	Quite a bit of Difficulty	Moderate Difficulty	A Little Bit of Difficulty	No Difficulty
a. Any of your usual work, housework or school activities.	0	1	2	3	4
b. Your usual hobbies, recreational or sporting activities.	0	1	2	3	4
c. Getting into or out of the bath.	0	1	2	3	4
d. Walking between rooms.	0	1	2	3	4
e. Putting on your shoes or socks.	0	1	2	3	4
f. Squatting	0	1	2	3	4
g. Lifting an object, like a bag of groceries from the floor.	0	1	2	3	4
h. Performing light activities around your home.	0	1	2	3	4
i. Performing heavy activities around your home.	0	1	2	3	4
j. Getting into or out of a car.	0	1	2	3	4
k. Walking 2 blocks.	0	1	2	3	4
l. Walking a mile.	0	1	2	3	4
m. Going up or down 10 stairs (about 1 flight of stairs).	0	1	2	3	4
n. Standing for 1 hour.	0	1	2	3	4
o. Sitting for 1 hour.	0	1	2	3	4
p. Running on even ground.	0	1	2	3	4
q. Running on uneven ground.	0	1	2	3	4
r. Making sharp turns while running fast.	0	1	2	3	4
s. Hopping.	0	1	2	3	4
t. Rolling over in bed.	0	1	2	3	4
COLUMN TOTALS:					

Section 3: To be completed by physical therapist/provider

SCORE:_____ out of 80 (No Disability 80, SEM 5, MDC 9) **Initial** **FU ___ weeks** **Discharge**

Number of treatment sessions:_____ **Gender:** Male Female

Diagnosis/ICD-9 Code:_____

[1] adapted from Binkley J et al; Phys Ther; 79: 371-383, 1999.[Prepared Feb 01]

KNEE OUTCOME SURVEY ACTIVITIES OF DAILY LIVING SCALE[1]

Section 1: To be completed by patient _____AD _____Non-Active Duty

Name:_____ Age:_____ Date:_____

Occupation:_____ Onset of knee pain:_____(this episode)

Section 2: To be completed by patient

This questionnaire has been designed to give your therapist information as to how your knee injury has affected your ability to manage in every day life. Please answer every question by placing a mark in the box that best describes your condition.

To what degree does each of the following symptoms affect your level of daily activity? (check one answer on each line)

	Never Have	Have, but does not affect activity	Affects activity slightly	Affects activity moderately	Affects activity severely	Prevent me from all daily activity
Pain						
Grinding or Grating						
Stiffness						
Swelling						
Slipping or Partial Giving Way of Knee						
Buckling or Full Giving Way of Knee						
Weakness						
Limping						

How does your knee affect your ability to…(check one answer on each line)

	Not difficult at all	Minimally difficult	Somewhat difficult	Fairly difficult	Very difficult	Unable to do
Walk						
Go up stairs						
Go down stairs						
Stand						
Kneel on the front of your knee						
Squat						
Sit with your knee bent						
Rise from a chair						

Section 3: To be completed by physical therapist/provider

SCORE:_____/80 x 100 _____% (SEM 9.7, MDC 8.4) **Initial** **FU ___ weeks** **Discharge**

Number of treatment sessions:_____ **Gender:** Male Female

Diagnosis/ICD-9 Code:_____

[1] adapted from Irrgang JJ, et al. Development of a patient-reported measure of function of the knee. J Bone Joint Surg Am. 1998; 80: 1132-1145.[Prepared Mar 00]

Knee Outcome Survey
Activities of Daily Living Scale

Instructions:

The following questionnaire is designed to determine the symptoms and limitations that you experience because of your knee while you perform your usual daily activities. Please answer each question by **checking the one statement that best describes you over the last 1 to 2 days**. For a given question, more than one of the statements may describe you, but please mark only the statement which best describes you during your usual daily activities.

Symptoms

To what degree does each of the following symptoms affect your level of daily activity? (check one answer on each line)

	5	4	3	2	1	0
	I Do Not Have the Symptom	**I Have the Symptom But It Does Not Affect My Activity**	**The Symptom Affects My Activity Slightly**	**The Symptom Affects My Activity Moderately**	**The Symptom Affects My Activity Severely**	**The Symptom Prevents Me From All Daily Activities**
Pain	☐	☐	☐	☐	☐	☐
Stiffness	☐	☐	☐	☐	☐	☐
Swelling	☐	☐	☐	☐	☐	☐
Giving Way, Buckling or Shifting of Knee	☐	☐	☐	☐	☐	☐
Weakness	☐	☐	☐	☐	☐	☐
Limping	☐	☐	☐	☐	☐	☐

Functional Limitations with Activities of Daily Living

How does your knee affect your ability to… (check one answer on each line)

	Activity Is Not Difficult	Activity is Minimally Difficult	Activity is Somewhat Difficult	Activity is Fairly Difficult	Activity is Very Difficult	I am Unable to Do the Activity
Walk?	☐	☐	☐	☐	☐	☐
Go up stairs?	☐	☐	☐	☐	☐	☐
Go down stairs?	☐	☐	☐	☐	☐	☐
Stand?	☐	☐	☐	☐	☐	☐
Kneel on the front of your knee?	☐	☐	☐	☐	☐	☐
Squat?	☐	☐	☐	☐	☐	☐
Sit with your knee bent?	☐	☐	☐	☐	☐	☐
Rise from a chair?	☐	☐	☐	☐	☐	☐

How would you rate the current function of your knee during your usual daily activities on a scale from 0 to 100 with 100 being your level of knee function prior to your injury and 0 being the inability to perform any of your usual daily activities?

_____ (Input score [number 1-100])

How would you rate the overall function of your knee during your usual daily activities? (please check the one response that best describes you)

- ☐ normal - 4
- ☐ nearly normal - 3
- ☐ abnormal - 2
- ☐ severely abnormal - 1

As a result of your knee injury, how would you rate your current level of daily activity? (please check the one response that best describes you)

- ☐ normal
- ☐ nearly normal
- ☐ abnormal
- ☐ severely abnormal

Knee Outcome Survey
Sports Activities Scale

Instructions:

The following questionnaire is designed to determine the symptoms and limitations that you experience because of your knee while you perform sports activities. Please answer each question by **checking the one statement that best describes you over the last 1 to 2 days**. For a given question, more than one of the statements may describe you, but please mark only the statement which best describes you when you participate in sports activities.

Symptoms

To what degree does each of the following symptoms affect your level of sports activity? (check one answer on each line)

	Never Have	**Have, But Does Not Affect Sports Activity**	**Affects Sports Activity Slightly**	**Affects Sports Activity Moderately**	**Affects Sports Activity Severely**	**Prevents Me From All Sports Activity**
Pain	☐	☐	☐	☐	☐	☐
Grinding or Grating	☐	☐	☐	☐	☐	☐
Stiffness	☐	☐	☐	☐	☐	☐
Swelling	☐	☐	☐	☐	☐	☐
Slipping or Partial Giving Way of Knee	☐	☐	☐	☐	☐	☐
Buckling or Full Giving Way of Knee	☐	☐	☐	☐	☐	☐
Weakness	☐	☐	☐	☐	☐	☐

Functional Limitations with Sports Activities

How does your knee affect your ability to… (check one answer on each line)

	Not Difficult at All	Minimally Difficult	Somewhat Difficult	Fairly Difficult	Very Difficult	Unable to Do
Run straight ahead?	☐	☐	☐	☐	☐	☐
Jump and land on your involved leg?	☐	☐	☐	☐	☐	☐
Stop and start quickly?	☐	☐	☐	☐	☐	☐
Cut and pivot on your involved leg?	☐	☐	☐	☐	☐	☐

How would you rate the current function of your knee during sports activities on a scale from 0 to 100 with 100 being your level of knee function prior to your injury and 0 being the inability to perform any sports activities?

_____
_____

How would you rate the overall function of your knee during sports activities? (please check the one response that best describes you)

- ☐ normal
- ☐ nearly normal
- ☐ abnormal
- ☐ severely abnormal

As a result of your knee problem, how would you rate your current level of activity during sports?
(please check the one response that best describes you)

- ☐ normal
- ☐ nearly normal
- ☐ abnormal
- ☐ severely abnormal

Changes in Sports Activity

Describe your highest level of sports activity at each of the following points in time. (check one answer on each line)

	Strenuous Sports (ex. football, soccer, basketball)	**Moderate Sports (ex. tennis, skiing)**	**Light Sports (ex. cycling, swimming, golf)**	**No Sports Activities Possible**
Prior to your knee injury	☐	☐	☐	☐
Prior to treatment of your knee injury	☐	☐	☐	☐
Currently	☐	☐	☐	☐

Describe the frequency that you participated in sports activity at each of the following points in time. (check one answer on each line)

	4 to 7 Times per Week	**1 to 3 Times per Week**	**1 to 3 Times per Month**	**Less Than 1 Time per Month**
Prior to your knee injury	☐	☐	☐	☐
Prior to treatment of your knee injury	☐	☐	☐	☐
Currently	☐	☐	☐	☐

Knee Outcome Survey
Sports Activities Scale

Instructions:

The following questionnaire is designed to determine the symptoms and limitations that you experience because of your knee while you perform sports activities. Please answer each question by **checking the one statement that best describes you over the last 1 to 2 days**. For a given question, more than one of the statements may describe you, but please mark only the statement which best describes you when you participate in sports activities.

Symptoms

To what degree does each of the following symptoms affect your level of sports activity? (check one answer on each line)

	5	4	3	2	1	0
	Never Have	**Have, But Does Not Affect Sports Activity**	**Affects Sports Activity Slightly**	**Affects Sports Activity Moderately**	**Affects Sports Activity Severely**	**Prevents Me From All Sports Activity**
Pain	☐	☐	☐	☐	☐	☐
Grinding or Grating	☐	☐	☐	☐	☐	☐
Stiffness	☐	☐	☐	☐	☐	☐
Swelling	☐	☐	☐	☐	☐	☐
Slipping or Partial Giving Way of Knee	☐	☐	☐	☐	☐	☐
Buckling or Full Giving Way of Knee	☐	☐	☐	☐	☐	☐
Weakness	☐	☐	☐	☐	☐	☐

Functional Limitations with Sports Activities

How does your knee affect your ability to… (check one answer on each line)

	Not Difficult at All	Minimally Difficult	Somewhat Difficult	Fairly Difficult	Very Difficult	Unable to Do
Run straight ahead?	☐	☐	☐	☐	☐	☐
Jump and land on your involved leg?	☐	☐	☐	☐	☐	☐
Stop and start quickly?	☐	☐	☐	☐	☐	☐
Cut and pivot on your involved leg?	☐	☐	☐	☐	☐	☐

How would you rate the current function of your knee during sports activities on a scale from 0 to 100 with 100 being your level of knee function prior to your injury and 0 being the inability to perform any sports activities?

_____ (Input score [number 1-100])

How would you rate the overall function of your knee during sports activities? (please check the one response that best describes you)

- ☐ normal - 4
- ☐ nearly normal - 3
- ☐ abnormal -2
- ☐ severely abnormal - 1

As a result of your knee problem, how would you rate your current level of activity during sports?
(please check the one response that best describes you)

- ☐ normal
- ☐ nearly normal
- ☐ abnormal
- ☐ severely abnormal

Changes in Sports Activity

Describe your highest level of sports activity at each of the following points in time. (check one answer on each line)

	Strenuous Sports (ex. football, soccer, basketball)	**Moderate Sports (ex. tennis, skiing)**	**Light Sports (ex. cycling, swimming, golf)**	**No Sports Activities Possible**
Prior to your knee injury	☐	☐	☐	☐
Prior to treatment of your knee injury	☐	☐	☐	☐
Currently	☐	☐	☐	☐

Describe the frequency that you participated in sports activity at each of the following points in time. (check one answer on each line)

	4 to 7 Times per Week	**1 to 3 Times per Week**	**1 to 3 Times per Month**	**Less Than 1 Time per Month**
Prior to your knee injury	☐	☐	☐	☐
Prior to treatment of your knee injury	☐	☐	☐	☐
Currently	☐	☐	☐	☐

Western Ontario and McMaster Universities (WOMAC) Osteoarthritis Index

Section A
INSTRUCTIONS TO PATIENTS

The following questions concern the amount of pain you have experienced due to arthritis in your knee joint(s). For each situation please enter the amount of pain experienced in the last 48 hours. (Please mark your answers with and "X".)

QUESTION: How much pain do you have?

1. Walking on a flat surface.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

2. Going up or down stairs.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

3. At night while in bed.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

4. Sitting or lying.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

5. Standing upright.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

Section B
INSTRUCTIONS TO PATIENTS

The following questions concern the amount of joint stiffness (not pain) you have experienced in the last 48 hours in your knee joint(s). Stiffness is a sensation of restriction or slowness in the ease with which you move your joints. (Please mark your answers with and "X".)

6. How severe is your stiffness after first wakening in the morning?

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

7. How severe is your stiffness after sitting, lying or resting later in the day?

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

Section C
INSTRUCTIONS TO PATIENTS

The following questions concern your physical function. By this we mean your ability to move around and to look after yourself. For each of the following activities, please indicate the degree of difficulty you have experienced in the last 48 hours due to arthritis in you knee joint(s). (Please mark your answers with and "X".)

QUESTION: What degree of difficulty do you have?

8. Descending stairs.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

9. Ascending stairs.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

10. Rising from sitting.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

11. Standing.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

12. Bending to floor.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

13. Walking on flat.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

14. Getting in/out of car.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

15. Going shopping.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

16. Putting on socks/stockings.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

17. Rising from bed.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

18. Taking off socks/stockings.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

19. Lying in bed.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

20. Getting in/out of bath.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

21. Sitting.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

22. Getting on/off toilet.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

23. Heavy domestic duties.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

24. Light domestic duties.

None	Mild	Moderate	Severe	Extreme
□	□	□	□	□

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The Western Ontario and McMaster Universities (WOMAC) Osteoarthritis Index is a disease-specific, self-administered, health status measure. It probes clinically-important symptoms in the areas of pain, stiffness and physical function in patients with osteoarthritis of the hip and/or knee. The index consists of 24 questions (5 pain, 2 stiffness and 17 physical function) and can be completed in less than 5 minutes. The WOMAC is a valid, reliable and sensitive instrument for the detection of clinically important changes in health status following a variety of interventions (pharmacologic, surgical, physiotherapy, etc.).

Individual question responses are assigned a score of between 0 (extreme) and 4 (None). Individual question scores are then summed to form a raw score ranging from 0 (worst) to 96 (best). Finally, raw scores are normalized by multiplying each score by 100/96. This produces a reported WOMAC Score of between 0 (worst) to 100 (best).

The WOMAC categories are:
(1) Severity, on average, during the past month, of:
Pain - Walking
Pain - Stair climbing
Pain - Nocturnal
Pain - Rest
Pain - Weightbearing
Morning Stiffness
Stiffness occurring during the day

(2) Level of difficulty performing the following functions:
Descending stairs
Ascending stairs
Rising from sitting
Standing
Bending to the floor
Walking on flat
Getting in/out of a car
Going shopping
Putting on socks
Rising from bed
Taking off socks
Lying in bed
Getting in/out of bath
Sitting
Getting on/off toilet
Heavy domestic duties
Light domestic duties

The WOMAC parameters are:
0 - none, 1 - slight, 2 - moderate, 3 - severe, 4 - extreme
The index is out of a total of 96 possible points, with 0 being the best and 96 being the worst.

Scoring the WOMAC

0	1	2	3	4
None	Mild	Moderate	Severe	Extreme

Hip Outcome Score (HOS)
Activity of Daily Living Scale

Please answer **every question** with one response that most closely describes to your condition within the past week.
If the activity in question is limited by something other than your hip mark not applicable (N/A).

	No difficulty at all	Slight difficulty	Moderate difficulty	Extreme difficulty	Unable to do	N/A
Standing for 15 minutes	☐	☐	☐	☐	☐	☐
Getting into and out of an average car	☐	☐	☐	☐	☐	☐
Putting on socks and shoes	☐	☐	☐	☐	☐	☐
Walking up steep hills	☐	☐	☐	☐	☐	☐
Walking down steep hills	☐	☐	☐	☐	☐	☐
Going up 1 flight of stairs	☐	☐	☐	☐	☐	☐
Going down 1 flight of stairs	☐	☐	☐	☐	☐	☐
Stepping up and down curbs	☐	☐	☐	☐	☐	☐
Deep squatting	☐	☐	☐	☐	☐	☐
Getting into and out of a bath tub	☐	☐	☐	☐	☐	☐
Sitting for 15 minutes	☐	☐	☐	☐	☐	☐
Walking initially	☐	☐	☐	☐	☐	☐
Walking approximately 10 minutes	☐	☐	☐	☐	☐	☐
Walking 15 minutes or greater	☐	☐	☐	☐	☐	☐

Because of your hip how much difficulty do you have with:

	No difficulty at all	Slight difficulty	Moderate difficulty	Extreme difficulty	Unable to do	N/A
Twisting/pivoting on involved leg	□	□	□	□	□	□
Rolling over in bed	□	□	□	□	□	□
Light to moderate work (standing, walking)	□	□	□	□	□	□
Heavy work (push/pulling, climbing, carrying)	□	□	□	□	□	□
Recreational activities	□	□	□	□	□	□

How would you rate your current level of function during your usual activities of daily living from 0 to 100 with 100 being your level of function prior to your hip problem and 0 being the inability to perform any of your usual daily activities?

□□□.0 %

Hip Outcome Score (HOS)
Sports Scale

Because of your hip how much difficulty do you have with:

	No difficulty at all	Slight difficulty	Moderate difficulty	Extreme difficulty	Unable to do	N/A
Running one mile	☐	☐	☐	☐	☐	☐
Jumping	☐	☐	☐	☐	☐	☐
Swinging objects like a golf club	☐	☐	☐	☐	☐	☐
Landing	☐	☐	☐	☐	☐	☐
Starting and stopping quickly	☐	☐	☐	☐	☐	☐
Cutting/lateral movements	☐	☐	☐	☐	☐	☐
Low impact activities like fast walking	☐	☐	☐	☐	☐	☐
Ability to perform activity with your normal technique	☐	☐	☐	☐	☐	☐
Ability to participate in your desired sport as long as you would like	☐	☐	☐	☐	☐	☐

How would you rate your current level of function during your sports related activities from 0 to 100 with 100 being your level of function prior to your hip problem and 0 being the inability to perform any of your usual daily activities?

☐☐☐.0 %

How would you rate your current level of function?

☐ Normal ☐ Nearly normal ☐ Abnormal ☐ Severely abnormal

MODIFIED OSWESTRY LOW BACK PAIN DISABILITY QUESTIONNAIRE[1]

Section 1: To be completed by patient _____AD _____Non-Active Duty

Name:_____ Age:_____ Date:_____

Occupation:_____ Number of days of back pain:_____(this episode)

Section 2: To be completed by patient

This questionnaire has been designed to give your therapist information as to how your back pain has affected your ability to manage in every day life. Please answer every question by placing a mark on the line that best describes your condition today. We realize you may feel that two of the statements may describe your condition, but **please mark only the line which most closely describes your current condition**.

Pain Intensity

_____The pain is mild and comes and goes.
_____The pain is mild and does not vary much.
_____The pain is moderate and comes and goes.
_____The pain is moderate and does not vary much.
_____The pain is severe and comes and goes.
_____The pain is severe and does not vary much.

Personal Care (Washing, Dressing, etc.)

_____I do not have to change the way I wash and dress myself to avoid pain.
_____I do not normally change the way I wash or dress myself even though it causes some pain.
_____Washing and dressing increases my pain, but I can do it without changing my way of doing it.
_____Washing and dressing increases my pain, and I find it necessary to change the way I do it.
_____Because of my pain I am partially unable to wash and dress without help.
_____Because of my pain I am completely unable to wash or dress without help.

Lifting

_____I can lift heavy weights without increased pain.
_____I can lift heavy weights but it causes increased pain
_____Pain prevents me from lifting heavy weights off of the floor, but I can manage if they are conveniently positioned (ex. on a table, etc.).
_____Pain prevents me from lifting heavy weights off of the floor, but I can manage light to medium weights if they are conveniently positioned.
_____I can lift only very light weights.
_____I can not lift or carry anything at all.

Walking

_____I have no pain when walking.
_____I have pain when walking, but I can still walk my required normal distances.
_____Pain prevents me from walking long distances.
_____Pain prevents me from walking intermediate distances.
_____Pain prevents me from walking even short distances.
_____Pain prevents me from walking at all.

Sitting

_____Sitting does not cause me any pain.
_____I can only sit as long as I like providing that I have my choice of seating surfaces.
_____Pain prevents me from sitting for more than 1 hour.
_____Pain prevents me from sitting for more than 1/2 hour.
_____Pain prevents me from sitting for more than 10 minutes.
_____Pain prevents me from sitting at all.

Section 2 (con't): To be completed by patient

Standing

_____I can stand as long as I want without increased pain.
_____I can stand as long as I want but my pain increases with time.
_____Pain prevents me from standing more than 1 hour.
_____Pain prevents me from standing more than 1/2 hour.
_____Pain prevents me from standing more than 10 minutes.
_____I avoid standing because it increases my pain right away.

Sleeping

_____I get no pain when I am in bed.
_____I get pain in bed, but it does not prevent me from sleeping well.
_____Because of my pain, my sleep is only 3/4 of my normal amount.
_____Because of my pain, my sleep is only 1/2 of my normal amount.
_____Because of my pain, my sleep is only 1/4 of my normal amount.
_____Pain prevents me from sleeping at all.

Social Life

_____My social life is normal and does not increase my pain.
_____My social life is normal, but it increases my level of pain.
_____Pain prevents me from participating in more energetic activities (ex. sports, dancing, etc.)
_____Pain prevents me from going out very often.
_____Pain has restricted my social life to my home.
_____I have hardly any social life because of my pain.

Traveling

_____I get no increased pain when traveling.
_____I get some pain while traveling, but none of my usual forms of travel make it any worse.
_____I get increased pain while traveling, but it does not cause me to seek alternative forms of travel.
_____I get increased pain while traveling which causes me to seek alternative forms of travel.
_____My pain restricts all forms of travel except that which is done while I am lying down.
_____My pain restricts all forms of travel.

Employment/Homemaking

_____My normal job/homemaking activities do not cause pain.
_____My normal job/homemaking activities increase my pain, but I can still perform all that is required of me.
_____I can perform most of my job/homemaking duties, but pain prevents me from performing more physically stressful activities (ex. lifting, vacuuming)
_____Pain prevents me from doing anything but light duties.
_____Pain prevents me from doing even light duties.
_____Pain prevents me from performing any job or homemaking chores.

Section 3: To be completed by physical therapist/provider

SCORE:_____ or _____% (SEM 11, MDC 16) **Initial** **FU** _____**weeks** **Discharge**

Number of treatment sessions:_____ **Gender:** Male Female

Diagnosis/ICD-9 Code:_____

[1] adapted from Hudson-Cook N, Tomes-Nicholson K, Breen A. A revised oswestry disability questionnaire. In: Roland M, Jenner J, eds. Back Pain: New Approaches to Rehabilitation and Education. New York: Manchester University Press; 1989. p. 187-204. [Prepared May 1999]

ADMINISTERING THE OSWESTRY DISABILITY INDEX (PAIN QUESTIONNAIRE)

1. Administration of Questionnaire:

a. The Oswestry correlates with spinal mobility, muscle function and other disability indexes. Therefore, this questionnaire should be used with all patients with lumbar pain.

b. The patient completes the form on his/her own, and marks the box that best describes the situation.

2. Scoring:

a. SCORE EACH SECTION. For each section the total possible score = 5; if the **first** statement is marked, the section **score = 0**. If the **last** statement is marked, the section **score = 5**. And so on. If two responses are checked, count the box that is scored the highest. In other words, use the rating that is lower down the chart. Below is an example of the section called "Pain Intensity" with the corresponding score that should be assigned if that response is selected.

Assign score of:	Pain Intensity
0	□ I can tolerate the pain I have without having to use pain medication.
1	□ The pain is bad but I can manage without having to take pain medication.
2	□ Pain medication provides me complete relief from pain.
3	□ Pain medication provides me with moderate relief from pain.
4	□ Pain medication provides me with little relief from pain.
5	□ Pain medication has not effect on my pain.

b. Add up the individual scores for each section.

c. If all **ten** sections are completed, the score is calculated as follows:

$2 \times n =$ **____% Disability** n = total scored

OR

$\langle n \div 50 \rangle \langle 100 \rangle =$ **____% Disability** n = total scored
50 = total possible score

d. If one + sections are missed or not applicable, the score is calculated as follows:

$\langle n \div a \rangle \langle 100 \rangle =$ **____% Disability** n = total scored
a = total possible score (answered sections)

However, it is recommended the clinician always check to ensure all items are completed to minimize having to adjust the score. The interpretation of the results become less meaningful when more than 1-2 items are missing.

