

Morbidity Assessment Index for Newborns (MAIN)

Overview: The Morbidity Assessment Index for Newborns (MAIN) can be used to evaluate newborn infants for morbidity. The tool is intended to allow comparison of the impact from obstetrical therapeutic strategies on neonatal outcomes.

Item Ranking (with Increasing Values)

Item	Description	Value
1	poor sucking within 24 hours	81
2	poor sucking at 24 hours to 7 days	98
3	serum bilirubin 251-340 µmol/L OR need for phototherapy	103
4	apnea and need for oxygen	115
5	assisted ventilation beyond 24 hours	117
6	poor sucking beyond 7 days	119
7	heart rate > 160 beats per minute	120
8	Apgar score at 05 minutes < 7	125
9	resuscitation at birth with intubation	127
10	hypotonia at 1-120 hours	129
11	mechanical ventilation within 24 hours	130
12	respiratory rate < 30 per minute or > 60 per minute at 3-24 hours	131
13	mechanical ventilation at 24 hours to 7 days	135
14	low systolic blood pressure (< 30 mm Hg for 28-32 weeks < 40 mm Hg for 32-42 weeks)	136
15	persistent vomiting	136
16	level of consciousness: drowsy or lethargic	137
17	single seizure OR tremors	137
18	apnea corrected by resuscitation	140
19	respiratory rate > 100 per minute 3 to 24 hours	140
20	low urine output (< 2 mL per kg per hour)	141
21	altered color: central cyanosis or dusky	145
22	bleeding skin lungs or GI tract	147
22	thrombocytopenia	147
23	cord blood pH < 7.1	151
24	hypoglycemia (< 2.2 mmol/L)	151
25	intraventricular hemorrhage: Grade 1 or 2	152
26	Apgar score at 10 minutes < 7	154
27	flaccidity at 1-120 hours	154
28	meconium below cords	155
29	multiple seizures	155
30	hypotonia persisting beyond 120 hours	156

31	heart rate < 100 beats per minute	157
32	mechanical ventilation beyond 7 days	161
33	cardiopulmonary resuscitation at any time	162
34	bacterial culture of blood: positive findings	162
35	Apgar score at 05 minutes < 4	162
36	transfusion for anemia or low platelet count	170
37	fracture of long bone clavicle or skull	176
38	serum bilirubin > 340 µmol/L OR need for exchange transfusion	179
39	subdural or intracranial hematoma	179
40	facial or peripheral nerve injury at birth	183
41	heart rate > 200 beats per minute	183
42	intraventricular hemorrhage: Grade 3 or