3. Interpretation of Score:

a. Minimal Disability = 0 - 20%

This patient is able to cope with most living activities. No particular treatment is indicated, but he/she may benefit from advice in lifting, posture, fitness, and diet. These patients are good candidates for back class, posture, and exercise education.

b. Moderate Disability = 20 - 40%

This patient can manage with conservative means of treatment. He/she may have difficulties with activities of daily living. They are prime candidates for physical therapy intervention and back class.

c. Severe Disability = 40 - 60%

This patient needs positive intervention, possibly surgery and/or rehabilitation. Every aspect of his/her life is affected, at home and at work.

d. Extreme Disability = 60 - 80%

This patient needs intensive rehabilitation efforts or surgery in order for the patient to improve and return to normal function.

e. Bed Bound or Exaggeration = 80 - 100%

4. Detecting Change: The standard error of the measurement is reported to be a score of 11 points and the minimal detectable change is 16 points.

Name:_____ **Date:**_____/_____/_____
mm dd yy

Here are some of the things other patients have told us about their pain. For each statement please circle the number from 0 to 6 to indicate how much physical activities such as bending, lifting, walking or driving affect or would affect your back pain.

	Completely Disagree			Unsure			Completely Agree
1. My pain was caused by physical activity.	0	1	2	3	4	5	6
2. Physical activity makes my pain worse.	0	1	2	3	4	5	6
3. Physical activity might harm my back.	0	1	2	3	4	5	6
4. I should not do physical activities which (might) make my pain worse.	0	1	2	3	4	5	6
5. I cannot do physical activities which (might) make my pain worse.	0	1	2	3	4	5	6

The following statements are about how your normal work affects or would affect your back pain.

	Completely Disagree			Unsure			Completely Agree
6. My pain was caused by my work or by an accident at work.	0	1	2	3	4	5	6
7. My work aggravated my pain.	0	1	2	3	4	5	6
8. I have a claim for compensation for my pain.	0	1	2	3	4	5	6
9. My work is too heavy for me.	0	1	2	3	4	5	6
10. My work makes or would make my pain worse.	0	1	2	3	4	5	6
11. My work might harm by back.	0	1	2	3	4	5	6
12. I should not do my regular work with my present pain.	0	1	2	3	4	5	6
13. I cannot do my normal work with my present pain.	0	1	2	3	4	5	6
14. I cannot do my normal work until my pain is treated.	0	1	2	3	4	5	6
15. I do not think that I will be back to my normal work within 3 months.	0	1	2	3	4	5	6
16. I do not think that I will ever be able to go back to that work.	0	1	2	3	4	5	6

FABQPA (2,3,4,5): _____/24 FABQW (6,7,9,10,11,12,15): _____/42

Facts about the FABQ

It is based on Lethem et al's and Troup et al's work. Their work basically addressed how different people respond to the fear of pain. There are basically two groups: those that confront the pain and those that try to avoid pain. Their main focus was that the patient's beliefs serve as the driving force for the behavior.

Further, Sandstrom & Esbjornson's work found that one of the most important statements in patient's ability to return towork was the following statement: "I am afraid of starting work again, because I don't think I will be able to manage" (Sound familiar?) Changing this attitude is fundamental to success with the fear-avoiding patient.

Waddell et al used this work to develop the FABQ (Fear Avoidance Beliefs Questionnaire) to help clinician predict those that tend to be fear avoiders.

This survey can help predict those that have a high pain avoidance behavior. Clinically, these people may need to be supervised more than those that confront their pain are.

For more information: Waddell: The Back Pain Revolution pp. 191-195 and Waddell et al: A fear avoidance beliefs questionnaire (FABQ) and the role of fear avoidance beliefs in chronic low back pain and disability; Pain. 1993; 52: 157-68.

Scoring the FABQ

The FABQ consists of 2 subscales, which are reflected in the division of the outcome form into 2 separate sections. The first subscale (items 1-5) is the Physical Activity subscale (FABQPA), and the second subscale (items 6-16) is the Work subscale (FABQW). Although we are only interested in the FABQW subscale for the purposes of classifying patients, all items should be completed. Interestingly, not all items contribute to the score for each subscale; however the patient should still complete all items as these items were included when the reliability and validity of the scale was initially established. Also note that there is no total score where the each subscale score is added as each subscale exists as a separate entity. The method to score each subscale is outlined below. (Note: It is extremely important to ensure all items are completed as there is no procedure to adjust for incomplete items.)

Scoring the Physical Activity subscale (FABQPA)
1. Sum items 2, 3, 4, and 5 (the score circled by the patient for these items).
2. Record this total on the form.

Scoring the Work subscale (FABQW)
1. Sum items 6, 7, 9, 10, 11, 12, and 15.
2. Record this total on the form.

Name: _____ Age: _____ Date: _____

Occupation: _____ Number of days of pain: _____ (this episode)

Read each sentence carefully. Please indicate for each of these questions which answer best describes how you have been feeling recently. For statement 5 and 7, if you are on a diet, answer as if you were not.

	Rarely or none of the time (less than 1 day per week)	Some or little of the time (1-2 days per week)	A moderate amount of time (3-4 days per week)	Most of the time (5-7 days per week)
1. I feel downhearted and sad				
2. Morning is when I feel the best				
3. I have crying spells or feel like it				
4. I have trouble getting to sleep at night				
5. I feel that nobody cares				
6. I eat as much as I used to				
7. I still enjoy sex				
8. I notice I am losing weight				
9. I have trouble with constipation				
10. My heart beats faster than usual				
11. I get tired for no reason				
12. My mind is as clear as it used to be				
13. I tend to wake up too early				
14. I find it easy to do the things I used to do				
15. I am restless and can't keep still				
16. I feel hopeful about the future				
17. I am more irritable than usual				
18. I find it easy to make a decision				
19. I feel quite guilty				
20. I feel that I am useful and needed				
21. My life is pretty full				
22. I feel that others would be better off of I were dead				
23. I am still able to enjoy the things I used to				

Modified Zung: Zung 1965, Main & Waddell 1984

Please indicate for each of these questions which answer best describes how you have been feeling recently

	Rarely or none of the time (less than 1 day per week)	Some or little of the time (1-2 days per week)	A moderate amount of time (3-4 days per week)	Most of the time (5-7 days per week)
1. I feel downhearted and sad	0	1	2	3
2. Morning is when I feel the best	3	2	1	0
3. I have crying spells or feel like it	0	1	2	3
4. I have trouble getting to sleep at night	0	1	2	3
5. I feel that nobody cares	0	1	2	3
6. I eat as much as I used to	3	2	1	0
7. I still enjoy sex	3	2	1	0
8. I notice I am losing weight	0	1	2	3
9. I have trouble with constipation	0	1	2	3
10. My heart beats faster than usual	0	1	2	3
11. I get tired for no reason	0	1	2	3
12. My mind is as clear as it used to be	3	2	1	0
13. I tend to wake up too early	0	1	2	3
14. I find it easy to do the things I used to do	3	2	1	0
15. I am restless and can't keep still	0	1	2	3
16. I feel hopeful about the future	3	2	1	0
17. I am more irritable than usual	0	1	2	3
18. I find it easy to make a decision	3	2	1	0
19. I feel quite guilty	0	1	2	3
20. I feel that I am useful and needed	3	2	1	0
21. My life is pretty full	3	2	1	0
22. I feel that others would be better off of I were dead	0	1	2	3
23. I am still able to enjoy the things I used to	3	2	1	0

Modified Zung: Zung 1965, Main & Waddell 1984

Name: _____ Age: _____ Date:_____

Occupation: _____ Number of days of pain: _____ (this episode)

Please describe how you have felt during the PAST WEEK by marking a check mark (✓) in the appropriate box. Please answer all questions. Do not think too long before answering

	Not at all	A little/ slightly	A great deal/ quite a lot	Extremely/ could not have been worse
Heart Rate Increasing				
Feeling hot all over				
Sweating all over				
Sweating in a particular part of the body				
Pulse in neck				
Pounding in head				
Dizziness				
Blurring of vision				
Feeling faint				
Everything appearing unreal				
Nausea				
Butterflies in stomach				
Pain or ache in stomach				
Stomach churning				
Desire to pass water				
Mouth becoming dry				
Difficulty swallowing				
Muscles in neck aching				
Legs feeling weak				
Muscles twitching or jumping				
Tense feeling across forehead				
Tense feeling in jaw muscles				

Please describe how you have felt during the PAST WEEK by marking a check mark (✓) in the appropriate box. Please answer all questions. Do not think too long before answering

	Not at all	A little/ slightly	A great deal/ quite a lot	Extremely/ could not have been worse
Heart Rate Increasing				
Feeling hot all over*	0	1	2	3
Sweating all over*	0	1	2	3
Sweating in a particular part of the body				
Pulse in neck				
Pounding in head				
Dizziness*	0	1	2	3
Blurring of vision*	0	1	2	3
Feeling faint*	0	1	2	3
Everything appearing unreal				
Nausea*	0	1	2	3
Butterflies in stomach				
Pain or ache in stomach*	0	1	2	3
Stomach churning*	0	1	2	3
Desire to pass water				
Mouth becoming dry*	0	1	2	3
Difficulty swallowing				
Muscles in neck aching*	0	1	2	3
Legs feeling weak*	0	1	2	3
Muscles twitching or jumping*	0	1	2	3
Tense feeling across forehead*	0	1	2	3
Tense feeling in jaw muscles				

The questionnaire as given to patients does not include the scoringOnly those items marked with an asterik (*) are scored and added to give a total score

MSPQ: Main CJ J of Psychosomatic Research 1983, 27: 503-514. Main CJ et al. Pain 1984, 2: 10-15. Main CJ et al Spine 1992, 17: 42-52

The DRAM (Distress and Risk Assessment Method) method of assessing psychologic distress (Main et al 1992)

Classification	Zung and MSPQ Scores
Normal	Modified Zung <17
At Risk	Modified Zung 17-33 and MSPQ, <13
Distressed, somatic	Modified Zung 17-33 and MSPQ, >12
Distressed, depressive	Modified Zung >33

DRAM prediction of 1 year outcome in primary care patients (based on data from Burton et al 1995)

DRAM at presentation	DRAM at 1 year		
	Normal	At Risk	Distressed
Normal (79)	87% (69)	9% (7)	4% (3)
At Risk (59)	46% (27)	44% (26)	10% (6)
Distressed (34)	18% (6)	35% (12)	47% (16)

The advantages and disadvantages of clinical interview and questionnaires (Waddell, Back Pain Revolution)

	Clinical Interview	Questionnaires
Advantages	Can be adapted to individual patient Incorporates clinical experience and judgement Link to goals for treatment	Quick, easy to administer Standardized Easy to score
Disadvantages	May be time-consuming Potential observer bias May be misleading unless skilled	Require reading and language skills Limited perspective May be too sensitive and susceptible to patient bias

Modified Zung: Zung 1965, Main & Waddell 1984

NECK DISABILITY INDEX[1]

Section 1: To be completed by patient _____AD _____Non-Active Duty

Name:_____ Age:_____ Date:_____

Occupation:_____ Number of days of neck pain:_____(this episode)

Section 2: To be completed by patient

This questionnaire has been designed to give your therapist information as to how your neck pain has affected your ability to manage in every day life. Please answer every question by placing a mark on the line that best describes your condition today. We realize you may feel that two of the statements may describe your condition, but **please mark only the line which most closely describes your current condition**.

Pain Intensity

_____I have no pain at the moment.
_____The pain is very mild at the moment.
_____The pain is moderate at the moment.
_____The pain is fairly severe at the moment.
_____The pain is very severe at the moment.
_____The pain is the worst imaginable at the moment.

Personal Care (Washing, Dressing, etc.)

_____I do not have to change the way I wash and dress myself to avoid pain.
_____I do not normally change the way I wash or dress myself even though it causes some pain.
_____Washing and dressing increases my pain, but I can do it without changing my way of doing it.
_____Washing and dressing increases my pain, and I find it necessary to change the way I do it.
_____Because of my pain I am partially unable to wash and dress without help.
_____Because of my pain I am completely unable to wash or dress without help.

Lifting

_____I can lift heavy weights without increased pain.
_____I can lift heavy weights but it causes increased pain
_____Pain prevents me from lifting heavy weights off of the floor, but I can manage if they are conveniently positioned (ex. on a table, etc.).
_____Pain prevents me from lifting heavy weights off of the floor, but I can manage light to medium weights if they are conveniently positioned.
_____I can lift only very light weights.
_____I can not lift or carry anything at all.

Reading

_____I can read as much as I want to with no pain in my neck.
_____I can read as much as I want to with slight pain in my neck.
_____I can read as much as I want with moderate pain in my neck.
_____I can't read as much as I want because of moderate pain in my neck.
_____I can hardly read at all because of severe pain in my neck.
_____I cannot read at all.

Headache

_____I have no headache at all.
_____I have slight headaches which come infrequently.
_____I have moderate headaches which come infrequently.
_____I have moderate headaches which come frequently.
_____I have severe headaches which come frequently.
_____I have headaches almost all the time.

(Don't forget to fill out the back side)

Section 2 (con't): To be completed by patient

Concentration

_____I can concentrate fully when I want to with no difficulty.
_____I can concentrate fully when I want to with slight difficulty.
_____I have a fair degree of difficulty in concentrating when I want to.
_____I have a lot of difficulty in concentrating when I want to.
_____I have a great deal of difficulty in concentrating when I want to.
_____I cannot concentrate at all.

Work

_____I can do as much as I want to.
_____I can only do my usual work but no more.
_____I can do most of my usual work, but no more.
_____I cannot do my usual work.
_____I can hardly do any work at all.
_____I can't do any work at all.

Driving

_____I can drive my car without any neck pain.
_____I can drive my car as long as I want with slight pain in my neck.
_____I can drive my car as long as I want with moderate pain in my neck.
_____I can't drive my car as long as I want because of moderate pain in my neck.
_____I can hardly drive at all because of severe pain in my neck.
_____I can't drive my car at all.

Sleeping

_____I have no trouble sleeping.
_____My sleep is slightly disturbed (less than 1 hour sleep loss).
_____My sleep is mildly disturbed (1-2 hour sleep loss).
_____My sleep is moderately disturbed (2-3 hours sleep loss).
_____My sleep is greatly disturbed (3-5 hours sleep loss).
_____My sleep is completely disturbed (5-7 hours sleep loss).

Recreation

_____I am able to engage in all my recreational activities with no neck pain at all.
_____I am able to engage in all my recreational activities with some pain in my neck.
_____I am able to engage in most but not all of my usual recreational activities because of pain in my neck.
_____I am able to engage in a few of my usual recreational activities because of pain in my neck.
_____I can hardly do any recreational activities because of pain in my neck.
_____ I can't do any recreational activities at all.

Section 3: To be completed by physical therapist/provider

SCORE:_____out of 50 (SEM 5, MDC 7) **Initial** **F/U ___ weeks** **Discharge**

Number of treatment sessions:_____ **Gender:** Male Female

Diagnosis/ICD-9 Code:_____

[1] Adapted from Vernon H, Mior S. The Neck Disability Indes: A Study of Reliability and Validitiy. Journal of Manipulative and Physiological Therapeutics 1991; 14(7): 409-415.

NDI SCORING

The NDI is a modification of the Oswestry Low Back Pain Disability Index. The NDI can be scored as raw score (Vernon, 1991) or doubled, and expressed as a percent (Riddle, 1998). Each section is scored on a 0-5 scale, with the first statement being “0” (ie. No pain) and the last statement being “5” (ie. Worst imaginable pain). A higher score indicates more patient-rated disability. There is no statement in the original literature on how to handle missing data. To use the NDI for patient decisions, a clinically important change was calculated as 5 points, with a sensitivity of 0.78 and a specificity of 0.80 (Stratford, 1999).

Vernon H, Mior S. The neck disability index: a study of reliability and validity. J Manip Physiol Ther 1991; 14:407-415.

Riddle DL, Stratford PW. Use of Generic versus region specific functional status measures on patients with cervical spine disorders. Phys Ther 1998; 78:951-963.

Stratford PW. Riddle DL. Binkley JM. Spadoni G. Westaway MD. Padfield B. Using the neck disability index to make decisions concerning individual patients. Physiotherapy Canada, 107-112, 1999.

Shoulder Pain and Disability Index[1]

Section 1: To be completed by patient _____AD _____Non-Active Duty

Name:_____ Age:_____ Date:_____

Occupation:_____ Number of days of shoulder pain:_____(this episode)

Section 2: To be completed by patient

This questionnaire has been designed to give your therapist information as to how your shoulder pain has affected your ability to manage in every day life. For the following questions, we would like you to score each question on a scale from 0 (no pain) to 10 (worst pain imaginable) that best describes your shoulder over the past **WEEK**. Please read each question and place a number from 0-10 in the corresponding box.

Pain Scale: 0= No Pain 10=Worst Pain Imaginable

	1.	At its worst?		
	2.	When lying on the involved side?		
	3.	Reaching for something on a high self?		
	4.	Touching the back of your neck?		
	5.	Pushing with the involved arm?		

Over the last **WEEK**, how much difficulty did you have?

Disability Scale: 0= No Difficulty 10= So Difficult it Requires Help

	6.	Washing your hair?		
	7.	Washing your back?		
	8.	Putting on an undershirt or pullover/sweater?		
	9.	Putting on a shirt that buttons down the front?		
	10.	Putting on your pants?		
	11.	Placing an object on a high shelf?		
	12.	Carrying a heavy object of 10 pounds?		
	13.	Removing something from your back pocket?		

Section 3: To be completed by physical therapist/provider

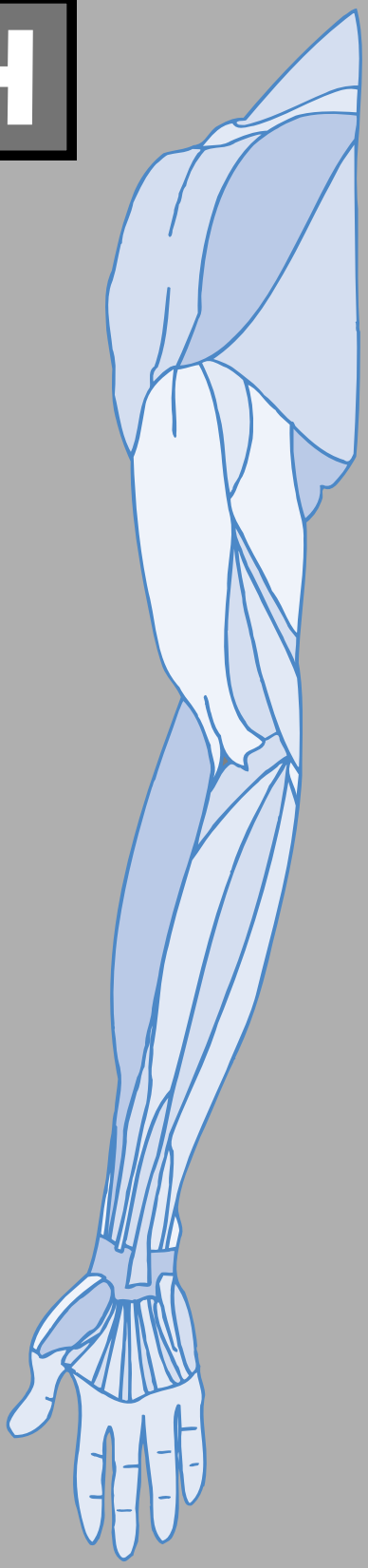
SCORE:_____ **Initial** **F/U at ___ wks** **Discharge**

Number of treatment sessions:_____ **Gender:** Male Female

Diagnosis/ICD-9 Code:_____

[1] Adapted from Williams JW: Measuring function with the shoulder pain and disability index. J of Rheumatology 1995; 22:4: 727-32.

THE DASH



INSTRUCTIONS

This questionnaire asks about your symptoms as well as your ability to perform certain activities.

Please answer *every question*, based on your condition in the last week, by circling the appropriate number.

If you did not have the opportunity to perform an activity in the past week, please make your *best estimate* on which response would be the most accurate.

It doesn't matter which hand or arm you use to perform the activity; please answer based on your ability regardless of how you perform the task.

Disabilities of the Arm, Shoulder and Hand

Please rate your ability to do the following activities in the last week by circling the number below the appropriate response.

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. Open a tight or new jar.	1	2	3	4	5
2. Write.	1	2	3	4	5
3. Turn a key.	1	2	3	4	5
4. Prepare a meal.	1	2	3	4	5
5. Push open a heavy door.	1	2	3	4	5
6. Place an object on a shelf above your head.	1	2	3	4	5
7. Do heavy household chores (e.g., wash walls, wash floors).	1	2	3	4	5
8. Garden or do yard work.	1	2	3	4	5
9. Make a bed.	1	2	3	4	5
10. Carry a shopping bag or briefcase.	1	2	3	4	5
11. Carry a heavy object (over 10 lbs).	1	2	3	4	5
12. Change a lightbulb overhead.	1	2	3	4	5
13. Wash or blow dry your hair.	1	2	3	4	5
14. Wash your back.	1	2	3	4	5
15. Put on a pullover sweater.	1	2	3	4	5
16. Use a knife to cut food.	1	2	3	4	5
17. Recreational activities which require little effort (e.g., cardplaying, knitting, etc.).	1	2	3	4	5
18. Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.).	1	2	3	4	5
19. Recreational activities in which you move your arm freely (e.g., playing frisbee, badminton, etc.).	1	2	3	4	5
20. Manage transportation needs (getting from one place to another).	1	2	3	4	5
21. Sexual activities.	1	2	3	4	5

Disabilities of the Arm, Shoulder and Hand

	NOT AT ALL	SLIGHTLY	MODERATELY	QUITE A BIT	EXTREMELY
22. During the past week, *to what extent* has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups? *(circle number)*	1	2	3	4	5

	NOT LIMITED AT ALL	SLIGHTLY LIMITED	MODERATELY LIMITED	VERY LIMITED	UNABLE
23. During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem? *(circle number)*	1	2	3	4	5

Please rate the severity of the following symptoms in the last week. *(circle number)*

	NONE	MILD	MODERATE	SEVERE	EXTREME
24. Arm, shoulder or hand pain.	1	2	3	4	5
25. Arm, shoulder or hand pain when you performed any specific activity.	1	2	3	4	5
26. Tingling (pins and needles) in your arm, shoulder or hand.	1	2	3	4	5
27. Weakness in your arm, shoulder or hand.	1	2	3	4	5
28. Stiffness in your arm, shoulder or hand.	1	2	3	4	5

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	SO MUCH DIFFICULTY THAT I CAN'T SLEEP
29. During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand? *(circle number)*	1	2	3	4	5

	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
30. I feel less capable, less confident or less useful because of my arm, shoulder or hand problem. *(circle number)*	1	2	3	4	5

DASH DISABILITY/SYMPTOM SCORE = $\left[\frac{(\text{sum of n responses})}{n} - 1\right] \times 25$, where n is equal to the number of completed responses.

A DASH score may <u>not</u> be calculated if there are greater than 3 missing items.

DISABILITIES OF THE ARM, SHOULDER AND HAND

WORK MODULE (OPTIONAL)

The following questions ask about the impact of your arm, shoulder or hand problem on your ability to work (including homemaking if that is your main work role).

Please indicate what your job/work is:_____

❒ I do not work. (You may skip this section.)

Please circle the number that best describes your physical ability in the past week. Did you have any difficulty:

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. using your usual technique for your work?	1	2	3	4	5
2. doing your usual work because of arm, shoulder or hand pain?	1	2	3	4	5
3. doing your work as well as you would like?	1	2	3	4	5
4. spending your usual amount of time doing your work?	1	2	3	4	5

SPORTS/PERFORMING ARTS MODULE (OPTIONAL)

The following questions relate to the impact of your arm, shoulder or hand problem on playing *your musical instrument or sport or both*.
If you play more than one sport or instrument (or play both), please answer with respect to that activity which is most important to you.

Please indicate the sport or instrument which is most important to you:_____

❑ I do not play a sport or an instrument. (You may skip this section.)

Please circle the number that best describes your physical ability in the past week. Did you have any difficulty:

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. using your usual technique for playing your instrument or sport?	1	2	3	4	5
2. playing your musical instrument or sport because of arm, shoulder or hand pain?	1	2	3	4	5
3. playing your musical instrument or sport as well as you would like?	1	2	3	4	5
4. spending your usual amount of time practising or playing your instrument or sport?	1	2	3	4	5

SCORING THE OPTIONAL MODULES: Add up assigned values for each response; divide by 4 (number of items); subtract 1; multiply by 25.
An optional module score may <u>not</u> be calculated if there are any missing items.

INSTITUTE FOR WORK & HEALTH
INSTITUT DE RECHERCHE SUR LE TRAVAIL ET LA SANTÉ

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THE QuickDASH OUTCOME MEASURE

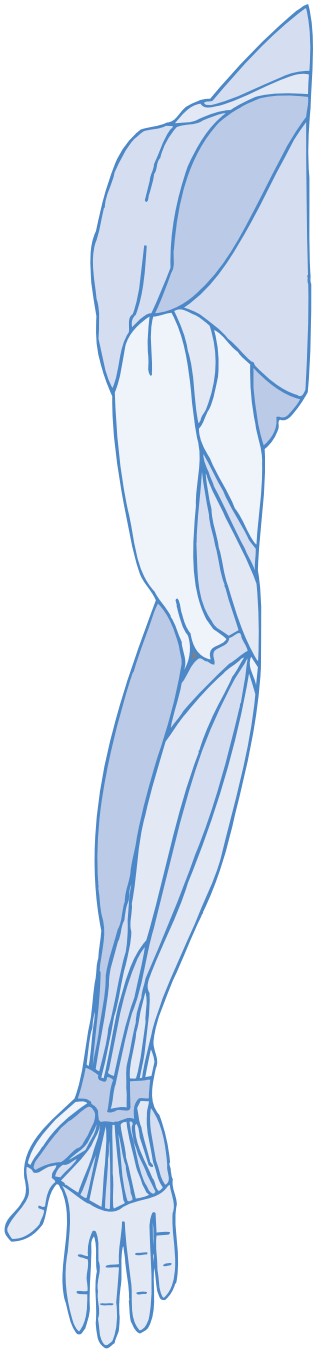
INSTRUCTIONS

This questionnaire asks about your symptoms as well as your ability to perform certain activities.

Please answer *every question*, based on your condition in the last week, by circling the appropriate number.

If you did not have the opportunity to perform an activity in the past week, please make your *best estimate* of which response would be the most accurate.

It doesn't matter which hand or arm you use to perform the activity; please answer based on your ability regardless of how you perform the task.



*Quick*DASH

Please rate your ability to do the following activities in the last week by circling the number below the appropriate response.

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. Open a tight or new jar.	1	2	3	4	5
2. Do heavy household chores (e.g., wash walls, floors).	1	2	3	4	5
3. Carry a shopping bag or briefcase.	1	2	3	4	5
4. Wash your back.	1	2	3	4	5
5. Use a knife to cut food.	1	2	3	4	5
6. Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.).	1	2	3	4	5

	NOT AT ALL	SLIGHTLY	MODERATELY	QUITE A BIT	EXTREMELY
7. During the past week, *to what extent* has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups?	1	2	3	4	5

	NOT LIMITED AT ALL	SLIGHTLY LIMITED	MODERATELY LIMITED	VERY LIMITED	UNABLE
8. During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem?	1	2	3	4	5

Please rate the severity of the following symptoms in the last week. *(circle number)*	NONE	MILD	MODERATE	SEVERE	EXTREME
9. Arm, shoulder or hand pain.	1	2	3	4	5
10. Tingling (pins and needles) in your arm, shoulder or hand.	1	2	3	4	5

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	SO MUCH DIFFICULTY THAT I CAN'T SLEEP
11. During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand? *(circle number)*	1	2	3	4	5

*Quick*DASH DISABILITY/SYMPTOM SCORE = $\left(\left[\frac{\text{sum of n responses}}{n}\right] - 1\right) \times 25$, where n is equal to the number of completed responses.

A *Quick*DASH score may <u>not</u> be calculated if there is greater than 1 missing item.

WORK MODULE (OPTIONAL)

The following questions ask about the impact of your arm, shoulder or hand problem on your ability to work (including homemaking if that is your main work role).

Please indicate what your job/work is:_____

❒ I do not work. (You may skip this section.)

Please circle the number that best describes your physical ability in the past week.

Did you have any difficulty:	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. using your usual technique for your work?	1	2	3	4	5
2. doing your usual work because of arm, shoulder or hand pain?	1	2	3	4	5
3. doing your work as well as you would like?	1	2	3	4	5
4. spending your usual amount of time doing your work?	1	2	3	4	5

SPORTS/PERFORMING ARTS MODULE (OPTIONAL)

The following questions relate to the impact of your arm, shoulder or hand problem on playing *your musical instrument or sport or both*. If you play more than one sport or instrument (or play both), please answer with respect to that activity which is most important to you.

Please indicate the sport or instrument which is most important to you:_____

❒ I do not play a sport or an instrument. (You may skip this section.)

Please circle the number that best describes your physical ability in the past week.

Did you have any difficulty:	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. using your usual technique for playing your instrument or sport?	1	2	3	4	5
2. playing your musical instrument or sport because of arm, shoulder or hand pain?	1	2	3	4	5
3. playing your musical instrument or sport as well as you would like?	1	2	3	4	5
4. spending your usual amount of time practising or playing your instrument or sport?	1	2	3	4	5

SCORING THE OPTIONAL MODULES: Add up assigned values for each response; divide by 4 (number of items); subtract 1; multiply by 25.
An optional module score may <u>not</u> be calculated if there are any missing items.

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Fibromyalgia Impact Questionnaire

1. Were you able to:	Always	Most Times	Occasion-ally	Never
a. Do shopping	0	1	2	3
b. Do laundry with a washer and dryer	0	1	2	3
c. Prepare meals	0	1	2	3
d. Wash dishes/cooking utensils by hand	0	1	2	3
e. Vacuum a rug	0	1	2	3
f. Make beds	0	1	2	3
g. Walk several blocks	0	1	2	3
h. Visit friends/relatives	0	1	2	3
i. Do yard work	0	1	2	3
J. Drive a car	0	1	2	3

Subtotal: _____

2. Of the 7 days in the past week, how many days did you feel good?

1 2 3 4 5 6 7

3. How many days in the past week did you miss work because of your fibromyalgia? (If you don't have a job outside the home, leave this item blank.)

1 2 3 4 5

4. When you did go to work, how much did pain, or other symptoms of your fibromyalgia interfere with your ability to do your job?

No problem Great difficulty

1 2 3 4 5 6 7 8 9 10

5. How bad has your pain been?

No pain Very severe pain

1 2 3 4 5 6 7 8 9 10

6. How tired have you been?

No tiredness Very tired

1 2 3 4 5 6 7 8 9 10

7. How have you felt when you got up in the morning?

Awoke well rested Awoke very tired

1 2 3 4 5 6 7 8 9 10

8. How bad has your stiffness been?

No stiffness Very Stiff

1 2 3 4 5 6 7 8 9 10

9. How tense, nervous, anxious have you felt?

Not tense Very tense

1 2 3 4 5 6 7 8 9 10

10. How depressed or blue have you felt?

Not depressed Very depressed

1 2 3 4 5 6 7 8 9 10

Subtotal (not including #2 & #3): _____

Total Score (not including #2 &#3): _____/100=_____%_

HEALTH ASSESSMENT OUTCOMES INDICATORS (HAOI)

PATIENT SPECIFIC OUTCOMES TOOL

PATIENT SPECIFIC FUNCTIONAL SCALE

Patient _____ **Date_____**

Read at Baseline Examination:

I'm going to ask you to identify up to 3 important activities that you are unable to do or are having difficulty with as a result of your (problem/injury/etc). Today, are there any activities that you are unable to do or have difficulty with because of your (problem/injury/etc)? (Therapist: show scale)

Supplement: Are there any other activities that you are having just a little bit of difficulty with? For example, activities that you might assign a score of 6 or more to. List up to 2 activities.

Read at follow up visits:

When you were initially examined, you said that you had difficulty with (read all activities from list one at a time).

Today, do you still have difficulty with _____ (ask this question for each activity separately and have the patient use the scale below to provide a score.

Patient Specific Activity Scoring scheme (Point to one number):

0 1 2 3 4 5 6 7 8 9 10

Unable to perform activity

Able to perform activity at same level as before your (injury or problem)

Activity	Baseline Score	6-Week Score	1-Year Score
1.			
2.			
3.			
Average:			
Supplement 1:			
Supplement 2:			
Average:			

Modified from Binkley, J: "Outcome measures for clinical use in patients with low back pain" lecture handout; Evidence-Based Practice in the 21st Century: Application to the Low Back Pain Patient, Denver, CO; April, 2000.

PATIENT SPECIFIC FUNCTIONAL SCALE

Note: To make this scale most useful, you want to be as specific as possible.

Here's an example:

1. PT: Read text from the PSFS:
    a. Patient response: "I cannot stand for long periods of time",
        i. PT: How Long?
        ii. Patient: "10 minutes is my max"
        iii. PT: Please point to the number that best describes your ability to stand for 10 minutes"
        iv. Patient: "6"
        v. PT: Clarify that with 0 = unable to perform the activity and a 10= able to perform at the same level as before the LSS, the sub. rates standing for <u>10 minutes</u> as a 6
        vi. At subsequent testing periods, the subject will be asked to rate his/her ability to stand for specifically <u>10 minutes</u>
    b. Patient: : "I have difficulty walking"
        i. PT: How far can you walk?
        ii. Patient: I can walk one block
        iii. PT: Please point to the number that best describes your ability to walk one block
        iv. Patient: points to a 4
        v. PT: Clarify that with 0 = unable to perform the activity and a 10= able to perform at the same level as before the LSS, the sub. rates walking <u>1 block</u> as a 4.

Also, it is helpful to get a spectrum of ratings. For example, if you had a couple of activities that were 0 – 5 ratings, you could then ask "are there any other activities that you are having just a little bit of difficulty with? For example, activities that you might assign a score of 6 or more to?" (or 2 or 3 to, etc).

HEALTH ASSESSMENT OUTCOMES INDICATORS (HAOI)

OTHER SCREENING FORMS
&
TOOLS

CAGE Screening Checklist for Alcoholism

One or more positive responses to the following questions can be considered a positive result to the CAGE test:

C Have you ever attempted to *cut* down on your drinking?

A Have you ever been *annoyed* by other people criticizing your drinking?

G Have you ever felt *guilty* about your drinking?

E Have you ever taken a morning *eye-opener?*

Name: _____ Age: _____ Date: _____

Occupation: _____ Number of days of pain: _____ (this episode)

Please answer the following questions. For an answer to be yes it should be a symptom that has
Been present nearly every day for at least two weeks and represent a marked change from previous functioning

Symptoms	Yes = 1	No = 2
1. Depressed mood.		
2. Markedly diminished interest or pleasure in all or almost all activities.		
3. Significant (5% body weight) weight loss or gain or decrease or increase in appetite.		
4. Insomnia or hypersomnia.		
5. Psychomotor agitation or retardation.		
6. Fatigue or loss of energy.		
7. Feeling of worthlessness or inappropriate guilt.		
8. Diminished concentration or indecisiveness.		
9. Recurrent thoughts of death or suicide.		

Psychosocial Screening and Assessment Tools:
4. DSM IV Screening Checklist for Depression

Consider psychosocial factors. For a diagnosis of a major depressive episode, at least five of the symptoms listed below must be present nearly every day for at least two weeks and represent a marked change from previous functioning. At least one of the symptoms must be either (1) depressed mood, or (2) loss of interest or pleasure.

Symptoms	Yes = 1	No = 2
1. Depressed mood.		
2. Markedly diminished interest or pleasure in all or almost all activities.		
3. Significant (5% body weight) weight loss or gain or decrease or increase in appetite.		
4. Insomnia or hypersomnia.		
5. Psychomotor agitation or retardation.		
6. Fatigue or loss of energy.		
7. Feeling of worthlessness or inappropriate guilt.		
8. Diminished concentration or indecisiveness.		
9. Recurrent thoughts of death or suicide.		

CENTER OF EPIDEMIOLOGICAL STUDIES DEPRESSION (CES-D) SCALE

Subject ID #:_____ Date:_____

Below is a list of the ways you might have felt or behaved. Please fill a circle on the scale to the right of each statement to indicate the statement that best describes **how often you felt or behaved this way DURING THE PAST WEEK**. Please mark only one response per question.

DURING THE PAST WEEK:	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
1. I was bothered by things that usually don't bother me.	○	○	○	○
2. I did not feel like eating; my appetite was poor.	○	○	○	○
3. I felt that I could not shake off the blues even with help from my family or friends.	○	○	○	○
4. I felt that I was just as good as other people.	○	○	○	○
5. I had trouble keeping my mind on what I was doing.	○	○	○	○
6. I felt depressed.	○	○	○	○
7. I felt that everything I did was an effort.	○	○	○	○
8. I felt hopeful about the future.	○	○	○	○
9. I thought my life had been a failure.	○	○	○	○
10. I felt fearful.	○	○	○	○

DURING THE PAST WEEK:	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
11. My sleep was restless.	○	○	○	○
12. I was happy.	○	○	○	○
13. I talked less than usual.	○	○	○	○
14. I felt lonely.	○	○	○	○
15. People were unfriendly.	○	○	○	○
16. I enjoyed life.	○	○	○	○
17. I had crying spells.	○	○	○	○
18. I felt sad.	○	○	○	○
19. I felt that people disliked me.	○	○	○	○
20. I could not get going.	○	○	○	○

Name: _____ Age: _____Date: _____

Occupation: _____ Number of days of pain: _____ (this episode)

Please answer the following questions in regards to your current work situation:

		Almost Always	Some of the Time	Hardly Ever
1	I am satisfied that I can turn to a fellow worker for help when something is troubling me.	( )	( )	( )
2	I am satisfied with the way my fellow workers talk things over with me and share problems with me.	( )	( )	( )
3	I am satisfied that my fellow workers accept and support my new ideas or thoughts.	( )	( )	( )
4	I am satisfied with the way my fellow workers respond to my emotions, such as anger, sorrow, or laughter.	( )	( )	( )
5	I am satisfied with the way my fellow workers and I share time together.	( )	( )	( )
6	I enjoy the tasks involved in my job.	( )	( )	( )
7	I get along with my closest or immediate supervisor.	( )	( )	( )

The Modified Work APGAR Score

The modified work APGAR score assesses job task enjoyment. A low score means the patient rarely enjoys job tasks. Negative responses often indicate a higher risk of chronic back pain/disability. Items 1-5 may be omitted. Items 6 and 7 usually are the most predictive for prolonged disability in low-back pain patients.
Note the patient's response to the listed questions.

Beck Anxiety Inventory

Below is a list of common symptoms of anxiety. Please read each item in the list carefully. Indicate **how much** you have been bothered by each symptom **during the past week, including today**, by placing a mark in the corresponding box.

	Not At All	**Mildly** (It did not bother me much)	**Moderately** (It was very unpleasant but I could stand it)	**Severely** (I could barely stand it)
Numbness or tingling	☐	☐	☐	☐
Feeling hot	☐	☐	☐	☐
Wobbliness in legs	☐	☐	☐	☐
Unable to relax	☐	☐	☐	☐
Fear of worst happening	☐	☐	☐	☐
Dizzy or lightheaded	☐	☐	☐	☐
Heart pounding or racing	☐	☐	☐	☐
Unsteady	☐	☐	☐	☐
Terrified	☐	☐	☐	☐
Nervous	☐	☐	☐	☐
Feeling of choking	☐	☐	☐	☐
Hands trembling	☐	☐	☐	☐
Shaky	☐	☐	☐	☐
Fear of losing control	☐	☐	☐	☐
Difficulty breathing	☐	☐	☐	☐
Fear of dying	☐	☐	☐	☐
Scared	☐	☐	☐	☐
Indigestion or discomfort in abdomen	☐	☐	☐	☐
Faint	☐	☐	☐	☐
Face flushed	☐	☐	☐	☐
Sweating (not due to heat)	☐	☐	☐	☐

Henry-Eckert Performance Assessment Tool

The performance score will be the sum of the 3 components.
A minimum of 3 points and a maximum of 12 points is possible for each exercise.

I. Cueing

1	2	3	4
Relied on Exercise Sheet, or Maximum Verbal and/or Manual Cueing	Moderate Verbal and/or Manual Cueing	Minimum Verbal and/or Manual Cueing	No Cueing

II. Alignment

1	2	3	4
Alignment Never Established	Correct Alignment Maintained <50% of Exercise	Correct Alignment Maintained >50% of Exercise	Alignment Maintained Throughout Exercise

III. Exercise Quality

1	2	3	4
Lacks Control, Coordination And/or rhythm During Exercise	Controlled, Coordinated, and Continuous <50% of Exercise	Controlled, Coordinated, and Continuous >50% of Exercise	Controlled, Coordinated, and Continuous Throughout Exercise

Total Score = _____/12

MEDICAL RECORD-SUPPLEMENTAL MEDICAL DATA

For use of this form, see AR 40-66; the proponent agency is the Office of The Surgeon General

REPORT TITLE	**OTSG APPROVED *(Date)***
Home Exercise Program – Compliance Documentation	

Date Initiated Therapy: _____ Diagnosis: _____

Home Exercise Program

Initial Exercises:	*Exercises Added & Date:*	*Exercises Deleted & Date:*

Assessment of Compliance with Home Exercise Program:

Date:	_____	Grade:	_____	Date:	_____	Grade:	_____
Date:	_____	Grade:	_____	Date:	_____	Grade:	_____
Date:	_____	Grade:	_____	Date:	_____	Grade:	_____

Score Sheet:

100%: If the patient was able to perform all of the exercises without verbal or manual cueing, while maintaining correct alignment, performed at proper speed, and was controlled and coordinated throughout the exercise performance.

80%: If the patient was able to perform most (>80%) of the exercises independently, needed minimal verbal or manual cueing, needed minimal comments about alignment, speed, control, or coordination. Must understand the concept of all exercises.

60% If the patient was able to perform > 50% of the exercises independently, needed only minimum-moderate manual or verbal cueing, needed comments about alignment, speed, control, or coordination on > 50% of the exercises. No reliance on exercise sheet handout for recall.

40%: If the patient was able to perform 25-50% of the exercises independently, needed moderate manual or verbal cueing, needed comments about alignment, speed, control, or coordination on > 75% of the exercises. Relied on exercise sheet for recall of some of the exercises.

20%: If the patient needed verbal or manual cueing for most of the exercises, needed comments about alignment, speed, control, or coordination on most of the exercises. Relied on exercise sheet for recall of most of the exercises.

10%: If the patient started to perform exercises not given to him/her and/or had no idea of what exercise program consisted of; needed full reorientation to their program.

Adapted from the Henry-Eckert Performance Assessment Tool and the Compliance Documentation Form from Home Exercise Programs Protocol.

REVIEWED BY *(Signature & Title)*	**DEPARTMENT/SERVICE/CLINIC**	**DATE**

PATIENTS IDENTIFICATION *(For typed or written entries give: Name-last, first, middle; grade; rank; hospital or medical facility)*	☐ **HISTORY/PHYSICAL**	☐ **FLOW CHART**
	☐ **OTHER/EXAMINATION OR EXAMINATION**	☐ **OTHER *(Specify)***
	☐ **DIAGNOSTIC STUDIES**	
	☒ **TREATMENT**	

DA FORM 1 MAY 78 4700

KNEE FUNCTION ASSESSMENT

(Adapted from Roland/Morris Disability Questionnaire by Wendy S. Burke, PT, OCS)

Name:_____ Date:_____

Instructions: When your knee hurts, you may find it hard to some of the things you usually do. The list below contains some sentences people have used to describe themselves when they have knee pain. Some sentences may describe you today. When you read a sentence that describes you today, please mark it. If it does not describe you today, leave the space beside it blank. Check only sentences that describe you today.

1. ____ I stay home most of the time because of my knee
2. ____ When I sit, I change position frequently to try and get my knee comfortable
3. ____ I walk more slowly than usual because of my knee
4. ____ Because of my knee I am not doing any of the jobs that I usually do around the house
5. ____ Because of my knee I use the handrail on stairs
6. ____ Because of my knee I lie down and rest more often
7. ____ Because of my knee I have difficulty getting out of an easy chair
8. ____ I get dressed more slowly than usual because of my knee
9. ____ Because of my knee I try to get other people to do things for me
10. ____ I only stand for short periods of time because of my knee
11. ____ I find it difficult to get out of a chair because of my knee
12. ____ Because of my knee I try not to squat down
13. ____ My knee is painful almost all of the time
14. ____ Running is difficult because of my knee
15. ____ My appetite is not good because of my knee
16. ____ I have trouble putting my shoes and socks (stockings) on because of my knee
17. ____ I walk only short distances because of my knee
18. ____ I sleep less well because of my knee
19. ____ I have difficulty going up stairs because of my knee
20. ____ I sit down for most of the day because of my knee
21. ____ Because of my knee it takes me longer to get going in the mornings
22. ____ Because of my knee pain I am more irritable and bad tempered with people than usual
23. ____ Because of my knee it is difficult to go down stairs
24. ____ I need to modify my fitness activities because of my knee

FUNCTIONAL KNEE DISABILITY QUESTIONNAIRE

Please answer each of the following questions with respect to your knee complaints:

1. Which knee is the one giving you pain or difficulty? □ Left □ Right

2. Would you rate your knee pain as:
   [1] Mild
   [2] Moderate
   [3] Severe
   [4] Disabling

3. Does your knee pain interfere with:
   [1] Recreation
   [2] Walking
   [3] Work
   [4] All activity

4. When does your knee "give out" on you?
   [1] Never
   [2] Walking
   [3] Down Stairs
   [4} Up stairs

5. Does your knee pain cause you to limp?
   [1] Never
   [2] Rarely
   [3] Frequently
   [4] Constantly

6. My pain seems to come from:
   [1] I have no pain
   [2] The front of my knee
   [3] The sides of my knee
   [4] All aspects of my knee

7. My knee pain lasts:
   [1] No pain
   [2] Several minutes
   [3] Several hours
   [4] My pain is constant

8. How far can you walk?
   [1] Unlimited
   [2] Over 1 mile
   [3] Less than 1 mile
   [4] Unable

9. How far can you run?
   [1] Unlimited
   [2] Over 1 mile
   [3] Less than 1 mile
   [4] Unable

10. When squatting it hurts
   [1] Never
   [2] Only in a deep squat
   [3] With repeated squats
   [4] Unable to squat

11. I have swelling:
   [1] Never
   [2] With strenuous exercise
   [3] With light exercise
   [4] Every evening

Kurtzke Expanded Disability Status Scale (EDSS)

- ❑ 0.0 - Normal neurological exam (all grade 0 in all Functional System (FS) scores*).
- ❑ 1.0 - No disability, minimal signs in one FS* (i.e., grade 1).
- ❑ 1.5 - No disability, minimal signs in more than one FS* (more than 1 FS grade 1).
- ❑ 2.0 - Minimal disability in one FS (one FS grade 2, others 0 or 1).
- ❑ 2.5 - Minimal disability in two FS (two FS grade 2, others 0 or 1).
- ❑ 3.0 - Moderate disability in one FS (one FS grade 3, others 0 or 1) or mild disability in three or four FS (three or four FS grade 2, others 0 or 1) though fully ambulatory.
- ❑ 3.5 - Fully ambulatory but with moderate disability in one FS (one grade 3) and one or two FS grade 2; or two FS grade 3 (others 0 or 1) or five grade 2 (others 0 or 1).
- ❑ 4.0 - Fully ambulatory without aid, self-sufficient, up and about some 12 hours a day despite relatively severe disability consisting of one FS grade 4 (others 0 or 1), or combination of lesser grades exceeding limits of previous steps; able to walk without aid or rest some 500 meters.
- ❑ 4.5 - Fully ambulatory without aid, up and about much of the day, able to work a full day, may otherwise have some limitation of full activity or require minimal assistance; characterized by relatively severe disability usually consisting of one FS grade 4 (others or 1) or combinations of lesser grades exceeding limits of previous steps; able to walk without aid or rest some 300 meters.
- ❑ 5.0 - Ambulatory without aid or rest for about 200 meters; disability severe enough to impair full daily activities (e.g., to work a full day without special provisions); (Usual FS equivalents are one grade 5 alone, others 0 or 1; or combinations of lesser grades usually exceeding specifications for step 4.0).
- ❑ 5.5 - Ambulatory without aid for about 100 meters; disability severe enough to preclude full daily activities; (Usual FS equivalents are one grade 5 alone, others 0 or 1; or combination of lesser grades usually exceeding those for step 4.0).
- ❑ 6.0 - Intermittent or unilateral constant assistance (cane, crutch, brace) required to walk about 100 meters with or without resting; (Usual FS equivalents are combinations with more than two FS grade 3+).

❑ 6.5 - Constant bilateral assistance (canes, crutches, braces) required to walk about 20 meters without resting; (Usual FS equivalents are combinations with more than two FS grade 3+).

❑ 7.0 - Unable to walk beyond approximately 5 meters even with aid, essentially restricted to wheelchair; wheels self in standard wheelchair and transfers alone; up and about in wheelchair some 12 hours a day; (Usual FS equivalents are combinations with more than one FS grade 4+; very rarely pyramidal grade 5 alone).

❑ 7.5 - Unable to take more than a few steps; restricted to wheelchair; may need aid in transfer; wheels self but cannot carry on in standard wheelchair a full day; May require motorized wheelchair; (Usual FS equivalents are combinations with more than one FS grade 4+).

❑ 8.0 - Essentially restricted to bed or chair or perambulated in wheelchair, but may be out of bed itself much of the day; retains many self-care functions; generally has effective use of arms; (Usual FS equivalents are combinations, generally grade 4+ in several systems).

❑ 8.5 - Essentially restricted to bed much of day; has some effective use of arm(s); retains some self-care functions; (Usual FS equivalents are combinations, generally 4+ in several systems).

❑ 9.0 - Helpless bed patient; can communicate and eat; (Usual FS equivalents are combinations, mostly grade 4+).

❑ 9.5 - Totally helpless bed patient; unable to communicate effectively or eat/swallow; (Usual FS equivalents are combinations, almost all grade 4+).

❑ 10.0 - Death due to MS.

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*Excludes cerebral function grade 1.

Note 1: EDSS steps 1.0 to 4.5 refer to patients who are fully ambulatory and the precise step number is defined by the Functional System score(s). EDSS steps 5.0 to 9.5 are defined by the impairment to ambulation and usual equivalents in Functional Systems scores are provided.

Note 2: EDSS should not change by 1.0 step unless there is a change in the same direction of at least one step in at least one FS.

Sources: Kurtzke JF. Rating neurologic impairment in multiple sclerosis: an expanded disability status scale (EDSS). Neurology. 1983 Nov;33(11):1444-52.

Haber A, LaRocca NG. eds. Minimal Record of Disability for multiple sclerosis. New York: National Multiple Sclerosis Society; 1985.

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A Comparison of Five Low Back Disability Questionnaires: Reliability and Responsiveness
Megan Davidson and Jennifer L Keating
PHYS THER. 2002; 82:8-24.

The online version of this article, along with updated information and services, can be found online at: http://ptjournal.apta.org/content/82/1/8

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Research Report

A Comparison of Five Low Back Disability Questionnaires: Reliability and Responsiveness

Background and Purpose. The aim of this study was to examine 5 commonly used questionnaires for assessing disability in people with low back pain. The modified Oswestry Disability Questionnaire, the Quebec Back Pain Disability Scale, the Roland-Morris Disability Questionnaire, the Waddell Disability Index, and the physical health scales of the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) were compared in patients undergoing physical therapy for low back pain. **Subjects and Methods.** Patients with low back pain completed the questionnaires during initial consultation with a physical therapist and again 6 weeks later (n=106). Test-retest reliability was examined for a group of 47 subjects who were classified as "unchanged" and a subgroup of 16 subjects who were self-rated as "about the same." Responsiveness was compared using standardized response means, receiver operating characteristic curves, and the proportions of subjects who changed by at least as much as the minimum detectable change (MDC) (90% confidence interval [CI] of the standard error for repeated measures). Scale width was judged as adequate if no more than 15% of the subjects had initial scores at the upper or lower end of the scale that were insufficient to allow change to be reliably detected. **Results.** Intraclass correlation coefficients (2,1) calculated to measure reliability for the subjects who were classified as "unchanged" and those who were self-rated as "about the same" were greater than .80 for the Oswestry and Quebec questionnaires and the SF-36 Physical Functioning scale and less than .80 for the Waddell and Roland-Morris questionnaires and the SF-36 Role Limitations–Physical and Bodily Pain scales. None of the scales were more responsive than any other. **Discussion and Conclusion.** Measurements obtained with the modified Oswestry Disability Questionnaire, the SF-36 Physical Functioning scale, and the Quebec Back Pain Disability Scale were the most reliable and had sufficient width scale to reliably detect improvement or worsening in most subjects. The reliability of measurements obtained with the Waddell Disability Index was moderate, but the scale appeared to be insufficient to recommend it for clinical application. The Roland-Morris Disability Questionnaire and the Role Limitations–Physical and Bodily Pain scales of the SF-36 appeared to lack sufficient reliability and scale width for clinical application. [Davidson M, Keating JL. A comparison of five low back disability questionnaires: reliability and responsiveness. *Phys Ther.* 2002;82:8–24.]

Bone and Joint DECADE AMERICA 2000-2010

APTA is a sponsor of the Decade, an international, multidisciplinary initiative to improve health-related quality of life for people with musculoskeletal disorders.

Key Words: *Disability, Low back pain, Measurement, Questionnaire.*

Megan Davidson, Jennifer L Keating

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The restoration of normal function is considered a key outcome of physical therapy for low back problems.[1,2] Physical therapists, therefore, need measurement tools that accurately assess function and monitor change over time. Activity limitations are defined in the World Health Organization's *International Classification of Functioning, Disability and Health* [ICIDH-2] as "difficulties an individual may have in executing activities."[3] Impairments such as decreased range of movement and reduced straight leg raise can be observed by therapists. However, direct observation of activity limitation is impractical, and physical therapists often rely on clients' self-report to assess the impact of low back pain on daily activities. Physical therapists routinely collect information on activity limitations in the course of their assessments, but the data may not always be collected in a standardized format that yields a measurement with known reliability and validity.[4,5] Standardized self-report questionnaires provide a convenient method of collecting and synthesizing a large amount of information on activity limitation.[1,2]

Many questionnaires have been developed to measure activity limitations in people with low back pain, but there is little evidence that physical therapists routinely use these tools. One of the barriers to their widespread clinical use is the proliferation of similar questionnaires.[1,6,7] A search of MEDLINE and CINAHL databases, the reference lists of retrieved articles, and published compilations of outcome measures located 24 low back region-specific questionnaires. There are also a number of generic health status measures available. Region-specific questionnaires for low back pain are thought to have the advantage of containing only items that are relevant to people with low back problems, whereas generic tools can be used across a wide range of conditions.

In the study reported in this article, we judged a questionnaire as having potential clinical utility if it could be self-administered, was brief and easy to complete, was simple to score, and had not been shown to have serious floor or ceiling effects in a general ambulatory clinical population. We also wanted the questionnaire to have adequate content validity (ie, relevant ICIDH-2 categories were represented) and evidence of credible construct validity and good reliability. Five questionnaires met these criteria: the modified Oswestry Disability Questionnaire,[8,9] the Quebec Back Pain Disability Scale,[10] the Roland-Morris Disability Questionnaire,[11] the Waddell Disability Index,[12] and the physical health scales of the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36).[13,14] We limited the study to 5 questionnaires because we estimated that the questionnaires would take up to 30 minutes to complete and we felt this was the most we could expect from respondents. The SF-36 questionnaire was chosen because it is relatively brief compared with other generic questionnaires and normative data are available in many countries.[15,16] In addition, we believe that if a generic questionnaire

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Ms Davidson provided concept/research design, writing, data collection and analysis, and project management. Dr Keating provided consultation (including review of manuscript before submission).

This study was approved by the Human Ethics Committee of La Trobe University.

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can be shown to perform as well as a condition-specific questionnaire, then it becomes redundant to use both condition-specific and generic questionnaires. The selected questionnaires have also been identified by other authors[1,2,10,17–19] as suitable for use in physical therapist practice. Scores have been shown to be correlated with related variables such as pain intensity and physical impairments and have also been demonstrated to detect change in functioning over time.[10,18,20–22]

It is important that the measurement properties of questionnaires are derived from or confirmed on samples from the population on whom the measurements will be used in clinical practice.[14,23] This is particularly the case for studies of reliability and responsiveness because the results of these studies provide the information required for interpreting the scores of individuals. Client groups receiving the services of other health care professionals (eg, orthopedic surgeons) are unlikely to be representative of the population receiving physical therapy. Much of the information currently available on the reliability of measurements obtained with and responsiveness of the 5 questionnaires is from studies that drew samples from clinical populations other than patients receiving physical therapy,[8,9,11,12,14,24] from only 1 or 2 physical therapy practices or hospital departments,[17,18,25] or from both physical therapy and medical treatment centers.[10]

Little information is currently available on the reliability of measurements obtained with and responsiveness of the Quebec and Waddell questionnaires, and no studies have demonstrated the reliability of measurements obtained with and responsiveness of these 5 questionnaires when concurrently administered to clients receiving treatment from physical therapists in a range of clinical settings. The aim of this study, therefore, was to compare the reliability of measurements obtained with and responsiveness of the modified Oswestry, Quebec, Roland-Morris, and Waddell questionnaires and the SF-36 physical health scales in an ambulatory clinical population seeking physical therapy for low back pain in hospital outpatient departments, community clinics, and private practices.

High test-retest reliability coefficients have generally been reported for the scores obtained with the 5 questionnaires. For the original Oswestry questionnaire, values of $r = .99$ over 24 hours[8] and ICC=.94 over 1 to 14 days[10] are typical. Baker et al[9] reported a reliability coefficient of $r = .89$ for a same-day test-retest of the modified Oswestry questionnaire. Kopec and colleagues[10] reported the test-retest reliability for measurements obtained with the Quebec scale as ICC (2,1)=.93 over 1 to 14 days. For the Roland-Morris questionnaire, reported reliability estimates ranged from .91 for same-day administration,[11] ICC=.93 for 1 to 14 days,[10] and ICC=.86 over 3 to 6 weeks.[25] No test-retest reliability studies have been reported for the Waddell index, although one research group[12] reported interrater reliability (kappa >.60) for each of the 9 questions administered by interview. For the Physical Functioning scale of the SF-36, Kopec and colleagues[10] reported an ICC=.73 over 1 to 14 days. Patrick et al[22] reported ICCs of .89, .89, and .67 for the SF-36 Physical Functioning, Role Limitations–Physical, and Bodily Pain scales, respectively, over a period of 3 months. In those studies where test-retest reliability was evaluated over longer periods, only data from subjects who were classified as "unchanged" based on patient ratings[10,22] or patient and therapist ratings on a retrospective change scale[25] were included.

The reliability coefficient reported as a value between 0 and 1 does not allow us, in our view, to judge whether the measurement has sufficient reliability for a particular purpose. To examine the effects of intervention, a therapist needs to know when change in an observed score indicates that real change has occurred. This is called the "minimum detectable change" (MDC) and has been defined by Stratford et al[17] as the amount of change required to be 90% confident that an observed change in scores reflects real change in the underlying variable. Stratford and colleagues[17,25] have reported the MDC for the Roland-Morris questionnaire as 4 to 5 points. No authors have reported the MDC for the modified Oswestry, Quebec, and Waddell questionnaires or the SF-36 physical health scales.

No improvement can be detected for an individual who has the best possible score prior to treatment, and no worsening can be detected for an individual who has the worst possible score on a particular scale. The lowest and highest possible scores are called the "floor" and "ceiling" of the scale. McHorney and Tarlov[26] suggested that health surveys with more than 15% of respondents scoring the lowest or highest possible score initially should not be used. However, because we believe an observed change in scores must be at least equal to the MDC to be 90% confident that the observed change is not simply due to measurement error, we propose that questionnaires with more than 15% of respondents scoring within the MDC at the upper or lower end of the available range of scores should not be used. For example, we believe that if a questionnaire has a possible range in scores from 0 to 100 and an MDC of 15 points, then no more than 15% of subjects should score less than 15 or more than 85. In this way, the MDC can be useful not only for interpreting change in questionnaire scores but also for providing a benchmark for choosing a measurement tool that is practical for use with a particular clinical population. In this article, we use the

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term "scale width" to indicate the capacity of a scale to have initial scores that are far enough onto the scale to allow detection of change in scores over time.

Responsiveness refers to the ability of a measurement tool to detect meaningful change over time and is also called "sensitivity to change."[23] Many methods have been proposed to explore the responsiveness of questionnaires,[27] and all involve the administration of the questionnaire before and after a period of time (usually when the participants are receiving treatment) during which it is expected that function will improve. Methods of exploring responsiveness can be classified either as those that measure change alone (distribution-based methods) or those that measure clinically meaningful change (criterion-based methods).[27,28] Criterion-based methods require that a judgment be made as to whether clinically meaningful change has occurred over the retest period. This is often achieved by having the participants rate the overall amount of change they have experienced.[10,20,21,25]

In 3 studies,[10,20,21] various combinations of questionnaires were administered to people who were receiving physical therapy, and the questionnaires' responsiveness was studied. The Oswestry and Roland-Morris questionnaires were compared by Stratford et al[21] in Ontario, Canada, and by Beurskens et al[20] in the Netherlands. Kopec et al[10] in Quebec, Canada, examined reliability of measurements from and responsiveness of the Oswestry, Quebec, and Roland-Morris questionnaires and the SF-36 Physical Functioning scale, but only 65% of the subjects were seen by physical therapists. In all 3 studies, the questionnaires were administered on 2 occasions, and a global change scale was used as the criterion for meaningful change. Direct comparison of these 3 studies is hampered by differences in subject characteristics, the use of different retest periods, differing interventions and global change scales, and the variety of strategies for classifying subjects as "changed" or "unchanged."

Of these 3 studies, only Stratford and colleagues[21] tested whether there were differences in observed responsiveness between the questionnaires used in the study. The conclusions of the other groups of authors were based only on the rank order of the magnitude of the particular responsiveness index used. However, without statistical testing of the difference between questionnaires, it is not clear whether observed differences are likely to reflect genuine or chance variations.[27]

Method

This was a prospective, multi-site study with repeated measurements taken when subjects entered the study and 6 weeks later. Over a 5-month period, consecutive eligible patients were invited by their treating therapist to participate in the study. Patients were eligible if they were aged 18 years or older, were able to read and write English, were seeking treatment for a complaint of low back pain, and provided written informed consent. We defined *low back pain* as pain in the lumbar region with or without referral of pain to the lower extremities. Subjects were recruited from the physical therapy outpatient departments of 3 hospitals, 3 community health services, and 4 private physical therapy practices. The 10 health care agencies from which the subjects came represented, in our view, the range of settings where physical therapy services are delivered to patients with low back pain who were ambulatory and were located in urban areas of high, middle, and low socioeconomic status.

Subjects who consented to participate in the study were given a package of questionnaires at the recruitment site, with a reply paid envelope for returning the questionnaires by mail. After 6 weeks, a second set of questionnaires was sent by mail to the subjects. On both occasions, questionnaires were presented in random order as determined by a random numbers table. The battery of questionnaires were bundled together with a paper clip. The forms were scan-forms and therefore could not be stapled. Because completion of questionnaires was unsupervised, there was no way of knowing whether subjects completed the questionnaires in the order in which they were presented. A reminder was mailed if the second set of questionnaires was not returned within 10 days. A 6-week retest interval was chosen for both the reliability and responsiveness studies. We agree with other authors[22,25] who contend that the variability in scores over a typical clinical retest period is more likely to reflect true variability in scores than that found with very short retest periods. We believe that 6 weeks is commonly used in practice as a time for comprehensive reassessment of patients with low back pain, particularly if they have not resumed their normal activities.[29,30] The type and frequency of treatments applied to patients in this study were not under investigation. Subjects were recruited at the first or second consultation for their current episode of back pain, and the combination of treatment and the natural history of the condition constituted the "construct for change."[11,27] We anticipated, based on the results reported by van den Hoogen et al,[31] that many subjects would experience some improvement over a 6-week period.

Materials

We administered by mail 5 questionnaires that we believed were most likely to be useful in clinical practice. The modified version of the Oswestry Disability Questionnaire[9] does not include a reference to medications in the pain and sleeping sections and is therefore, in our

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Table 1.
Characteristics of the Oswestry Disability Questionnaire,[8,9] Quebec Back Pain Disability Scale,[10] Roland-Morris Disability Questionnaire,[11] Waddell Disability Index,[12] and Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) Physical Functioning, Role Limitations–Physical, and Bodily Pain Scales[13,14]

Questionnaire	Reference Period[a]	No. of Items in Scale	No. of Response Options	Score Range	Better Function Indicated by
Oswestry Disability Questionnaire	Not specified	10	6	0–100	Lower scores
Quebec Back Pain Disability Scale	Today	20	6	0–100	Lower scores
Roland-Morris Disability Questionnaire	Today	24	1	0–24	Lower scores
Waddell Disability Index	Since onset of back pain	9	2	0–9	Lower scores
SF-36 Physical Functioning scale	Now	10	3	0–100	Higher scores
SF-36 Role Limitations–Physical scale	Past 4 wk	4	2	0–100	Higher scores
SF-36 Bodily Pain scale	Past 4 wk	2	5 and 6	0–100	Higher scores

[a] Activity limitations experienced during this period or at this point in time.

view, more widely applicable, as not all patients will be taking medications. We used the original Roland-Morris Disability Questionnaire,[11] the final format of the Quebec Back Pain Disability Scale recommended by the developers,[10] the Waddell Disability Index wording from Delitto,[2] and the Australian version of the SF-36.[32] Characteristics of the 5 questionnaires are shown in Table 1. The Oswestry, Quebec, Roland-Morris, and Waddell questionnaires were all developed to measure activity limitation in people with low back problems and take only a few minutes to complete and score. Scores for the individual questions are summed to provide a single "index" score for each questionnaire, and higher scores indicate greater activity limitation. In contrast, the SF-36 is a generic health survey that is designed to assess health for any population and for any condition.[13–15] The SF-36 consists of 8 scales that provide a "profile" of scores, with higher scores indicating better health status. The 10-item Physical Functioning scale is used to measure activity limitations and so, to a lesser extent, does the 4-item Role Limitations–Physical scale and the 2-item Bodily Pain scale. The SF-36 takes about 10 minutes to complete, and a scoring algorithm is used to calculate scores.[32]

Questionnaire scores were calculated according to developers' instructions. For the Oswestry questionnaire, the sum of the section scores was divided by the total possible score (50 if all sections are completed), and the resulting total was multiplied by 100 to yield a percentage score. The Quebec questionnaire total score was calculated by summing the 20 individual item scores. The Roland-Morris questionnaire score was a count of the chosen items, and the Waddell questionnaire score was the sum of the "yes" responses. The scoring methods prescribed by the test developers were applied to the SF-36 Physical Functioning, Role Limitations–Physical, and Bodily Pain scales.[32]

In addition to the 5 questionnaires, demographic data and details of current and past medical history were also collected initially using the questionnaire designed for this study. At follow-up, a 7-level global change scale was included with the questionnaires. This scale asked subjects to rate the extent to which their back problem had changed over the past 6 weeks. The rating scale, previously used in a study by Patrick and colleagues,[22] had 7 response options: 1="completely gone," 2="much better," 3="better," 4="a little better," 5="about the same," 6="a little worse," and 7="much worse." Many scales have been used to rate global change, from a simple 3-level "better"/"the same"/"worse" scale[10] to a 15-level scale with 7 levels of improvement and worsening.[10,17,21] We decided to steer what we considered a middle course between a very parsimonious scale that lacked any distinction in the magnitude of change and a complex scale that subjects may have found difficult to interpret and complete without assistance. The selected rating scale had 4 levels for rating improvement but only 2 ratings of worsening. We believe this rating scale was appropriate for rating overall change for 2 reasons. First, there is no opposite of "completely gone," yet complete resolution of the problem is the optimal patient outcome. Second, we expected that few subjects would report a worsening of their problem, and therefore an additional step between "a little worse" and "much worse" was unnecessary.

Data Analysis

Unless otherwise stated, statistical analyses were performed using SPSS for Macintosh Version 6.1.* Test-retest reliability was explored for a subgroup of patients who were identified *post hoc* as not changed by what we believed to be a clinically meaningful amount over the

* SPSS Inc, 444 N Michigan Ave, Chicago, IL 60611.

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6-week retest period. That is, we classified subjects who self-reported their condition as "about the same" or only "a little better" or "a little worse" as "unchanged." A paired *t* test was also used to test the hypothesis that the questionnaire scores for the "unchanged" group at the 2 administrations were not different ($P \leq .05$). Based on our experience and that of other authors,[20,25] we believe that patients who report only a little change are unlikely to have experienced clinically meaningful change, which we defined as the smallest change in the domain of interest that can be considered significant. To check the validity of this assumption, we used a paired *t* test to check that scores for the subgroup who reported they were "a little better" were not different between the start of the study and follow-up.

Intraclass correlation coefficients (2,1)[33] were then calculated for each of the questionnaires. We used parametric tests because, with the exception of the SF-36 Role Limitations–Physical scale, the data were normally distributed or approached a normal distribution, and pretest and posttest variances were equivalent. The SF-36 Role Limitations–Physical scale scores were positively skewed at pretest and posttest for the "unchanged" group. It has been demonstrated, however, that even severely abnormal distributions have little effect on the result of the *t* test or the F test when the samples come from the same population, and violation of the homogeneity of variance assumption has little effect on the result provided the sample sizes are the same.[34] To check the validity of measurements obtained with our *post hoc* method of identifying a stable group of subjects, we calculated ICCs for another group of subjects, those with back pain of more than 6 months' duration, who a priori could be expected to experience little change over a 6-week retest period.

We defined the *minimum detectable change* as the 90% CI of the error associated with the repeated measurements.[17] First, the standard error of measurement (SEM) was determined by the formula:

$$(1) \qquad SEM = SD_{av}\sqrt{(1-R)}$$

where SD_{av} was the average standard deviation of the scores initially and at follow-up for the 106 subjects who completed both sets of questionnaires and R was the test-retest reliability coefficient for the 47 subjects classified as "unchanged."[35] The error associated with the repeated measurements was calculated by the formula:

$$(2) \qquad SEM_{repeat} = \sqrt{2 \times SEM}$$

and this step recognizes that there is error associated with both the first and second measurements.[36] The 90% CI (the MDC) was calculated by multiplying the result by 1.64 (the tabled *z* value). This calculation can be interpreted as the magnitude of change, expressed in scale points, required to be 90% confident that the observed change reflects real change and not just measurement error.[17]

Unless subjects score far enough onto the scale to allow change by at least as much as the MDC, there is insufficient scale width to reliably detect change over time. To evaluate scale width, we calculated for each questionnaire the proportion of the 140 subjects who returned the initial questionnaire who did not register an initial score that would allow at least that amount of improvement or worsening to be registered at follow-up.

Responsiveness was quantified in 3 ways. We used one distribution-based method (standardized response means [SRMs]), one criterion-based method (receiver operating characteristic [ROC] curves), and a method that counted the proportion of subjects who changed by at least as much as the MDC. The SRM was calculated by dividing the mean change by the standard deviation of change scores.[10,20,27,37] We chose the SRM because a method of testing the significance of observed differences in SRMs has been described by Liang et al.[37] Confidence intervals were constructed using the "jackknife" method detailed by Liang et al,[37] and a paired *t* test was used to compare the estimated population SRMs derived by this method.[27,37] Rather than compare the SRMs for questionnaires using every possible pair-wise comparison, we limited the number of comparisons by comparing the highest and lowest SRMs until nonsignificant comparisons occurred.

Criterion-based methods of evaluating responsiveness require that a judgment be made as to whether clinically meaningful change has or has not occurred.[27,28] In this study, subjects were classified as having improved by an important amount if they rated their back problem as "completely gone," "much better," or "better" at posttest and as "unchanged" if they reported being "a little better," "about the same," or "a little worse." Receiver operating characteristic curve analysis was performed using Accuroc Version 2.0.[†] The area under the ROC curve reflects the ability of the test to discriminate between subjects who have improved from subjects who are unchanged.[23,27] A value of 1 for the area under the curve represents perfect (100%) accuracy, whereas a value of .50 represents chance alone. Accuroc uses a chi-square statistic to compare ROC curves for different questionnaires. Even without the Bonferroni adjustments for the multiple *post hoc* comparisons, there were no observed differences in area under the ROC curves among the different instruments. The 95% CIs of the

[†] Accumetric Corp, 1650 Cedar Ave, Montreal, Quebec, Canada H3G 1A4.

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areas under the ROC curves show the similarities among questionnaires.

The third method of evaluating responsiveness relates responsiveness to reliability and has not previously been used to compare concurrently administered questionnaires. Goldie and colleagues[38] suggested that the proportion of subjects who improve by at least as much as the MDC could be used as an indicator of test responsiveness. We have termed this a reliable-change approach. We calculated the proportion of subjects who registered a change in questionnaire scores equal to or greater than the MDC. The standard error of the proportions (SEp) was calculated as:

$$SEp = \sqrt{\frac{p(1-p)}{n}} \quad (3)$$

where p is the observed proportion and n is the number of subjects. The observed proportion $\pm 1.96 \times SEp$ yields the 95% CI.[39] The Cochran Q test was used to determine whether the proportions were different among all of the questionnaires.

Results

Of 284 patients with a complaint of low back pain, 226 met the eligibility criteria to participate in the study, and 207 (92%) agreed to participate. One hundred forty participants (68%) returned the first set of questionnaires, and 106 participants (51%) returned the follow-up package 6 weeks later. Five subjects who completed both sets of questionnaires failed to complete the global change scale. The time taken to return the questionnaires at both pretest and posttest was a median of 8 days. There was no difference in age or sex between subjects who returned both sets of questionnaires and those who returned only the first set.

The mean change in scores for subjects in each of the 7 levels of the global change scale is shown in Table 2 for the 101 subjects who completed both sets of questionnaires and the global change scale. We classified the 47 subjects who reported that their back problem was "about the same," "a little better," or "a little worse" as "unchanged" and the 52 subjects who reported that their back problem was "better," "much better," or "completely gone" as "improved." Sample characteristics for the "unchanged" and "improved" groups are shown in Table 3. The mean age of the "unchanged" group was 55 years (SD=17, range=19–83), and the mean age of the "improved" group was 49 years (SD=16, range=20–80) ($t_{(97)} = -1.87$, $P = .06$).

Questionnaire scores obtained when the study began and at follow-up for the "unchanged" and "improved" groups are shown in Table 4. For the "unchanged"

Table 2.
Self-Rated Change in Questionnaire Scores (n=101)[a]

Global Change Scale	Oswestry Disability Questionnaire[8,9]		Quebec Back Pain Disability Scale[10]		Roland-Morris Disability Questionnaire[11]		Waddell Disability Index[12]		SF-36 Physical Functioning Scale		SF-36 Role Limitations–Physical Scale		SF-36 Bodily Pain Scale	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Completely gone (n=6)	33	30	38	25	9	7	4	3	−38	32	−58	38	−46	26
Much better (n=26)	16	16	19	25	7	6	2	3	−16	19	−42	48	−31	27
Better (n=20)	9	13	11	14	3	5	1	2	−15	25	−26	47	−14	26
A little better (n=28)	3	10	2	11	0	4	0	1.6	−2.5	13	−6	41	−12	22
About the same (n=16)	0	7	0.3	11	1	7	−1	1.6	5	10	1.6	28	−5	17
A little worse (n=3)	−6	6	−6	8	0	7	0	1	7	13	17	29	4	21
Much worse (n=2)	−4	17	−8	18	−2	2	−1	2	7.5	11	−13	18	10	15

[a] SF-36=Medical Outcomes Study 36-Item Short-Form Health Survey.[13,14] Positive scores reflect improvement, except for the SF-36 for which negative scores indicate improvement. All scales scored 0–100, except Roland-Morris Disability Questionnaire (0–24) and Waddell Disability Index (0–9).

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Table 3.
Sample Characteristics of "Unchanged" and "Improved" Groups

	"Unchanged" (n=47)		"Improved" (n=52)	
Variable	**No.**	**%**	**No.**	**%**
Age (y)				
18–30	4	8.5	6	11.5
31–40	6	12.8	12	23.1
41–50	14	29.8	10	19.2
51–60	4	8.5	11	21.2
61–70	9	19.1	5	9.6
≥71	10	21.3	8	15.4
Sex				
Male	17	36.2	14	26.9
Female	30	63.8	38	73.1
Work situation				
Employed	14	29.8	24	46.1
Unemployed	5	10.6	3	5.8
Not in the labor force	28	59.6	25	48.1
Receiving compensation				
Yes	2	4.3	7	13.5
No	45	95.7	45	86.5
Duration of current episode				
<1 wk	2	4.2	9	17.3
1–6 wk	10	21.3	22	42.2
6 wk to 6 mo	11	23.4	10	19.2
>6 mo	24	51.1	9	17.3
Missing			2	4.0
Pain location				
Back only	8	17.0	20	38.5
Buttock, groin, or thigh	20	42.6	20	38.5
Below knee	19	40.4	12	23.0
Previous episodes				
None	3	6.4	5	9.6
1–5	9	19.2	20	38.5
>5	22	46.8	21	40.4
Continuous pain	13	27.6	5	9.6
Missing			1	1.9

group, normal distribution of scores when the study began and at follow-up was confirmed by the K-S Lilliefors test for the Oswestry and Quebec questionnaires and the SF-36 Physical Functioning scale initially and at follow-up and for the SF-36 Bodily Pain scale initially. The K-S Lilliefors test is the Kolmogorov-Smirnov statistic with a Lilliefors significance level for testing normality.[40] Data are normally distributed if the significance level is greater than .05. The K-S Lilliefors test is very sensitive to departures from normal distribution, so a visual inspection was also made of histograms and box plots of the data that did not meet the K-S Lilliefors standard.[40] Only the SF-36 Role Limitations–Physical scale data were extremely positively skewed, reflecting a large floor effect, with 68% of the subjects scoring the lowest (worst) possible score initially and 25% of the subjects scoring the lowest (worst) possible score at follow-up.

Table 4 shows that for the 47 subjects who were classified as "unchanged," there was no difference between initial and follow-up scores on any questionnaire except the SF-36 Bodily Pain scale. Scores on this scale improved by an average 8 points (SD=20) over the retest period ($t_{(46)}=2.88$, $P=.006$). For the 52 subjects classified as "improved," all questionnaire scores were different at follow-up ($P<.0001$). Because the SF-36 Bodily Pain scale scores initially and at follow-up for the group classified as "unchanged" were different, we examined the subgroup of 28 subjects who said their problem was "a little better." The SF-36 Bodily Pain scale scores improved by an average of 12 points (SD=22) over the retest period ($t_{(27)}=2.97$, $P=.006$), but there were no differences between initial and follow-up scores for any of the other questionnaires. Because the SF-36 Bodily Pain scale score indicated that the subjects who rated themselves as "a little better" had changed, we calculated the ICC (2,1), SEM, SEM_{repeat}, and MDC for the subjects classified as "unchanged" and for the subgroup of 16 subjects who rated their problem as "about the same" at follow-up (Tab. 5). Scores initially and at follow-up for the 16 subjects were confirmed by the KS-Lilliefors test to be normally distributed, except for the SF-36 Role Limitations–Physical scale scores, which were positively skewed. Paired *t* tests confirmed that for all scales, the questionnaire scores were not different between the start of the study and follow-up.

The ICCs exceeded .80 for the Oswestry and Quebec questionnaires and the SF-36 Physical Functioning scale for the "unchanged" group of 47 subjects, and the ICCs for these questionnaires were higher than for the Roland-Morris questionnaire or the SF-36 Role Limitations–Physical or Bodily Pain scale (there was no overlap of 95% CIs for the reliability coefficients). The 95% CI for the Waddell questionnaire overlaps with those of all the other scales. Reliability coefficients for a group of 37 subjects with back pain of more than 6 months' duration were similar or identical to the coefficients for the group that was classified as "unchanged."

For the subgroup of 16 subjects who rated themselves as "about the same," the reliability coefficient for the Oswestry questionnaire was higher, based on the 95% CIs, than that obtained for the Roland-Morris questionnaire and the SF-36 Role Limitations–Physical scale. The reliability coefficient for the SF-36 Physical Functioning scale was higher than that obtained for the Roland-Morris questionnaire. The 95% CIs of the Roland-Morris questionnaire and the SF-36 Role Limitations–Physical and Bodily Pain scales were very wide (Tab. 5).

Scale width was calculated on the 140 subjects who completed initial questionnaires and is shown in Table 6 for the MDC calculated for the "unchanged" group and

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Table 4.
Questionnaire Initial and Follow-up Scores for Subjects Classified as "Unchanged" and "Improved"[a]

Questionnaire	Subjects Classified as "Unchanged" (n=47)							Subjects Classified as "Improved" (n=52)						
	Initial		Follow-up		Difference		*t* Test	Initial		Follow-up		Difference		*t* Test
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	*P*	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	*P*
Oswestry Disability Questionnaire[8,9]	35	15[b]	34	15[b]	1	9[b]	.38	35	17[b]	19	14[b]	16	18	.000
Quebec Back Pain Disability Scale[10]	41	21[b]	40	17[b]	1	11[b]	.54	38	21[b]	20	16	18	22	.000
Roland-Morris Disability Questionnaire[11]	9	5.2	8.2	5.2	0.8	5.1	.30	9.5	5.9	3.8	4.1	5.7	6	.000
Waddell Disability Index[12]	4.6	2.3	4.9	2.1	0.3	1.6	.31	4.4	2.2	2.6	2.1	1.9	2.5[b]	.000
SF-36 Physical Functioning scale	51	20[b]	50	23[b]	1	13[b]	.77	52	25[b]	70	21[b]	−18	24[b]	.000
SF-36 Role Limitations–Physical scale	20	32	22	33	−2	36	.76	19	31	57	42	−39	47	.000
SF-36 Bodily Pain scale	32	17[b]	40	19	−8	20[b]	.006	35	24	61	21[b]	−26	28[b]	.000

[a] SF-36=Medical Outcomes Study 36-Item Short-Form Health Survey.[13,14] For SF-36, a negative change score indicates improvement due to reverse scoring direction. All questionnaires have a possible score range of 0–100, except for the Roland-Morris Disability Questionnaire (0–24) and the Waddell Disability Index (0–9).
[b] K-S Lilliefors confirms normal distribution of scores.

for the subgroup classified as "about the same." The 15% criterion limit was met for the Oswestry questionnaire and the SF-36 Physical Functioning scale in both cases and for the Quebec questionnaire when the MDC for the subgroup was calculated. The SF-36 Role Limitations–Physical and Bodily Pain scales would be unable to detect worsening over time in 87% and 54% of the subjects, respectively.

Table 7 shows the point estimates and 95% CIs for the 3 methods of quantifying responsiveness. The 95% confidence intervals that are presented in Table 7 indicate that there are no differences in the estimate of the mean SRM across instruments. The mother used by Liang et al[37] for comparing SRMs does not use independent *t* tests but rather uses paired *t* tests to compare multiple SRMs for each test assembled under "jackknife" procedures. Using this method, the SRM of the Waddell questionnaire was different from that of the SF-36 Bodily Pain scale ($t_{(105)}$=2.92, *P*=.004) and the Roland-Morris questionnaire ($t_{(105)}$=2.52, *P*=.013). However, if Bonferroni adjustments are made for all 21 paired comparisons, none of the effects are significant. There were no differences among the questionnaires on the ROC curves, as indicated by the overlap of all of the 95% CIs and the chi-square analysis of the highest and lowest values (Oswestry questionnaire and SF-36 Role Limitations–Physical and Bodily Pain scales). The reliable-change method based on the MDC for the group originally classified as "unchanged" and for the subgroup of 16 subjects showed no differences among the questionnaires, with overlap of all of the 95% CIs. That is, the proportion of subjects who changed by at least as much as the MDC was not different among the questionnaires.

Discussion

We chose to explore the test-retest reliability of measurements obtained for 5 questionnaires by identifying *post hoc* a group of subjects who were unchanged (ie, subjects who rated themselves as "about the same," "a little better," or "a little worse"). We checked the validity of measurements obtained using this strategy in 3 ways. First, we examined the mean change scores for each level of the global rating scale. The pattern confirmed to us the direction and magnitude of mean change scores for the 7 levels of the global change scale that we expected. Only 5 subjects reported any overall worsening of their condition. There were some inconsistencies. For example, on the SF-36 Role Limitations–Physical scale, the 3 subjects who rated their problem as "a little worse" had an average worsening of 17 points, whereas the 2 subjects who rated themselves as "much worse" improved by an average of 13 points. These inconsistencies were likely due to the very small numbers of subjects who selected either category; to the structure of the SF-36 Role Limitations–Physical scale, which yields only 5 total scores; and to the forced choice between the ratings "a little worse" and "much worse."

Second, we confirmed that, with the exception of the SF-36 Bodily Pain scale, the questionnaire scores of the subjects classified as "unchanged" were not different initially and at follow-up, nor were the scores for subjects

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Table 5.
Test-Retest Reliability (Intraclass Correlation Coefficients [ICC (2,1)]), Standard Error of Measurement (SEM), Standard Error of Repeated Measurement (SEM_{repeat}), and Minimum Detectable Change (MDC) for Subjects Classified as "Unchanged" and Subjects Self-Rated as "About the Same"[a]

	Subjects Classified as "Unchanged" (n=47)				Subjects Self-Rated as "About the Same" (n=16)			
Questionnaire	**ICC (95% CI)**	**SEM (95% CI)**	**SEM_{repeat} (95% CI)**	**MDC (95% CI)**	**ICC (95% CI)**	**SEM (95% CI)**	**SEM_{repeat} (95% CI)**	**MDC (95% CI)**
Oswestry Disability Questionnaire[8,9]	.84 (.73–.91)	6 (5–8)	9 (7–12)	15 (11–19)	.92 (.79–.97)	4.5 (3–7)	6 (4–10)	10.5 (6–17)
Quebec Back Pain Disability Scale[10]	.84 (.73–.91)	8 (6–10)	11 (8.5–15)	19 (14–24)	.89 (.72–.96)	7 (4–11)	9 (6–15)	15 (9–24)
Roland-Morris Disability Questionnaire[11]	.53 (.29–.71)	3.7 (2.9–4.6)	5.2 (4.1–6.4)	8.6 (6.7–10.6)	.42 (−.07–.75)	4.1 (2.7–5.6)	5.8 (3.8–7.9)	9.5 (6.3–13)
Waddell Disability Index[12]	.74 (.58–.85)	1.2 (0.9–1.5)	1.7 (1.3–2.2)	2.8 (2.1–3.5)	.79 (.51–.92)	1.1 (0.7–1.6)	1.5 (0.9–2.3)	2.5 (1.5–3.8)
SF-36 Physical Functioning scale	.83 (.71–.90)	10 (7–13)	14 (10.5–18)	22 (17–29)	.91 (.76–.97)	7 (4–12)	10 (6–16)	16 (9–27)
SF-36 Role Limitations–Physical scale	.39 (.11–.61)	28 (23–35)	40 (32–49)	66 (53–80)	.47 (−.02–.78)	27 (17–37)	38 (24–52)	62 (40–86)
SF-36 Bodily Pain scale	.37 (.09–.59)	18 (14–21.5)	25 (20–30)	41 (33–50)	.59 (.15–.83)	14 (9–21)	20 (13–20)	33 (22–48)

[a] SF-36=Medical Outcomes Study 36-Item Short-Form Health Survey,[13,14] SEM=SD $\sqrt{(1-R)}$, where SD is the average standard deviation for pretest and posttest for 106 subjects and R is the ICC (2,1). The MDC is expressed in the same scale units as the questionnaires and is the 90% confidence interval of the error associated with repeated measurements.

who rated themselves as "a little better" different at the 6-week follow-up. There was a difference in the SF-36 Bodily Pain scale scores between the initial and follow-up tests (5 points for the 47 subjects classified as "unchanged" and 12 points for the 16 subjects who rated themselves as "a little better"), but neither magnitude of change may be clinically meaningful. Third, we identified another group of subjects, those with back pain of more than 6 months' duration, who a priori could be expected to experience little change over a 6-week retest period. Intraclass correlation coefficients for this group of 37 subjects were identical or similar to those for the group that was classified as "unchanged" using the global change scale.

Because on one of the scales (ie, the SF-36 Bodily Pain scale) there was a difference in the "unchanged" group between the initial score and the follow-up score, we also calculated ICCs on questionnaire scores for the subgroup of 16 subjects who rated themselves as "about the same."

For the modified Oswestry Disability Questionnaire, the ICC value of .84 (95% CI=.73-.91) that we found is comparable to the reliability coefficient reported by Baker et al[9] for same-day administration of this questionnaire (r=.89). The MDC derived from the group classified as "unchanged" was about the same (15 points) as the estimate of 16 points that we made from data published by Fairbank et al[8] for the original version of the Oswestry questionnaire. The ICC for the subgroup of 16 subjects was .92 (95% CI=.79-.97), and the MDC based on this ICC value was 10.5. Applying either MDC to the initial questionnaire scores demonstrates that the modified Oswestry questionnaire has sufficient scale width for clinical application of the questionnaire in this sample. We did not find the low data quality (blank and multiple responses) reported by Stratford and colleagues,[21] and the scoring algorithm accommodates those individuals who choose not to complete the sex life section. We believe that the modified Oswestry questionnaire has sufficient reliability to recommend it as a standardized measure of activity limitation. Our data indicate that the MDC for the modified Oswestry questionnaire is either 10.5 or 15 points. Therefore, a therapist would need to see a change of at least 10.5 points (and possibly as much as 15 points), in our opinion, to be 90% confident that real change had occurred.

For the Quebec Back Pain Disability Scale, the ICC value of .84 (95% CI=.73–.91) that we found was a little lower than the ICC of .93 reported by Kopec et al.[10] We believe that this difference reflects either sampling differences or the greater variability in scores we would expect because we used a longer retest period. The MDC of 19 for the "unchanged" group was somewhat larger than

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Table 6.
Scale Width of Questionnaires at Initial Measurement[a]

Questionnaire	Subjects Classified as "Unchanged" (n=47)[b]		Subjects Classified as "About the Same" (n=16)[c]	
	Proportion of Subjects With Insufficient Initial Score to Reliably Detect Improvement (n=140)	Proportion of Subjects With Insufficient Initial Score to Reliably Detect Deterioration (n=140)	Proportion of Subjects With Insufficient Initial Score to Reliably Detect Improvement (n=140)	Proportion of Subjects With Insufficient Initial Score to Reliably Detect Deterioration (n=140)
Oswestry Disability Questionnaire[8,9]	11%	0%	3%	0%
Quebec Back Pain Disability Scale[10]	19%	4%	14%	1%
Roland-Morris Disability Questionnaire[11]	51%	16%	51%	16%
Waddell Disability Index[12]	21%	20%	21%	20%
SF-36 Physical Functioning scale	13%	15%	9%	10%
SF-36 Role Limitations–Physical scale	21%	87%	21%	86%
SF-36 Bodily Pain scale	11%	54%	6%	54%

[a] SF-36=Medical Outcomes Study 36-Item Short-Form Health Survey.[13,14]
[b] Subjects who self-rated their condition as "about the same" or "a little better/worse" and who were classified as "unchanged."
[c] Subjects who self-rated their condition as "about the same" after 6 weeks.

Table 7.
Standardized Response Means (SRM), Receiver Operating Characteristic (ROC) Curves, and the Proportion of the Sample Improved at Least as Much as the Minimum Detectable Change (MDC)[a]

Questionnaire	SRM (n=106)	95% CI	ROC (n=99)	95% CI	Proportion Improved ≥ MDC (n=106)			
					Based on Subjects Classified as "Unchanged" (n=47)[b]	95% CI	Based on Subjects Classified as "About the Same" (n=16)[c]	95% CI
Oswestry Disability Questionnaire[8,9]	0.52	−0.51–1.56	.78	.69–.87	24%	16–33	30%	21–39
Quebec Back Pain Disability Scale[10]	0.49	−0.47–1.44	.74	.64–.84	23%	15–31	29%	20–38
Roland-Morris Disability Questionnaire[11]	0.55	−0.54–1.64	.77	.68–.87	22%	14–30	17%	10–24
Waddell Disability Index[12]	0.35	−0.33–1.01	.76	.67–.86	21%	13–29	21%	13–29
SF-36 Physical Functioning scale	0.44	−0.44–1.34	.74	.64–.84	20%	12–28	27%	18–36
SF-36 Role Limitations–Physical scale	0.45	−0.47–1.43	.73	.64–.83	21%	13–29	21%	13–29
SF-36 Bodily Pain scale	0.67	−0.66–2.00	.73	.63–.84	18%	11–25	23%	15–31

[a] SF-36=Medical Outcomes Study 36-Item Short-Form Health Survey.[13,14] 95% CI=95% confidence interval.
[b] Subjects who self-rated their condition as "about the same" or "a little better/worse" and who were classified as "unchanged."
[c] Subjects who self-rated their condition as "about the same" after 6 weeks.

the estimate of 14 points that we calculated from Kopec and colleagues' data.[10] Subjects in the study by Kopec et al, however, were classified as "unchanged" if they rated themselves as the same on a 3-level transitional scale ("better," "the same," "worse"); therefore, the MDC of 15 points derived from the reliability data of the subjects who said they were "about the same" in our study is comparable. A change of at least 15 points in the Quebec questionnaire score of an individual patient (and possibly as much as 19 points) would be necessary, in our

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view, to be 90% confident that real change had occurred. Scale width for the Quebec questionnaire when based on the MDC for the "unchanged" group was a little over the 15% criterion limit at the lower end of the scale, with 19% of subjects having an initial score too low to allow improvement to be detected. When based on the MDC for the subgroup, scale width was within the 15% criterion.

For the Roland-Morris Disability Questionnaire, the ICC value of .53 (95% CI=.29–.71) that we found was markedly lower than that reported over a 3- to 6-week retest period by Stratford and colleagues.[25] They reported an ICC of .86 (95% CI=.72–.94) and an MDC of 4 to 5 points.[21] The ICC appeared lower again (ICC=.42, 95% CI = −.07–.75) for the subgroup of 16 subjects who rated themselves as "about the same," and the lower bound of the 95% CI crosses zero. Our data showed an MDC of 8.6 or 9.5 points based on the reliability estimates for the 2 groups. The difference in test-retest reliability found in other studies and in our study may be explained by sample differences. The subjects in the studies by Stratford and colleagues[17,25] were referred by physicians to the physical therapy outpatient department of 1 or 2 hospitals. In contrast, we drew our sample from a range of physical therapy outpatient services, and we believe that our subjects were more likely to be more variable and more closely representative of the general clinical population in a health care system where patients may consult a physical therapist with or without referral from a physician.

The sample in our study included a greater proportion of female subjects, were on average older, had lower initial Roland-Morris questionnaire scores, and had a longer duration of back pain than the samples in the studies by Stratford and colleagues.[17,25] If sample differences were sufficient to explain poorer test-retest reliability for the Roland-Morris questionnaire, we would expect to have seen a similar effect with the other questionnaires, but this was not the case. The use of the average of the patient's and the therapist's ratings of overall change in the studies by Stratford and colleagues may have screened out the types of subjects in our study who showed considerable variability in scores. Subjects in our study who reported no change but whose Roland-Morris questionnaire scores suggested they had changed, tended to have had their low back problem for more than 6 months. Perhaps these subjects had become used to their problem and reported no overall perception of change, despite the functional improvement detected by the Roland-Morris questionnaire. This explanation, however, seems unlikely in the absence of similar variability in the scores of the other questionnaires. Another possibility is that the variability in scores may reflect the emphasis in the Roland-Morris questionnaire's instructions to subjects to select an item only "if you are sure that it describes you today." Low back pain can vary considerably from day to day; thus, Roland-Morris questionnaire scores will reflect diurnal variations in activity limitations. The instructions also urge that "if the sentence does not describe you, then leave the space blank"; therefore, it is possible that subjects will not select an item if they have not attempted that activity that day.

The poor reliability and consequently large MDC for the Roland-Morris questionnaire severely reduces the scale width. At the time of the initial measurements, 51% of the subjects scored less than the MDC. Therefore, the Roland-Morris questionnaire would not be able to reliably detect improvement in half of the sample. Even using the previous best estimate by Stratford et al[17] of the MDC at scale extremes of 4 points, 19% of the subjects scored less than 4 points at initial testing. On the basis of the poor test-retest reliability and consequently large MDC and limited scale width, we cannot recommend the use of the Roland-Morris questionnaire as a measure of functional outcome in a general clinical population.

The test-retest reliability of measurements obtained with the Waddell Disability Index has not previously been reported for a self-administered version of the questionnaire. We calculated the ICCs as .74 (95% CI=.58–.85) for the "unchanged" group and .79 (95% CI=.51–.92) for the subgroup and the MDC as around 3 points, which constitutes one third of the available range of the scale. The potential clinical utility of the Waddell Disability Index is diminished by the relatively large MDC and a lack of scale width, as 21% of the sample scored less than 3 points and 20% more than 6 points at the initial measurement.

The ICCs of .83 (95% CI=.71–.90) and .91 (95% CI=.76–.97) that we obtained for the SF-36 Physical Functioning scale are similar to that reported by Patrick et al[22] (ICC=.89), who analyzed the data for 52 subjects with sciatica who self-rated their leg pain as unchanged over a 3-month retest period. The MDC of 22 is close to the 21 points we estimated from the data reported by Patrick et al. When based on the smaller subgroup in our study, the MDC might be as low as 16. Scale width is within the 15% criterion limit whether the MDC of 16 or 22 is applied, and the SF-36 Physical Functioning scale therefore appears to be an appropriate scale for use by physical therapists. A therapist would need to observe a change in the SF-36 Physical Functioning scale score of at least 16 points (or 22 points by the less stringent reliability analysis) to be 90% confident that real change had occurred.

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The ICCs for the Role Limitations–Physical and Bodily Pain scales of the SF-36 in our study were considerably lower than those reported by Patrick et al[22] (ICC=.80 and .67). Although the ICCs for the subgroup who rated themselves as "about the same" were somewhat stronger, they were still weak (ICC=.47 and .59), and the lower bound of the CIs approached zero. In the study by Patrick et al, subjects rated the overall change in their leg pain rather than the change in their overall condition. In addition, the subjects had sciatica secondary to a herniated lumbar intervertebral disk and represent a different clinical population than the subjects in our study. The different results, therefore, may relate to differences in sample characteristics (eg, variance differences), but scale characteristics may also help explain the different results. The SF-36 Role Limitations–Physical scale consists of 4 questions with forced-choice (yes/no) responses, and available total scores are therefore 0, 25, 50, 75, and 100. For any individual, a small number of changes in responses from "yes" to "no" or vice versa could have a very large effect on the score. Score distribution was very skewed, with 66% of the subjects at the initial measurement and 42% of the subjects at the follow-up measurement scoring 0, the worst possible score. Thirty subjects scored 0, the worst possible score, at both pretest and posttest, but many others showed large improvements and worsening. The data for the SF-36 Role Limitations–Physical scale were highly skewed, and the estimate of MDC of 62 or 66 points is likely to be overestimated.

There was a small improvement in SF-36 Bodily Pain scale scores over the retest period for subjects classified as "unchanged" and for those who rated their back condition as "a little better." The SF-36 Bodily Pain scale has only 2 items, and poor reliability is more likely in very brief scales. The MDC was 33 or 41 points, and scale width was beyond the 15% criterion limit at the lower end of the scale range. On its own, the SF-36 Bodily Pain scale, in our view, cannot be said to be an adequate measure of pain or pain-related function, comprised as it is of one pain intensity item and one item regarding how much pain interferes with normal work. Because of the substantial floor effect, the poor scale width, and the variability in scores in stable subjects, the SF-36 Role Limitations–Physical and Bodily Pain scales do not appear to be useful measures of functional outcome for individual patients.

Based on these data, the Physical Functioning scale is the most relevant of the SF-36 physical health scales, and it can be easily hand-scored. We see advantages, however, in administering the SF-36 in its entirety. The SF-36 provides a health status profile, rather than a single index score, and individual and aggregated data can be compared with the population norms available in many countries.[15,16,41–45] The International Quality of Life Assessment (IQOLA) Project is translating, validating, and norming the SF-36 in 14 countries: Australia, Belgium, Canada, Denmark, France, Germany, Italy, Japan, the Netherlands, Norway, Spain, Sweden, the United Kingdom (English version), and the United States (English and Spanish versions).[46] The scales in the mental health domain may provide a brief screening tool to alert the clinician to the need for appropriate referral. The main disadvantage of the SF-36 is that hand-scoring of some of the 8 scales is laborious, in our view, because of the complex scoring algorithm. However, SF-36 scores can be easily generated using a spreadsheet, and customized scoring software is also available.

The results of the reliability portion of our study indicated that the modified Oswestry Disability Questionnaire, the SF-36 Physical Functioning scale, and the Quebec Low Back Disability Scale were the most reliable and had sufficient scale width to detect improvement or worsening in most subjects. The reliability of measurements obtained with the Waddell Disability Index is moderate, but we believe the scale width is insufficient to recommend it for clinical application. The Roland-Morris Disability Questionnaire and the SF-36 Role Limitations–Physical and Bodily Pain scales lacked sufficient reliability and scale width for clinical application. Test-retest reliability results for the Roland-Morris Disability Questionnaire differed from those of earlier reports, and this highlights the importance of examining reliability in the population to which the measurement tool will be applied in practice.

In the second part of our study, we explored the responsiveness of the 5 questionnaires. Just as measurements obtained with a test may be reliable but not valid, it is possible for a test to yield reliable measurements but to be unresponsive. There has also been some debate about whether a test can yield unreliable measurements yet be responsive.[47,48] There is currently no agreement as to the most appropriate method of evaluating the responsiveness of tests.[24,27,49,50] Therefore, we explored responsiveness using 3 methods by which point estimates and 95% CIs could be calculated and the differences among questionnaires tested. The SRM is typical of the distribution-based or overall-change approach, and the ROC curve is representative of the criterion-based or valid-change approach. The third method, which calculates the proportion of subjects who change by at least as much as the MDC has not previously been used and can be termed a reliable-change approach.

The absolute value of the SRM can be interpreted in the same way was an effect size, where .20 is regarded as small, .40 as moderate, and .80 as large.[51] The SRM point estimate values for the questionnaires in our study were

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moderate, and the 95% CIs were very wide. We chose the SRM because it is the only distribution-based method for which a method of hypothesis testing has been described.[27,37] We believe there is considerable opportunity in the repeated iterations of Liang and colleagues' complex SRM procedure[37] for error. The "jackknife" procedure used to generate what Liang and colleagues called "pseudo-values"[37] is performed by systematically dropping each subject's data from analysis at a time. That is, the SRM is recalculated n times with each subject removed in turn. This results in a population of n SRM pseudo-values around the sample SRM and provides a sampling distribution of SRMs from which to estimate a population SRM. The population SRM and variance are then estimated from the pseudo-values, and finally a t test is used to compare the tests. We found that the result was distorted unless calculations were made to 5 decimal places.

The area under the ROC curve has a possible range from .50, indicating a chance finding, to 1.0, indicating perfect ability of change scores to discriminate between changed and unchanged patients. The ROC point estimate in our study fell within a narrow range from .73 to .78, and there was no difference among the scores from the questionnaires, suggesting that all of the tests were equivalent in responsiveness. The ROC values of .78 and .77 that we obtained for the Oswestry and Roland-Morris questionnaires are almost identical to those reported by Stratford and colleagues[21] (.78 and .79). Beurskens et al[20] reported a similar ROC value for the Oswestry questionnaire (.76), but a higher value for the Roland-Morris questionnaire (.93).

Criterion-based methods require the sample to be dichotomized into those subjects who are unchanged and those who have improved by a certain amount.[27,28] The use of patients' self-ratings of overall change as the criterion of meaningful clinical change has several limitations: the measurements have unknown reliability and validity; recall of initial states tend to be inflated, which tends to inflate the perceived magnitude of change; and the scale is completed at the same time as the follow-up questionnaires and is therefore not independent.[52] In our study, subjects were asked to complete the rating of change scale before the questionnaires, and the completion of the questionnaires may have been influenced by the overall rating. However, because the questionnaires were administered by mail, we have no way of knowing the order in which the subjects completed the tasks. Patient self-ratings, or averages of patient and therapist ratings of overall change, are commonly used as the criterion of change because of the valued perspective of the rater(s) and because the information can be collected easily.

The reliable-change method of evaluating responsiveness counted the number of subjects who changed by at least as much as the MDC over 6 weeks. Because we had performed 2 reliability analyses, one for the group classified as "unchanged" and one for the smaller subgroup who had rated themselves as "about the same," we had 2 estimates of MDC. In neither case was the proportion different among the questionnaires.

In the responsiveness portion of our study, we found that none of the questionnaires could be shown to be more or less responsive than any other. Furthermore, it appears possible for a questionnaire to yield scores with very poor reliability, but to have reasonable responsiveness. The SF-36 Bodily Pain scale's ICC was lower than .50, but the scale was comparable in responsiveness to the other questionnaires. This finding may indicate either that the questionnaires perform similarly in their ability to detect change over time or that the responsiveness methods are not able to discriminate between instruments with low and high responsiveness. The proliferation of responsiveness measures and debate concerning methods for determining responsiveness suggest that the optimal way to quantify this relatively recently conceptualized psychometric property of tests has not been described.[27,28,48,50] The validity of scores obtained with a responsiveness index could be demonstrated by testing whether the index is able to discriminate between a test that is known to be responsive and one that is known not to detect change over time in a particular clinical population.

We suggest that the choice of a responsiveness index should be dictated by the purpose for which the index is being used in this application. If the aim is to quantify the responsiveness of an outcome measure to be used in research, then we believe that a distribution-based method would be most appropriate, as this information could be used to estimate sample size and statistical power. Distribution-based methods, however, provide no information about whether change is clinically meaningful. A criterion-based method may be appropriate where the purpose is to detect meaningful change in a clinical setting. Distribution-based methods provide information analogous to a test of statistical significance, and criterion-based methods are analogous to a judgment of clinical significance. The reliable-change method, in our opinion, provides practical information for clinical application in that it answers the question, "In what proportion of my patients is this questionnaire likely to detect change beyond the amount that can be attributed to measurement error?" The limitation of this method is that the MDC may not be known for many questionnaires and clinical tests.

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We are the first authors to report on reliability and responsiveness for these 5 questionnaires in a sample drawn from the range of settings in which patients with low back pain seek physical therapy interventions. Our sample was drawn from hospitals, private practices, and community-based services, whereas previous studies have used samples obtained from patients seeking physical therapy at 1 or 2 hospitals or practices[17,18,25] or from both physical therapy and medical treatment centers.[10]

Although our sampling strategy was designed to obtain a representative sample, a number of factors tend to reduce generalizability. The success of consecutive sampling may have been obscured if therapists did not record instances when they failed to approach a potential subject. Only 7 such instances were recorded, and it is possible that underreporting occurred in the course of busy daily practice and due to the eagerness of the therapist to appear cooperative. In addition, 67 subjects (32%) who initially agreed to participate failed to return the first set of questionnaires, and it is not known whether this group was different from those who actually participated in the study. In addition, because the recruitment sites were all located in urban areas, the sample may not reflect differences in the profile of clients seeking physical therapy in rural locations. For practical reasons, people who could not read or write English were excluded, and the results therefore may not be generalizable to people from non–English-speaking backgrounds.

Another limitation of our study is the use of the global rating of change scale as the sole criterion of meaningful change. Whether the single-item global change scale used in this study yields reliable measurements is unknown, and it is likely that the rating was not independent of the activity limitation questionnaire responses. That is, a subject's response to the global rating of change may have influenced the subsequent responses to the questionnaires at follow-up. Norman and colleagues[52] identified one study of quality of life in childhood asthma[53] where the criterion of change was determined by an independent evaluation of all patient data. It needs to be established whether an independent evaluation of change based on these data would be a better criterion of change in patients with low back pain.[52,53]

In the questionnaires that we studied, subjects were asked to report activity limitation during different time periods (Tab. 1), which could have influenced their responses. The Roland-Morris and Quebec questionnaires ask about activity limitation "today," the SF-36 Physical Functioning scale asks about activity limitation "now," the SF-36 Role Limitations–Physical and Bodily Pain scales ask about activity limitation during "the past 4 weeks," and the Oswestry questionnaire gives no specific time reference. We are unaware of any studies that have explored this issue, although Fairbank and Pynsent[54] recently reported that patients prefer a format such as that of the Oswestry questionnaire in which the time frame "now" is made explicit.

A surprising result in our study was that although 49% of the subjects said their condition was "better," "much better," or "completely gone" after 6 weeks, none of the questionnaires reliably detected change in more than 30% of the subjects (Tab. 7). This result illustrates that the amount of change in questionnaire scores perceived by the client to be meaningful may be smaller than the amount of change required to be statistically 90% confident that score change is not just measurement error (the MDC). More reliable and responsive methods need to be developed for measuring activity limitation in people with low back pain. Perhaps we are currently overestimating the SEM (and therefore the MDC) derived from small samples. However, the consequences of wrongly concluding that a patient with low back pain either has or has not changed by a measurable amount based on change in questionnaire scores are unlikely, in our opinion, to be substantially adverse. If a patient's status does not change by at least as much as the current MDC within an expected time-frame, the therapist may decide to alter some component of the treatment regimen, to refer the patient to another health care professional, or to cease therapy. The clinician faced with interpreting a change in an individual patient's questionnaire scores will advisedly use a range of outcome indicators to provide a picture of overall change.

Although we contend that the modified Oswestry Disability Questionnaire, the SF-36 Physical Functioning scale, and the Quebec Back Pain Disability Scale appear to be the most useful measures of functional outcome for people with low back pain, there are practical considerations that also influence the choice of questionnaire. If a clinician sees few patients with low back problems and fast processing of results is the primary consideration, then the Waddell Disability Index may be appropriate. Therapists in multidisciplinary clinics may decide that the SF-36 can provide the more comprehensive assessment required for their purposes. Scale content also provides a point of differentiation. For example, the SF-36 does not ask about difficulty sustaining body positions such as sitting and standing, and the Oswestry questionnaire does not include difficulty moving between postures such as sit to stand. The Quebec questionnaire has more content relating to upper-limb activities (pulling/pushing, throwing/catching, reaching) than the other scales. Notwithstanding a careful choice of scale, there will always be some individuals who do not have a sufficient initial score to enable change to

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be reliably detected over time. Clinicians, therefore, should have alternative or multiple strategies for measuring functional outcome, and they should be aware of the limitations of each method.

Conclusion

Our data indicate that the Oswestry Disability Questionnaire, the SF-36 Physical Functioning scale, and the Quebec Back Pain Disability Scale have sufficient reliability and scale width to be applied in an ambulatory clinical population with low back problems. The Waddell Disability Index has insufficient scale width for clinical utility. The Roland-Morris Disability Questionnaire and the SF-36 Role Limitations–Physical and Bodily Pain scales did not have sufficient reliability to be recommended as clinical outcome measures for individual patients. This study showed that the responsiveness of the questionnaires was similar, and we conclude that one questionnaire cannot be preferred over another based on the magnitude of the absolute values of responsiveness indexes.

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Megan Davidson and Jennifer L Keating

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Lower Limb Questionnaire

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Clinic ID _____ First six letter of patient's last name _____

Physician ID _____ Office Chart # _____

	Diagnosis & ICD-9 Code*	Procedure & CPT Code	CPT Date	Side of body procedure was performed on:
Primary DX	DX _____ ICD-9	Tx _____ ICD-9		☐ Right ☐ Left ☐ Both ☐ N/A
Secondary DX	DX _____ ICD-9	Tx _____ ICD-9		☐ Right ☐ Left ☐ Both ☐ N/A
Secondary DX	DX _____ ICD-9	Tx _____ ICD-9		☐ Right ☐ Left ☐ Both ☐ N/A
Secondary DX	DX _____ ICD-9	Tx _____ ICD-9		☐ Right ☐ Left ☐ Both ☐ N/A
Secondary DX	DX _____ ICD-9	Tx _____ ICD-9		☐ Right ☐ Left ☐ Both ☐ N/A

Lower Limb Questionnaire

Today's Date / /

Thank you for completing this questionnaire!

This questionnaire will help us to better understand your general health and any problems related to bone and muscle conditions.

Your completion of this questionnaire is completely voluntary and your responses will be held in the strictest confidence.

Please answer every question. Some questions may look like others, but each one is different.

There are no right or wrong answers. If you are not sure how to answer a question, just give the best answer you can. You can make comments in the margin. We do read all your comments, so feel free to make as many as you wish.

Your Birth Date / /

Your Social Security Number _____

Lower Limb Questionnaire

Instructions

Please answer the following questions for the lower limb being treated or followed up. If it is BOTH lower limbs, please answer the questions for your **worse** side. All questions are about how you have felt, on average, during the **past week.** If you are being treated for an injury that happened less than one week ago, please answer for the period since your injury.

1. During the **past week**, how **stiff** was your lower limb? (Circle one response.)

1 Not at all 2 Mildly 3 Moderately 4 Very 5 Extremely

2. During the **past week**, how **swollen** was your lower limb? (Circle one response.)

1 Not at all 2 Mildly 3 Moderately 4 Very 5 Extremely

During the **past week**, please tell us about how painful your lower limb was during the following activities. (Circle ONE response on each line that best describes your average ability.)

	Not painful	Mildly painful	Moderately painful	Very painful	Extremely painful	Could not do because of lower limb pain	Could not do for other reasons
3. Walking on **flat** surfaces?	1	2	3	4	5	6	7
4. Going up or down stairs?	1	2	3	4	5	6	7
5. Lying in bed at night?	1	2	3	4	5	6	7

6. Which of the following statements **best** describes your ability to get around most of the time during the **past week**? (Circle one response.)

1 I did not need support or assistance at all.
2 I mostly walked without support or assistance.
3 I mostly used one cane or crutch to help me get around
4 I mostly used two canes, two crutches or a walker to help me get around.
5 I used a wheelchair.
6 I mostly used other supports or someone else had to help me get around.
7 I was unable to get around at all.

7. How difficult was it for you to put on or take off socks/stockings during the **past week**? (Circle one response.)

1 Not at all difficult 2 A little bit difficult 3 Moderately difficult 4 Very difficult 5 Extremely difficult 6 Cannot do it at all

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Facial disability index (FDI): Adaptation to Spanish, reliability and validity

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Abstract

Objectives: To adapt to Spanish the facial disability index (FDI) described by VanSwearingen and Brach in 1995 and to assess its reliability and validity in patients with facial nerve paresis after parotidectomy.

Study Design: The present study was conducted in two different stages: a) cross-cultural adaptation of the questionnaire and b) cross-sectional study of a control group of 79 Spanish-speaking patients who suffered facial paresis after superficial parotidectomy with facial nerve preservation. The cross-cultural adaptation process comprised the following stages: (I) initial translation, (II) synthesis of the translated document, (III) retro-translation, (IV) review by a board of experts, (V) pilot study of the pre-final draft and (VI) analysis of the pilot study and final draft.

Results: The reliability and internal consistency of every one of the rating scales included in the FDI (Cronbach's alpha coefficient) was 0.83 for the complete scale and 0.77 and 0.82 for the physical and the social well-being subscales. The analysis of the factorial validity of the main components of the adapted FDI yielded similar results to the original questionnaire. Bivariate correlations between FDI and House-Brackmann scale were positive. The variance percentage was calculated for all FDI components.

Conclusions: The FDI questionnaire is a specific instrument for assessing facial neuromuscular dysfunction which becomes a useful tool in order to determine quality of life in patients with facial nerve paralysis. Spanish adapted FDI is equivalent to the original questionnaire and shows similar reliability and validity. The proven reproducibility, reliability and validity of this questionnaire make it a useful additional tool for evaluating the impact of facial nerve paralysis in Spanish-speaking patients.

Key words: *Parotidectomy, facial nerve paralysis, facial disability.*

Introduction

Facial nerve paralysis is the main complication of surgical treatment of parotid gland tumors. As a result, preservation of facial nerve function is a key objective in this type of intervention. Several studies on facial nerve function following parotidectomy show that a temporary paralysis or paresis is common and occurs in between 17 and 64.4% of patients (1-5), with an incidence of permanent paralysis ranging between 0 and 5.5%.

Although the facial nerve is kept intact after surgery, patients experience a facial paresis or transient nerve paralysis which usually has a strong functional and socio-laboral impact in them. Patients frequently complain of impaired speech, difficulty eating, difficulty closing eyelids and/or lips, aesthetic deformity of the face, dribbling, etc. Symptoms improve gradually in days or weeks until complete recovery of facial nerve function is achieved. Quality of life in relation to facial nerve paralysis refers to the subjective assessment patients make of different aspects of their daily life which affect their health condition before they get the full functionality of the facial nerve.

Quality of life is assessed by means of a series of questionnaires or scales which include items or questions distributed into domains or fields and which are analysed either individually or globally. General questionnaires to measure quality of life like the SF-36 (*Short Form 36 Health Survey*) or the HRLQ (*Health Related Quality of Life*) and even other head and neck-specific surveys have not proved useful to discriminate the true difficulties experienced by patients with facial mobility disorders.

The Facial Disability Index (FDI; in Spanish IDF, *Índice de Discapacidad Facial*) (6) is an instrument widely used in a great number of studies which has not been adapted to Spanish and whose aim is to assess specific quality of life secondary to alterations of facial mimicry. The FDI is a short, self-report questionnaire dealing with psychosocial and physical impairment aspects associated with facial neuromuscular function. There is no other specific instrument in the Spanish language to evaluate patients with facial paralysis after parotid surgery which allows physicians to carry out both the diagnosis of paresis effects and the early and long-term follow up of such impairment. Taking into account this scenario, the aim of our study has been to adapt the original FDI devised by VanSwearingen and Brach in 1995 (6) to our linguistic and cultural milieu, translating it into Spanish and performing the transcultural adaptation in order to provide, not only a specific tool to assess facial paresis after parotid gland surgery but also to evaluate its impact on the quality of life of patients and evaluate the neuromuscular disorders affecting facial mimicry.

Material and Methods

In a preliminary stage we performed a literature search of the 10 years previous to the onset of our study in order to establish a translation protocol consistent with the latest reports published on this subject. The main researcher contacted via e-mail the creators of the questionnaire and obtained their consent to carry out the study.

-Study stages

The present study was conducted in two different stages: 1) cross-cultural adaptation of the FDI questionnaire and 2) cross-sectional study in a control group to assess its reliability and validity.

The transcultural adaptation was carried out using the translation-retrotranslation technique (7-10). Prior to any step in the process, the creators of the FDI gave their consent to the development of the present study and were invited to take part in it. The two translators enrolled for the study were two bilingual certified translators whose first or mother tongue is Spanish and have American English as second language. They were responsible for translating the original FDI from American English into Spanish (step 1). Both translators rated the difficulty to find the conceptual equivalents in the translation in a scale from 1 (minimum difficulty) to 10 (maximum difficulty). Then, one of the researchers and an external expert reconciled both translations, that is, they analysed and compared the differences between them in order to approve a final Spanish draft (step 2). In order to assess the correctness of the translation, the agreed version was in turn retrotranslated into American English (step 3) by a bilingual speaker (American English as mother tongue and Spanish as second language), who did not know about the questionnaire in its original tongue. Translators were asked to make a conceptual and not a literal translation. In a following step, the retrotranslation and the original were compared (step 4) analysing differences and contradictions and an almost definitive Spanish version was written. The comparison criteria were: *different*, when the resulting item lost its original meaning; *literal*, when the result was identical to the original and *similar or conceptual*, when some word changed its meaning but the concept of the questionnaire was maintained. Items were revised and modified according to the researchers' criteria in order to solve discrepancies. The next step was to perform an analysis of the comprehensibility and equivalence of the final version submitting it to the test of 20 patients with facial paresis after parotidectomy (step 5). After the real application in patients, the last required modifications were made and the definitive adapted FDI was obtained (step 6).

The field survey was conducted from 2008 through 2010 on a series of patients admitted in the Oral and Maxillofacial Surgery Department, Virgen del Rocio University Hospital, Seville (Spain). The Research and Ethics Committee of the hospital gave their consent to

perform the study. Inclusion criteria were: incident cases corresponding to diagnosed patients not yet treated for a benign tumor in the superficial lobe of the parotid gland confirmed by means of histological examination by a fine needle aspiration biopsy of the tumoral tissue and an imaging study (CT/MRI), and patients eligible for ablative tumor surgery by means of superficial parotidectomy with preservation of the facial nerve. Exclusion criteria were: patients with a previous history of idiopathic facial paralysis or who suffered from it at the moment of the study, surgical section of one or more branches of the facial nerve during surgery resulting in permanent paralysis, previous history of cerebrovascular accidents, psychiatric or psychomotor disorders which prevent the interview with the patient, illiteracy and regular residence outside the influence area of the hospital (temporary residents); we did not consider the level of education. During the pre-surgery visit, patients were informed of their participation in the study; they received the questionnaires, an acknowledgement letter, written information about the project and the informed consent.

-Questionnaire

The FDI (Fig. 1) is internationally validated short-form questionnaire gathering information related to the impact of facial paralysis and the physical and social well-being impairment it provokes. It is a specific, short and simple questionnaire easy to be filled in by patients, comprising 10 items or questions distributed into two subscales: physical and social well-being (6). The higher the score obtained in the questionnaire, the better the quality of life of the patient. The aim is to assess disability and the outcome of any intervention in terms of a significant change in the physical disability and social well-being of patients.

-Analysis

Considering that all patients responded to 100% of the items, the feasibility and acceptability of the instrument were taken for granted. We analyzed the following aspects of the translated questionnaire:

The validity of the questionnaire was analysed using the factorial analysis of the main components. The aim was to identify emerging and underlying factors which become evident when we try to group the items or questions answered by patients in the same direction (11). We analysed the correlations found in the answers to the translated questionnaire. This statistical analysis was used to identify the number of dimensions in a group of multivariate items showing the contribution of each item to the specific dimension under study.

Reliability was defined as internal consistency (homogeneity) of the overall questionnaire and of its subscales, calculating Cronbach's alpha coefficient of every one of them. Cronbach's alpha coefficient is the adjusted mean of the correlations between items or questions included in the scale. The expected alpha coefficient was estimated at 0.70; so it was considered that alpha values above than this value were sufficient to ensure the reliability of the scale and to consider that the instrument would calculate consistent and stable measurements.

In order to test the construct validity of the translated questionnaire, we assessed the relationship between the results of the translated questionnaire which evaluated patients' disability and their true physical impairment using the international House-Brackmann scale (H-B) (12). This scale is a widely-validated standard method

PHYSICAL FUNCTION SUBSCORE	
ITEM 1	*How much difficulty did you have keeping food in your mouth moving food around in your mouth or getting food stuck in your cheek while eating?*
ITEM 2	*How much did you have drinking from a cup?*
ITEM 3	*How much difficulty did you have saying specific sounds while speaking?*
ITEM 4	*How much difficulty did you have with your eye tearing excessively or becoming dry?*
ITEM 5	*How much difficulty did you have with brushing your teeth or rinsing your mouth?*
SOCIAL FUNCTIONING AND WELL-BEING SUBSCORE	
ITEM 6	*How much of the time have you felt calm and peaceful?*
ITEM 7	*How much of the time did you isolate yourself from people around you?*
ITEM 8	*How much of the time did you get irritable towards those around you?*
ITEM 9	*How often did you wake up early or wake up several times during your nighttime sleep?*
ITEM 10	*How often has your facial function kept you from going out to eat shop or participate in family or social activities?*

Fig. 1. Original version of the FDI.

(13) to measure facial nerve function, control its evolution over time, and assess recovery and effects after treatment. H-B scale classifies the degree of paresis into 6 levels, from I (no paresis) to VI (total paresis). The total score is obtained by adding the result of each of the 5 branches in the facial nerve, thus obtaining an interval of values which may range from 6 to 36. Pearson's correlation coefficient was used to determine such bivariate correlation. The result of each of the subscales obtained in the factorial analysis of the main components was compared with the physical examination.

Finally, we determined whether the specific translated questionnaire proved more valid than other general instruments measuring quality of life which have already been translated into Spanish and are widely validated and employed. In order to do so, we compared the FDI and the SF-36 survey (14) once we had asked the © 2011 QualityMetric for the required permission. The SF-36 survey is a standardized self-report instrument including 8 dimensions. We used the physical dimension to compare it with the H-B scale. Pearson's correlation coefficient was used for such purpose.

Our hypothesis was to establish the lack of correlation or a slight correlation between the SF-36 survey and the H-B scale, comparing it with the correlation between the FDI, the physical subscale of the SF-36 survey and the H-B scale. A value of $p<0.05$ was considered statistically significant. Data were analysed using the software package SPSS v.15.0 for Windows.

Results

From January 2008 through December 2010 we carried out a prospective study of the data corresponding to 79 patients who had undergone conservative superficial parotidectomy with preservation of the facial nerve for pleomorphic adenoma of the parotid gland superficial lobe and met the inclusion criteria. Mean age of patients was 40 yrs in an interval between 24 and 81 yrs. Patients were handed the FDI questionnaire three months after the intervention.

The difficulty of the translation was rated by 2 translators with a mean score of 3. In the end, once the definitive adaptation was evaluated we obtained the complete equivalence in all the items in the questionnaire. Figure 2 shows the final translation of each of the questions in the FDI. For example, some changes were introduced in item 1, *"How much difficulty did you have keeping food in your mouth, moving food around in your mouth or getting food stuck in your cheek while eating?"*, which was translated into Spanish as *"¿Con qué dificultad ha mantenido la comida en la boca, ha movido la comida en el interior de tu boca o ha apartado la comida a un lado de la boca mientras comías?"*. Nevertheless, the final adaptation was: *"¿Cuánta dificultad ha tenido para guardar la comida en la boca, mover la comida dentro de la boca o mantener comida a nivel de los carrillos mientras come?"*. Likewise, item 4: "How much difficulty did you have with your eye tearing excessively or becoming dry?", was translated as *"¿Con qué dificultad sus ojos han lagrimeado excesivamente o se han secado?"*, but the final adaptation: *"¿Cuánta dificultad ha tenido respecto al lagrimeo excesivo o sequedad en sus ojos?"*, was less confusing for patients and explained more clearly the physical disorder it attempted to measure (eye hydration in patients with paresis of the ophthalmic branch of the facial nerve).

	SUBESCALA FUNCIONAMIENTO FÍSICO
ITEM 1	*¿Cuánta dificultad ha tenido para guardar la comida en la boca, mover la comida dentro de la boca o mantener comida a nivel de los carrillos mientras come?*
ITEM 2	*¿Cuánta dificultad ha tenido en beber de un vaso?*
ITEM 3	*¿Cuánta dificultad ha tenido en decir sonidos específicos mientras habla?*
ITEM 4	*¿Cuánta dificultad ha tenido respecto al lagrimeo excesivo o sequedad en sus ojos?*
ITEM 5	*¿Cuánta dificultad ha tenido en lavarse los dientes o en enjuagarse la boca?*
	SUBESCALA FUNCIONAMIENTO SOCIAL Y BIENESTAR
ITEM 6	*¿Cuánto tiempo se siente tranquilo o calmado?*
ITEM 7	*¿Cuánto tiempo se aísla de la gente que le rodea?*
ITEM 8	*¿Cuánto tiempo se ha notado irritado hacia la gente que está a su alrededor?*
ITEM 9	*¿Con qué frecuencia se levanta pronto o se despierta varias veces durante el sueño?*
ITEM 10	*¿En cuántas ocasiones su función facial evita que salga a comer, de tiendas, o le impide su participación en actividades familiares o sociales?*

Fig. 2. Spanish adapted version of the FDI.

Reliability was measured using Cronbach's alpha coefficient both for the complete scale and for the two dimensions (physical and social well-being functions) established by the analysis of the main components. The data obtained showed adequate reliability at 3 months after surgery. Cronbach's alpha coefficient was 0.83 for the complete scale and 0.77 and 0.82 for the physical and social well-being subscales, respectively. In an attempt to improve homogeneity, we calculated Cronbach's coefficient excluding in each case one of the items. For all and every one of the items we obtained lower reliability levels than for the global scale (Table 1).

Table 1. Assessment of reliability and internal consistency (Cronbach's alpha coefficient) of the adapted FDI, excluding each one of the items.

Excluded item	Cronbach´s alpha coefficient
1	0,82
2	0,82
3	0,81
4	0,80
5	0,82
6	0,79
7	0,78
8	0,78
9	0,81
10	0,82

As regards the analysis of the main components, we carried out a factorial analysis with Varimax rotation and factor extraction with an eigenvalue >1; that is, the analysis of the components should show more variance in the overall instrument than any of the items in the questionnaire. This analysis confirmed that the items included in the physical subscale formed a homogeneous group, clearly apart from the social well-being subscale. Table 2 highlights those values >0.5 showing the separation between the first component (physical subscale) and the second one (social well-being subscale).

The SF-36 survey was filled in by 34 patients. Table 3 shows bivariate correlations between FDI and H-B scale, and between SF-36 survey (physical function dimension) and H-B scale. As we expected, when we compared the results of the FDI with the true physical dysfunction of the patient measured by means of the H-B scale, we observed a statistically significant correlation between the physical subscale and the clinical diagnosis of facial paresis measured by means of the H-B scale (Table 3, item a). The analysis of the correlation between the total FDI and the H-B scale revealed a lower correlation than the one observed with the physical subscale on its own (Table 3, item b). As we hypothesized, a direct relation was not observed between the physical scale in the SF-36 survey and the true physical function of the patient measured by means of the H-B scale (Table 3, item c), the way it is observed in the case of FDI (physical subscale).

Table 2. Analysis of the main components of the FDI using rotated component matrix (factor extraction method with analysis of main components and Kaiser Varimax rotation).

	Component	
	1	2
IDF 1	-,053	**,876**
IDF 2	,271	**,788**
IDF 3	,156	**,647**
IDF 4	,415	**,677**
IDF 5	,245	**,592**
IDF 6	**,823**	,183
IDF 7	**,719**	,428
IDF 8	**,804**	,282
IDF 9	**,739**	,291
IDF 10	**,626**	-,026

Component 1: physical subscale.
Component 2: social well-being subscale
Values > 0.5 are indicated in bold

Table 4 shows the analysis of variance percentage revealed by each of the FDI components, which coincides with the validation of the original instrument. The variance percentages of the first and second components were 31.12 and 29.96, respectively.

Discussion

The results of the present study suggest that the Spanish adapted FDI is equivalent to the original questionnaire and shows similar reliability and validity as well as similar limitations. Cronbach's alpha coefficients of the scales and dimensions of the adapted FDI are similar to those of the original questionnaire with values ranging from 0.70 to 0.90. In order to boost the research we have conducted a prospective study of homogeneous incident cases, all of them with the same type of tumor in the same anatomical location and treated with the same surgical technique.

As regards reliability, the FDI assessed quality of life accurately and with adequate internal validity. Reliability surpasses 0.7 (0.83), a level considered adequate to carry out comparisons and to monitorize facial disability in the same patient with self-report instruments and shows a degree of internal consistency similar to that obtained by means of other questionnaires which com-

Table 3. Bivariate correlations between the FDI, H-B scale and SF-36 survey.

		Total H-B	FDI: physical subscale	FDI: social well-being subscale
Total H-B	Pearson's correlation (bilateral) significance	1	(a) ,405(**) ,001	…
FDI: physical subscale	Pearson's correlation (bilateral) significance	,405(**) ,001	1	,464(**) ,000
FDI: social well-being subscale	Pearson's correlation (bilateral) significance	1,41 ,272	,464(**) ,000	1
Overall FDI	Pearson's correlation (bilateral) significance	(b) ,264** ,001	---	---
SF-36 Physical dimension (0-100)	Pearson's correlation (bilateral) significance	(c) ,134 ,449 (n=34)	,435(*) ,010 (n=34)	,361(*) ,036 (n=34)

** 0,01 (bilateral) accounts for significant correlation

Table 4. Variance percentage expressed for each one of the FDI components.

FDI Component	Initial self-values			Sums of squares of factor extraction saturations		Sum of squares rotation saturations			
	Total	Variance %	Accumulated %	Total	Variance %	Accumulated %	Total	Variance %	Accumulated %
1	4,635	46,345	46,345	4,635	46,345	46,345	3,112	31,123	31,123
2	1,475	14,747	61,092	1,475	14,747	61,092	2,997	29,969	61,092

Component 1: physical subscale. Component 2: social well-being subscale

prise the same number of items (15). This confirms that the internal validity of the questionnaire has not been altered by the translation process. Unlike the original instrument (6), we observe a slightly lower reliability in the physical dimension (0.77) than in the social well-being dimension (0.82), although in view of the small difference it is not considered relevant. In any case, both values are valid to state the reliability of the FDI.

To carry out factorial analysis, we have used a different sample than to perform the validation of the original instrument, as far as size, sampling technique, language and culture are concerned. Both samples are heterogeneous and comprise different types of people and the sampling technique has been non probabilistic, as it is not a requirement for validation. Therefore, as the results obtained are similar to those obtained in the analysis of the original questionnaire, we can affirm that the questionnaires measure the same, despite the differences between the samples. Similarity is observed in both factor groups, almost identical, which confirms the hypothesis that the cross-cultural adaptation does not alter the questionnaire. After calculating Cronbach's alpha coefficient discarding 1 item in each case, we found that the global scale of the FDI was even more reliable for the overall instrument than for each isolated item.

Taking into account the lack of a standardized measurement of facial paresis, we used H-B scale to validate the construct (12). Such validity has been proved for the correlation between the FDI and the clinical measurement of facial movement (Table 3). This correlation also confirmed the conceptual relationship between dysfunction and disability, which underlies facial function recovery. The expected correlation was higher between the physical subscale and the H-B scale (0.405) (Table 3, item a) in comparison with a global measurement of the FDI and the H-B scale (0.264) (Table 3, item b), which supports the validity in the subscales format.

However, agreeing with our hypothesis, unlike the case with the translated questionnaire, no correlation was observed between the physical dimension of the SF-36

survey and the clinical measurement of facial paresis. This may be explained by the lack of specificity of this latter survey to evaluate facial neuromuscular dysfunction (Table 3, item c). The SF-36 survey has not proved useful in the evaluation and follow-up of patients as it measures different aspects of physical disability and focuses on other health problems apart from facial neuromuscular dysfunction.

The Spanish translated and adapted FDI operates as a specific questionnaire providing valuable information to evaluate facial neuromuscular dysfunction. The objective assessment of quality of life in relation to facial function using validated instruments may play a key role in the diagnosis and follow up of our patients (16). In this sense, the FDI can be firstly used as a diagnostic instrument and in a subsequent stage as a follow-up tool after treatment or surgery (6). The FDI is a short, simple and easy self-report instrument which can be administered in about 4 minutes. It has been widely accepted by patients, as the translation is comprehensible and is adapted to Spanish language. Researchers have never been required to explain the items or questions during the completion of the questionnaire and physicians have never complained about incomprehensible expressions or difficulty in its use.

Due to the simplicity of most of the items in the questionnaire, a literal translation was preferred for half of them (items number 2,3,5,7 and 8) and a conceptual one for the other half (items number 1,4,6,9 and 10). The translations made separately by the bilingual translators showed almost no differences when compared. The descriptive, clear and concise language of the original questionnaire favored the almost complete agreement between translators. Under no circumstance has the meaning of the questions been modified in order to maintain the object of the question in the original instrument. Neither has it been considered appropriate to create any new item or modify the meaning of any of them. During the pilot study and during the validation process, we have not found any problem with the questions; none of them were misleading or difficult to understand. None of the patients has required any further explanation to fill in the overall questionnaire.

To sum up, the results of the present study show that the Spanish adapted FDI is reliable and valid instrument both for research and for application in daily clinical practice. It is a useful tool to assess the impact of facial disability associated to facial paralysis /paresis following parotidectomy; it is accessible to Spanish speaking patients and physicians involved in the treatment and follow-up of these patients. Future work in this field should focus on the application of this instrument to analyze the different facial neuromuscular disorders and to optimize the management, treatment and rehabilitation of facial paresis or paralysis in the long term.

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The Scripps Neurological Rating Scale (NRS) in Patients with Multiple Sclerosis

Overview: The Scripps Neurological Rating Scale (NRS) was developed for the clinical assessment of patients with multiple sclerosis. The authors are from the Scripps Clinic in La Jolla California.

Parameters (22):

(1) mentation and mood

(2) eyes and related cranial nerves

- (a) visual acuity
- (b) visual fields ocular discs pupils
- (c) eye movements
- (d) nystagmus

(3) lower cranial nerves

(4) motor function in each extremity

- (a) right upper
- (b) left upper
- (c) right lower
- (d) left lower

(5) deep tendon reflexes (DTRs)

- (a) upper extremities
- (b) lower extremities

(6) Babinski sign

- (a) left side
- (b) right side

(7) sensory function in each extremity

- (a) right upper
- (b) left upper
- (c) right lower
- (d) left lower

(8) cerebellar signs

(a) upper extremities

(b) lower extremities

(9) gait trunk and balance

(10) special category for autonomic dysfunction (bladder bowel and/or sexual dysfunction)

Parameter	**Finding**	**Points**
mentation and mood	normal	10
	mild impairment	7
	moderate impairment	4
	severe impairment	0
visual acuity	normal	5
	mild impairment	3
	moderate impairment	1
	severe impairment	0
fields discs pupils	normal	6
	mild impairment	4
	moderate impairment	2
	severe impairment	0
eye movements	normal	5
	mild impairment	3
	moderate impairment	1
	severe impairment	0
nystagmus	normal	5
	mild impairment	3
	moderate impairment	1
	severe impairment	0
lower cranial nerves	normal	5
	mild impairment	3
	moderate impairment	1

	severe impairment	0
motor right upper extremity	normal	5
	mild impairment	3
	moderate impairment	1
	severe impairment	0
motor left upper extremity	normal	5
	mild impairment	3
	moderate impairment	1
	severe impairment	0
motor right lower extremity	normal	5
	mild impairment	3
	moderate impairment	1
	severe impairment	0
motor left lower extremity	normal	5
	mild impairment	3
	moderate impairment	1
	severe impairment	0
DTR upper extremities	normal	4
	mild impairment	3
	moderate impairment	1
	severe impairment	0
DTR lower extremities	normal	4
	mild impairment	3
	moderate impairment	1
	severe impairment	0
Babinski sign left side	absent	2
	present	0
Babinski sign right side	absent	2

	present	0
sensory right upper extremity	normal	3
	mild impairment	2
	moderate impairment	1
	severe impairment	0
sensory left upper extremity	normal	3
	mild impairment	2
	moderate impairment	1
	severe impairment	0
sensory right lower extremity	normal	3
	mild impairment	2
	moderate impairment	1
	severe impairment	0
sensory left lower extremity	normal	3
	mild impairment	2
	moderate impairment	1
	severe impairment	0
cerebellar signs upper extremities	normal	5
	mild impairment	3
	moderate impairment	1
	severe impairment	0
cerebellar signs lower extremities	normal	5
	mild impairment	3
	moderate impairment	1
	severe impairment	0
gait trunk and balance	normal	10
	mild impairment	7
	moderate impairment	4

	severe impairment	0
bladder bowel sexual dysfunction	normal	0
	mild impairment	-3
	moderate impairment	-7
	severe impairment	-10

where:

• The scoring for the special category is a little unclear. The options are (a) to grade based on the most severely affected (b) overall impairment. I used the former approach in the implementation.

total NRS =

= SUM(points for all of the parameters)

Impression:

• minimum score: -10

• maximum score: 100

• The higher the score the better the patient's level of function.

Performance:

• The score was more sensitive to change than the DSS.

• The test shows a good inter-observer correlation.

References:

Sipe JC Knobler RL et al. A neurologic rating scale (NRS) for use in multiple sclerosis. Neurology. 1984; 34: 1368-1372.

Pain Disability Index

The Pain Disability Index is a tool designed to help patients measure the degree their daily lives are disrupted by chronic pain.

You can customize the form on the next page and add your practice name and address information in the area at the top of the page. Some forms include additional fields you can complete.

INSTRUCTIONS FOR CUSTOMIZING THE PDF

Click in the first form field you want to fill in and start typing. After entering text, do any of the following:

- Press Tab or Shift+Tab to accept the form field change and go to the next or previous field
- Press Esc to reject the form field change and deselect the current form field. If you are viewing the form in full-screen mode, pressing Esc a second time causes you to exit full-screen mode

After you fill in the form fields, do any of the following:

- Click the "Submit Form" button, if one exists. Clicking this button sends the form data to a database across the Web or over your company intranet
- Choose File > Save As, and rename the file to save the form with the data you entered. Save it to your computer
- Print the form

Enter practice name here or delete this text before printing

Enter address information here or delete this text before printing

Pain Disability Index[1]

Name_____ Date_____

Pain disability index: The rating scales below are designed to measure the degree to which aspects of your life are disrupted by chronic pain. In other words, we would like to know how much your pain is preventing you from doing what you would normally do or from doing it as well as you normally would. Respond to each category by indicating the overall impact of pain in your life, not just when the pain is at its worst.

For each of the 7 categories of life activity listed, please circle the number on the scale that describes the level of disability you typically experience. **A score of 0 means no disability at all, and a score of 10 signifies that all of the activities in which you would normally be involved have been totally disrupted or prevented by your pain.**

Family/home responsibilities: This category refers to activities of the home or family. It includes chores or duties performed around the house (eg, yard work) and errands or favors for other family members (eg, driving the children to school).

No disability 0 1 2 3 4 5 6 7 8 9 10 Worst disability

Recreation: This category includes hobbies, sports, and other similar leisure time activities.

No disability 0 1 2 3 4 5 6 7 8 9 10 Worst disability

Social activity: This category refers to activities that involve participation with friends and acquaintances other than family members. It includes parties, theater, concerts, dining out, and other social functions.

No disability 0 1 2 3 4 5 6 7 8 9 10 Worst disability

Occupation: This category refers to activities that are a part of or directly related to one's job. This includes nonpaying jobs as well, such as that of a housewife or volunteer worker.

No disability 0 1 2 3 4 5 6 7 8 9 10 Worst disability

Sexual behavior: This category refers to the frequency and quality of one's sex life.

No disability 0 1 2 3 4 5 6 7 8 9 10 Worst disability

Life-support activity: This category refers to basic life-supporting behaviors such as eating, sleeping, and breathing.

No disability 0 1 2 3 4 5 6 7 8 9 10 Worst disability

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Systematic Evaluation of Rating Scales for Impairment and Disability in Parkinson's Disease

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Abstract: We assessed the clinometric characteristics of rating scales used for the evaluation of motor impairment and disability of patients with Parkinson's disease (PD), conducting a systematic review of PD rating scales published from 1960 to the present. Thirty studies describing clinometrics of 11 rating scales used for PD were identified. Outcome measures included validity (including factor structure), reliability (internal consistency, inter-rater, and intrarater) and responsiveness. We traced three impairment scales (Webster, Columbia University Rating Scale [CURS] and Parkinson's Disease Impairment Scale), four disability scales (Schwab and England, Northwestern University Disability Scale [NUDS], Intermediate Scale for Assessment of PD, and Extensive Disability Scale), and four scales evaluating both impairment and disability (New York University, University of California Los Angeles, Unified Parkinson's Disease Rating Scale [UPDRS], and Short Parkinson Evaluation Scale). The scales showed large differences in the extent of representation of items related to signs considered responsive to dopaminergic treatment or to those signs that appear late in the disease course and lack responsiveness to treatment. Regardless of the scale, there was a conspicuous lack of consistency concerning inter-rater reliability of bradykinesia, tremor, and rigidity. Overall disability items displayed moderate to good inter-rater reliability. The available evidence shows that CURS, NUDS, and UPDRS have moderate to good reliability and validity. In contrast to their widespread clinical use for assessment of impairment and disability in PD, the majority of the rating scales have either not been subjected to an extensive clinometric evaluation or have demonstrated clinometric shortcomings. The CURS, NUDS, and UPDRS are the most evaluated, valid, and reliable scales currently available. © 2002 Movement Disorder Society

Key words: rating scales; Parkinson's disease; systematic review

Parkinson's disease (PD) is a progressive neurological disorder that gradually results in an accumulating disability. Because most of the motor features result from striatal dopamine deficiency, the treatment of patients with PD has focussed on the administration of dopaminergic drugs to alleviate symptoms. New insights in the pathophysiology of PD and an increasing awareness of factors that contribute to levodopa-induced motor complications have stimulated the development of not only new drugs but also very promising surgical techniques.[1–3] Consequently, the increasing number of therapeutic interventions in PD, has highlighted the importance of measuring clinical outcomes. In 1981, Marsden and Schachter[4] reviewed all methods for the assessment of extrapyramidal disorders and presented a comprehensive summary of subjective and objective assessments, regardless of their validity and reliability. Since the appearance of this review the evaluation of patient outcomes, clinometrics, has developed in a science of its own. Information on validity, reliability and responsiveness is now considered as essential knowledge to assure the useful application of a rating scale.[5] We conducted a systematic review of the clinometric aspects of scales that are used by observers to evaluate the motor impairment and disability of patients with PD.

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METHODS

Studies were included if they evaluated clinometric properties of a PD rating scale that addressed impairment

or disability, scored or evaluated by an observer. Self-reporting scales and quality of life measures were therefore excluded from this review.[6] Impairment is defined as an abnormality of a body or organ structure or function; and disability as a reduction of a person's ability to perform a basic task.[7,8] Scales that assessed primarily dyskinesias or motor fluctuations were also excluded.

Search Strategy

The following sources were used to identify studies of interest: Computerized searches of Medline and EMBase using text words (rating) scale, impairment, disability, clinometrics, evaluation, and the individual scale names in combination with "Parkinson" and related terms (search conducted December 2001), reference lists of the reviews found by the Medline and EMBase search-strategy, SCIsearch, the Cochrane Library,[9] symposia reports, PD handbooks, and reference lists of all included publications. Searches were not restricted to the English language.

Methods of Review

Two reviewers independently reviewed the identified publications according to a two-step review process. First, abstracts were reviewed for eligibility. Eligible reports were judged against a set of methodological criteria in which both thoroughness (methodological and statistical) and results of studies testing validity, reliability, and responsiveness were assessed. A checklist was used to evaluate sample characteristics, outcome measures, appropriateness of statistical analysis, and methodological quality. The method of presenting the quality of scales was adopted from McDowell and Newell.[10]

In attempting to interpret the different indices of correlation and degrees of agreement, we noted that there is no general agreement about how high they should be. Because a new rating scale is generally not designed to replicate precisely the existing method against which it is compared, the expected correlation should not be perfect as this may indicate that the new scale is redundant. Few studies, however, declare what levels of correlation are to be taken as demonstrating adequate validity or reliability.

We interpreted the different correlations and degrees of agreement for validity and reliability as follows: The Spearman's coefficient ρ, Pearson's coefficient ρ, Kendall's coefficient W or T, Eta coefficient, and Cramer's coefficient V with values of 0.7 and lower were considered poor,[11] whereas values over 0.7 were considered moderate to good. The values for κ, κ_w and ICC of 0.40 or lower were considered to indicate poor agreement, 0.41 to 0.60 moderate, 0.61 to 0.80 substantial and values over 0.81 good to almost perfect agreement.[12] Cronbach's α lower than 0.70 were considered poor, whereas values of 0.71 to 0.90 were considered moderate to good.[10,13] If, however, α is too high, ($\alpha > 0.90$), then this may reflect redundancy, indicating that some of the items are unnecessary.[11]

The thoroughness of the evidence was classified as follows. If the appropriate statistical procedures were used, the sample size was considered large enough and all circumstances were optimal (i.e., the PD population) then it was classified as good. If less preferable statistical procedures were used or the circumstances were less optimal, then it was classified as substantial. If inappropriate statistical procedures were used or circumstances were less optimal it was classified as moderate, and if the statistical procedure or the circumstances were inadequate, it was classified as poor.

Studies were eligible when they calculated the following clinometric characteristics of disease specific impairment and disability instruments in Parkinson's disease: validity (content validity, criterion validity, and construct validity including factor structure), reliability (internal consistency, inter-rater reliability, intrarater reliability) or responsiveness.

Validity is the extent to which an instrument measures what it is supposed to measure and does not measure what it is not supposed to measure. Three types of validity are frequently discussed: content, criterion, and construct validity.

Content Validity.

Content validity consists of a judgment of whether the instrument samples all the relevant or important contents or domains. It relies on expert opinions and reviews of the literature.

Criterion Validity.

The demonstration of the concordance of an assessment compared with a particular standard, the criterion. It is assessed using correlation coefficients of concordance, or percentage of agreements. The most commonly used correlation coefficients of concordance are Spearman's coefficient ρ, Pearson's coefficient ρ, Kendall's coefficient W and Cramer's coefficient V. Coefficients range from −1 (indicating an inverse linear association) through 0 (indicating no association at all) to +1 (indicating perfect positive linear association). This concept is particularly useful when an obvious gold standard exists for use as a criterion.

Construct Validity.

Construct validity is commonly used instead of criterion validity, because in most cases a gold standard is

lacking. It is demonstrated by examining the relations among a newly created test and other test to show that the new test measures the same construct. Factor analysis is commonly used to study the internal structure of a scale that contains separate components, each reflecting a different aspect of the measured domain. Using this technique a large number of interrelated items are reduced to a smaller number of common dimensions or factors (clusters of items). Unrelated items should not belong to the same factor.

Reliability is the extent to which an instrument is free of measurement error. Reliability assessment aims to quantify the most important sources of measurement error, including both consistency among scale items and reproducibility between and within observers.

Internal Consistency.

Internal consistency estimates the extent to which all items are measuring the same construct. Cronbach's coefficient α, the most frequently used indicator of internal consistency, represents the average of all correlations between all items grouped in all possible combinations of two scale halves. Coefficient α will be equal to zero, when there is no linear relationship between the items. If all items are perfectly reliable and measure the same aspect (true score), then coefficient α is equal to 1. For clinical applications at a patient group level the minimum value is 0.7, for influences at the level of an individual patient, the minimum 0.9 is desirable.[11]

Inter-rater (or Inter-observer) Reliability.

This measures the agreement among different observers performing the assessment on a same individual. Inter-rater reliability is best assessed by the intraclass correlation (=ICC) or the kappa (=κ) statistics.[14] ICC is a parametric measure of agreement and represents the proportion of variance among patients that is caused by true differences.[15] Kappa, developed for the study of nonparametric ratings by observers, measures agreement corrected for the extent of agreement expected by chance alone. Where the categories are ordered, it may be preferable to give different weights to disagreements according to the magnitude of the discrepancy, the κ_w (= weighted kappa).[16] If a squared weighting scheme is used, then the κ_w is identical to the ICC.

Intrarater (or Intra-observer) Reliability.

This measures the reproducibility of the assessment by the same examiner, during repeat assessment (test–retest reliability). The intrarater reliability is also best assessed by the ICC or the κ statistics.

Responsiveness or sensitivity to change is the ability of an instrument to reflect underlying changes over time. In contrast to the assessment of individual differences in change, there is no clear consensus as to how this should be assessed for a rating method.[15,17]

Other information that was gathered included the type of scale, the number of items, the scoring method, and administration time. Whenever information on studies or scales was unclear or incomplete, we contacted the authors with the request to provide additional information.

RESULTS

Description of Studies

Over the period of 1966 to December 2001, 30 studies were identified that described clinometric characteristics of 11 rating scales for patients with PD. We excluded a study by Cutson and colleagues[18] that deals with the Duke University Parkinson's Rating Scale (DUPRS), because the original scale items could not be retrieved. We were unable to trace studies that evaluated responsiveness. Three impairment scales (the Columbia University Rating Scale [CURS], the Parkinson's Disease Rating Scale by Webster [Webster], and the Parkinson's Disease Impairment Scale [PDIS]), four disability scales (the Northwestern University Disability Scale [NUDS], the Intermediate Scale for Assessment of Parkinson's disease [ISAPD], the Schwab and England, and the Extensive Disability Scale [EDS]), and four multimodular scales containing both impairment and disability sections (the New York University Parkinson's disease evaluation [NYU], the University of California Los Angeles scale [UCLA], the Short Parkinson's Evaluation Scale [SPES], and the Unified Parkinson's Disease Rating Scale [UPDRS]) were identified.

We describe clinometric characteristics of individual impairment and disability items. Details on individual scales and a comparison of their clinometric characteristics follow.

Impairment

Content Validity.

In evaluating the content of impairment scales and impairment sections of multimodular scales large differences emerged. Some impairment items were present in all (tremor and bradykinesia) or in the majority (rigidity and gait) of the available scales. Some items were unique for a particular scale (e.g., blepharospasm in the UCLA, short and extra steps in the PDIS). As the core features are not equally represented and defined in the different rating scales, the contribution of these signs to the total score varies from scale to scale (Table 1). The contribution of items dealing with bradykinesia and hypokinesia (including finger and foot taps, successive hand move-

TABLE 1. *Contribution of an item to the total impairment score*

	WEBSTER	UCLA (signs)	CURS	NYU	UPDRS (motor)	PDIS	SPES (motor)
Brady-/hypokinesia	40	23	28	16	37	30	17
Tremor	10	11	20	14	26	20	33
Rigidity	10	9	20	14	19	0	17
Postural stability	0	0	4	0	4	10	8
Other items	40	57	28	56	14	40	25

Values are percentages equal to the possible maximum score for that item/the possible maximum score for the impairment scale or impairment section of multimodular scale.

ments, facial expression, body bradykinesia, akinesia, and arm swing) to the total impairment scores vary from 17% (SPES Motor Evaluation [ME] section) to 40% (Webster). For tremor these values vary from 10% (Webster) to 33% (SPES), for rigidity 0% (PDIS) to 20% (CURS), and for postural stability 0% (Webster, UCLA and NYU) to 10% (PDIS).

Two scales use a weighting factor for each item. In the NYU the maximum possible score for each sign determines the weighting; in the UCLA, as an example, 'akinesia' is weighted nine times whereas mask facies is weighted only once. Several studies repeatedly demonstrated that tremor behaves independent from all other items, not significantly contributing to the explained variance of a scale,[19] nor to the construct validity (Hoehn and Yahr [H&Y] staging).[20,21] Postural instability, an other major feature of PD occurring in the later stages of the disease, is not evaluated in the Webster, the UCLA and the NYU. The item speech is present in five impairment scales or sections (Webster, UCLA, CURS, UPDRS- and SPES ME section). Seborrhea and sialorrhea are evaluated in three (Webster, UCLA, and CURS) and two impairment scales (UCLA and CURS), respectively.

Another problem that emerged concerned the applied methods by which an impairment was evaluated. This was particularly conspicuous for bradykinesia.

Reliability.

Nine studies reported inter-rater reliability of the separate items, whereas only one evaluated intrarater reliability.[22] This study reported a moderate to good intrarater reliability for all items of the CURS, except for rigidity, which was not reported because this study was video-based.

Regardless of the scale, there was a conspicuous lack of consistency among the findings (range, poor to good) concerning inter-rater reliability of the core features bradykinesia, tremor and rigidity as well as for the item speech (Table 2). The majority of the studies found a good inter-rater reliability for postural stability. Seborrhea as well as sialorrhea showed in the CURS a poor[22,23] and in the UCLA a moderate[24] inter-rater reliability.

Disability

Content Validity.

The Schwab and England activities of daily living scale is a staging system, in which 100% stands for completely independent and 0% for a vegetative state. The remaining three disability scales and four disability sections of multimodular rating scales bear only some resemblance in content of items. Dressing, walking, speech, hygiene, and feeding or eating (swallowing) items are included in all scales. Turning in or getting out of bed, and getting out of a chair are included in all scales except in the NUDS. The items handwriting and climbing the stairs are found in four scales (UCLA, NYU, UPDRS Activities of Daily Living [ADL] section and SPES ADL section) and in three (UCLA, EDS, and ISAPD), respectively.

Reliability.

Eight studies reported inter-rater reliability of the separate items, in contrast to the intrarater reliability, which was only evaluated in one study.[20] This study reported a moderate to good intrarater reliability for all items of the PDIS.

Overall, the disability items displayed moderate to good inter-rater reliability, with a few exceptions. Speech scored poor in two studies assessing the NUDS,[23,28] and in one study on the EDS.[28] In the original publication of the UPDRS,[28] Fahn reported a poor inter-rater reliability for walking, in contrast to two later studies that found substantial to excellent values for this item.[21,28]

CLINIMETRIC CHARACTERISTICS OF THE INCLUDED SCALES

Impairment Scales

The three impairment scales (Table 3), the Columbia University Rating Scale (CURS), the Webster, and the Parkinson's Disease Impairment Scale (PDIS), vary in

TABLE 2. *Interpretation of values for interrater reliability*

	Webster	UCLA (signs)	CURS	UPDRS (motor)	SPES (motor)
Brady-/hypokinesia					
Finger tap			$+^{1}$ $++^{22}$	$+^{27}$ $++^{42}$ $+++^{21,26,41}$	$+++^{21}$
Foot tap			$-^{23}$ $++^{22}$	$+^{26,27}$ $+++^{21,41,42}$	
Successive movements	$+^{25}$ $++^{23}$		$-/+^{23}$ $++^{22}$	$-^{26}$ $++^{27,41}$ $++/+++^{21,42}$ $-^{26,42}$	
Facial expression	$-^{23,24}$	$-^{24}$	$+^{22,23}$	$+^{27}$ $++^{21,41}$ $+^{26,27}$	
Body bradykinesia			$-^{23}$ $++^{22}$	$++^{42}$ $+++^{21,41}$	
Akinesia		$+^{24}$			
Arm swing	$-^{23}$ $+^{24}$				
Tremor					
Rest and postural	$++^{23}$ $+^{24,25}$	$+^{24}$	$-/++^{23}$ $+^{25}$ $++^{22}$		
Rest				$+^{27}$ $++/+++^{21,41}$ $+++^{26,42}$	$+++^{21}$
Postural				$++^{21}$ $-^{41}$	$++/+++^{21}$
Action				$+^{21,27}$ $++^{26,42}$ $+^{26,42}$	
Rigidity	$-^{23}$ $+^{24,25}$	$++^{24}$	$-^{25}$ $-/+^{23}$	$++/+++^{21}$ $+++^{27}$	$+++^{21}$
Postural stability			$+++^{22}$	$+^{26,42}$ $+++^{43,27,41}$ $-^{26}$	$+++^{21}$
Posture	$-^{23}$ $+^{24,25}$	$+^{24}$	$++^{22}$	$+^{27,42}$ $++^{21}$ $+++^{41}$ $-^{42}$	
Speech	$-^{23}$ $+^{24}$	$+^{24}$	$-^{23}$ $+^{22}$	$+^{27}$ $++^{21,26}$ $+++^{41}$	$++^{21}$
Seborrhoea	$-^{23}$	$+^{24}$	$-^{22,23}$		
Sialorrhoea	$+^{24}$	$+^{24}$	$-^{23}$		

The superscript number corresponds with the studies in References in which interrater reliability per item is evaluated. For the NYU and the PDIS, no information on interrater reliability (per item) is available.

−, poor; +, moderate; ++, substantial; +++, good.

number of items (10, 27, and 10 items respectively) and in scoring of items (0–4, 0–3, and 0–3).

Parkinson's Disease Rating Scale by Webster.

For a scale that has been used for a long time by many investigators, surprisingly little evidence is published on its validity and reliability. Notably, the Webster includes one disability (self-care) and nine impairment items, which makes this scale conceptually unclear. From a factor analysis, assessed in one study, three factors were derived, including (I) arm swing, gait, self-care and pos-

TABLE 3. *Results of validity and reliability and thoroughness (strength of evidence) of validity and reliability testing*

Scale	Scale type[a]	N (items)	Validity		Reliability			No. of studies[c]
			Construct	Factor[b]	Interrater	Intrarater	Internal	
CURS 1969		25	++(+)/+++	/+++	++/+++	+++/+++	+++/+++	5[22,23,25,29,30]
CURS-modified (Sydney) 1993	I	11	++(+)/+++	0	+++/+++	+++/+++	0	1[22]
CURS-modified 1985		8	0	/–	+/+	0	0	1[52]
EDS 1991	D	21	+++/+++	0	+++/+++	0	0	1[25]
ISAPD 1987	I,D	13	+++/+++	/+++	++(+)/+++	0	+++/+++	1[31]
NUDS 1980	D	6	++(+)/+++	0	++(+)/+++	0	0	6[2,19,23–25,28]
NYU 1980	I,D	6	+++/+++	0	0	0	0	1[36]
PDIS 1987	I	10	–(+)/+	/–	0	++(+)/++	0	1[20]
SPES 1997	I,D	25	+++/+++	/+++	+++/++(+)	0	0	1[21]
UCLA 1981	I,D	21	0	0	++(+)/+++	0	0	2[24,28]
UPDRS 1987		31	+++/+++	/+++	++/+++	0	+++/+++	4[26,27,40,42]
UDRS ADL	I,D	13	+++/+++	/+++	0	0	+++/+++	2[21,39]
UPDRS ME		14	+(+)/+(++)	/+++	++/++	0	+++/+++	6[21,32,38,39,41]
Webster 1968	I	10	++/+	/++	–(+)/+++	0	0	6[19,23,24,28,29,51]

Signs before the slash refer to results of validity and reliability and signs behind the slash refer to thoroughness (strength of evidence) of validity and reliability testing. Results of validity and reliability testing: 0, no numerical results reported; ?, results not interpretable; –, poor results; +, moderate results; ++, substantial results; +++, good results.

Thoroughness of validity and reliability testing: 0, no reported evidence; ?, results not interpretable; –, poor evidence; +, moderate evidence; ++, substantial evidence; +++, good evidence.

[a]I, impairment scale; D, disability scale.

[b]Thoroughness of testing only.

[c]Superscript numbers correspond with the studies in References.

ture; (II) speech and facies; (III) seborrhea.[19] Four studies showed that the scale displays poor to moderate interrater reliability.[23–28]

Columbia University Rating Scale.

Although the Columbia University Rating Scale (CURS) has been used frequently in clinical studies before the introduction of the UPDRS in 1981, few studies have been published on the validity and/or reliability of this scale, mostly in combination with other PD rating scales.[22,23,28,29] The available evidence shows the CURS to have moderate to good validity and reliability. The factor structure was evaluated in only one study, which included 95 patients with PD plus syndromes, and thus precludes a conclusion on this issue in PD.[30] A modified version of the CURS, the Sydney scale, appears to be equally valid and reliable.[22]

Parkinson's Disease Impairment Scale.

Only one study has assessed validity and reliability of the Parkinson's Disease Impairment Scale (PDIS). Due to unclear factor analysis and the subsequent assessment of the construct validity based on these factors, the validity of this scale is questionable.[20] The intrarater reliability appeared to be moderate to good.

Disability Scales

Four disability scales, including the Northwestern University Disability Scale (NUDS), the Intermediate Scale for Assessment of Parkinson's disease (ISAPD), the Schwab and England and the Extensive Disability Scale (EDS) are hard to compare, because they vary much in scoring, grading, number, and kind of items. Although the ISAPD is, among others, based on the NUDS, its grading is different; 0 to 3 instead of 0 to 10.

Schwab and England.

The Schwab and England scale has become a standard assessment tool in PD and has been used in hundreds of studies. The clinometric properties of this scale, however, have never been established. The data available from studies with a primary aim to investigate characteristics of other rating scales suggest a moderate to substantial validity and good reliability.[28,31,32]

Northwestern University Disability Scale.

Two studies found a moderate to good construct validity.[19,28] These studies showed that the total Northwestern University Disability Scale (NUDS) score correlates highly with the total Webster score (Kendall's $W = 0.82$)[19] and with the CURS (Spearman's $\rho = -0.78$),[28] which are both impairment scales. The interrater reliability of the NUDS was found to be excellent by its designers[33] but only moderate by others.[23,24,28] A reason for the latter could be the combined effect of the large number of severity gradations in this scale and the use of non-weighted κs. Although this scale is frequently used, no information is available on internal consistency or intrarater reliability.

Intermediate Scale for Assessment of Parkinson's Disease.

Evaluated only by its designers, the Intermediate Scale for Assessment of Parkinson's disease (ISAPD) shows a moderate to good correlation with the H&Y, with the UPDRS and with the Schwab and England.[31] In the same study, the results were also excellent for the internal consistency and good for the inter-rater reliability. The administration time was recorded as 7 minutes (±3.70).[31]

Extensive Disability Scale.

The Extensive Disability Scale (EDS) is a modified version of the Minimal Record of Disability (MRD),[34,35] which is used in examining patients suffering from multiple sclerosis and has only been used and tested by its authors, who found a moderate to good construct validity and inter-rater reliability.[28] The administration time was stated as 15–20 minutes by a trained reviewer.[28]

Impairment and Disability Sections in Multimodular Scales

In comparing the four impairment and disability scales, the New York University Parkinson's disease evaluation (NYU), the Short Parkinson's Evaluation Scale (SPES), the University of California Los Angeles scale (UCLA), and the Unified Parkinson's Disease Rating Scale (UPDRS), we noticed the similarity in item content. All scales included items such as bradykinesia, tremor, rigidity, walking, eating, turning in bed, and handwriting.

New York University Parkison's Disease Evaluation.

For this scale only poor construct validity with the H&Y was reported.[36] The administration time was stated as 10 minutes by a trained examiner.[36]

University of California Los Angeles Scale.

The UCLA scale is rarely used in clinical trials and beyond the work of Martínez-Martín,[24] who found a moderate to good inter-rater reliability, no further evidence for reliability or validity of the scale has been published.

Unified Parkinson's Disease Rating Scale.

The UPDRS has found broad acceptance for the evaluation of PD and has been used in many trials.[37] Nine studies extensively tested and evaluated this scale. Like the Webster, the UPDRS ADL section is conceptually unclear as it includes several impairment items (salivation, falling, freezing, tremor, and sensory complains). Nevertheless, the UPDRS demonstrates high internal consistency and inter-rater reliability, shows moderate construct validity, and has a stable factor structure.[21,28,32,38–42] Even across *off*- and *on*-state examinations, the ME section of this scale has a stable factor structure and high internal consistency.[32] The high internal consistency of the ADL and motor section most likely indicates a redundancy of items. This was underscored by a previous study that successfully reduced the ADL and motor section of the UPDRS to eight items each, without losing reliability or validity.[39] The time to administer was stated 10–20 minutes[28] and assessed as 16.95 minutes (±7.98).[28]

SPES.

Evidence for construct validity and inter-rater reliability of the SPES is good, but was only reported in an article by its original designers.[21] The advantage of the SPES seems to be that it is short, and easy to administer in 7–10 minutes (by neurologists).[21]

DISCUSSION

Compared to their widespread clinical use for assessment of impairment and disability in PD, rating-scales are seldom extensively evaluated for validity and reliability. The terms impairment and disability are derived from the World Health Organization International Classification of Impairments, Disabilities, and Handicaps (ICIDH; http://www.who.int/icidh).[7,8] The ICIDH-2 was developed recently, and introduces new terms; body function and structures are handled both positive (functional and structural integrity) and negative (impairment) as well as activities (activity vs. activity limitation).

Systematically reviewing the available literature, we traced 30 studies describing clinometric issues of 11 scales for impairment and disability rating in PD. In general, a criticism could be made on the frequent choice of the H&Y as the gold standard for testing other scales, because, to the best of our knowledge, none have evaluated its clinometric data. Nevertheless, the H&Y is the most commonly used method of establishing the severity of PD with a simple staging assessment.

In evaluating impairment items, the contribution of the core motor features of PD to the total impairment score appears to vary from scale to scale. For instance, items dealing with brady kinesia and hypokinesia contribute almost 40% to the total score of the UPDRS ME section resulting in a strong effect on the sum scores of the impairment section and on the total score.

There are also large differences in the extent of representation of items related to symptoms considered responsive to dopaminergic treatment (e.g., bradykinesia, rigidity) or those that appear late in the disease course and lack responsiveness to dopaminergic treatment (e.g., postural instability, swallowing, speech, freezing).

Hence, these differences in content should be taken into consideration when choosing a scale for evaluating a short-term dopaminergic treatment or a long-term follow-up in which the occurrence of signs not responsive to dopaminergic treatment indicate disease progression. Generally, within the framework of impairments, items as sialorrhea and seborrhea have a limited clinical significance. Regardless of the scale, the findings concerning inter-rater reliability of the core features bradykinesia, tremor and rigidity as well as for the item speech lacked consistency. The majority of the studies, however, found a good inter-rater reliability for postural stability. Clearer description of items may help to improve inter-rater reliability of items. To avoid the problems with inter-rater reliability, objective measurements could be considered in assessing impairment in PD.[43–48] It is remarkable that only one study evaluated intrarater reliability on this level of disease assessment, which is relevant in the case of longitudinal studies performed by one assessor.

Although there is general agreement on the definition of disability (i.e., the experienced difficulty in carrying out activities of daily living), there is no consensus on what should be measured. All evaluated disability scales and sections included the items of the NUDS (dressing, walking, speech, hygiene, feeding, and eating). Overall disability items displayed moderate to good inter-rater reliability. The low inter-rater reliability values repeatedly found for speech and walking suggest that these items are difficult to score or lack clear anchors.

The PD rating scales identified can be divided in three groups: impairment scales, disability scales, and multimodular scales containing both impairment and disability sections. By comparing the three impairment scales Webster, CURS, and PDIS, we found evidence for the CURS to have strong validity, where there is insufficient data on validity available for the Webster and the PDIS. As the overall reliability of the CURS is moderate to good, the inter-rater reliability of the Webster is assessed as poor to moderate. So, as a brief rating method the Webster appears adequate, but the available clinometric data on CURS point out that this scale is preferable. The PDIS has inadequately been evaluated by its designers and due to the lack of other information on clinometric issues of the PDIS, no recommendations can be given with respect to this scale. The four disability scales, the NUDS, the ISAPD, the Schwab and England and the EDS bear hardly any resemblance. Large differences between the scales are found in the scoring and grading of items. The Schwab and England disability scale takes a unique position, because this scale uses a different grading system and has never been primarily evaluated for its clinometric characteristics. The construct validity and the inter-rater reliability of the NUDS, ISAPD and EDS were found to be moderate to good, suggesting no preference. Only the NUDS was evaluated independently. The ISAPD, evaluated only by its designers, appears to be a very valid and reliable disability scale, which may be useful as a tool for evaluation of disability in PD. Independent verification of the clinometric characteristics, however, is recommended.

Of the scales containing both an impairment and a disability section, the UPDRS is the most widely used and tested scale. The NYU, SPES, and UCLA are rarely used and have only been evaluated by the designers. The construct validity of the UPDRS is satisfactory in those studies that have used the H&Y as comparison. Important differences between these scales include the scoring and the contribution of the individual items to the subtotal and total score. In relation to the validity aspects of the UPDRS, some findings deserve comments. The construct validity of the UPDRS has to be considered very satisfactory. The UPDRS ADL section, however, is conceptually unsound as it includes several impairment items. Concerning the inter-rater reliability, the UPDRS, the SPES, and the UCLA should be considered reliable scales. The SPES and UCLA, however, were evaluated only by designers of the scales. The UPDRS demonstrates a very high internal consistency, but the effects of redundancy (several items focused on the same aspect of the construct) should be kept in mind. Internal consistency increases with the number of items and depends substantially on the homogeneity of the items and on the inter item correlation. Taken together, the evaluation of the impairment and disability sections as a whole show that the UPDRS is a reliable and valid scale, although these sections include some redundant and unreliable items. The SPES appears to be a valid and reliable scale that might be considered for evaluation of patients with PD. Nonetheless, independent verification of the clinometric characteristics is recommended. Because the UCLA and NYU lack thorough clinometric testing, no recommendations can be given.

Others have reviewed disease-specific PD scales,[4,43,49,50] but only Mitchell and associates[37] presented some clinometric properties of the most commonly used scales (identified through a Medline search conducted from 1966 until August 1998). In this study the UPDRS was found to be the most thoroughly studied scale with overall better clinometric properties compared to other scales. As mentioned by the authors, one of the limitations of this study lies in the main focus, which was not to summarize the clinometrics of scales but to examine the pattern of utilization of disease-specific clinical scales used

as endpoints in PD trials. The summary of clinical properties they report is simple and is intended to serve as a guide.

In summary, this review underscores that the clinometric soundness of the majority of PD assessment scales is questionable. Moreover, as these scales are generally used in trials on PD patients who lack serious comorbidity, there is no information on the clinometric behavior of the scales in unselected PD populations.

We emphasize the following critical notes regarding clinometric issues:

1. The most important question in choosing a scale is how well it is suited to the task at hand in terms of validity, reliability, and efficiency.
2. A greater number of items increases the internal consistency and leads to greater concordance between examiners (its reliability increases). Reliability of a composite scale will increase as a function of the number of the individual items that are included. Limiting the number of items in a scale, however, contributes to simplicity and utility of the assessment, at the expense of completeness, sensitivity, and reliability.
3. It is remarkable that none of the studies addressed differences in responsiveness between scales, which is required to ensure the usefulness in the longitudinal evaluation of PD. Responsiveness is an essential part of the statistical analysis as it refers to the ability of a measure to reflect change.
4. Video recordings may help to improve assessment of inter- and intrarater reliability in studies. These recordings have their limitations, however, for they can only be used to score items that are clearly visible or audible. Rigidity, seborrhea and sialorrhea are difficult to discern on tape and should not be included if a scale is used for video assessments.

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Name:_____ Date:_____

The Roland-Morris Disability Questionnaire

When your back hurts, you may find it difficult to do some of the things you normally do. This list contains some sentences that people have used to describe themselves when they have back pain. When you read then, you may find that some stand out because they describe you today. As you read the following list, think of yourself today. When you read a sentence that describes you today, put a tick against it. If the sentence does not describe you then leave the space blank and go on to the next one. Remember to only tick the sentence if you are sure that it describes you today.

- ❑ 1. I stay at home most of the time because of my back.
- ❑ 2. I change position frequently to try and get my back comfortable.
- ❑ 3. I walk more slowly than usual because of my back.
- ❑ 4. Because of my back, I am not doing any of the jobs that I usually do around the house.
- ❑ 5. Because of my back, I use a handrail to get upstairs.
- ❑ 6. Because of my back, I lie down to rest more often.
- ❑ 7. Because of my back, I have to hold on to something to get out of an easy chair.
- ❑ 8. Because of my back, I try to get other people to do things for me.
- ❑ 9. I get dressed more slowly than usual because of my back.
- ❑ 10. I only stand for short periods of time because of my back.
- ❑ 11. Because of my back, I try not to bend or kneel down.
- ❑ 12. I find it difficult to get out of a chair because of my back.
- ❑ 13. My back is painful almost all the time.
- ❑ 14. I find it difficult to turn over in bed because of my back.
- ❑ 15. My appetite is not very good because of my back pain.
- ❑ 16. I have trouble putting on my socks (or stockings) because of the pain in my back.
- ❑ 17. I only walk short distances because of my back.
- ❑ 18. I sleep less well on my back.
- ❑ 19. Because of my back pain, I get dressed with help from someone else.
- ❑ 20. I sit down for most of the day because of my back.
- ❑ 21. I avoid heavy jobs around the house because of my back.
- ❑ 22. Because of my back pain, I am more irritable and bad tempered with people than usual.
- ❑ 23. Because of my back, I go upstairs more slowly than usual.
- ❑ 24. I stay in bed most of the time because of my back.

TOTAL:_____
The score is the total number of items check and will range from 0 – 24

Roland M & Fairbank J. The Roland-Morris Disability Questionnaire and the Oswestry Disability Questionnaire. Spine 2000; 25(24):3115-3124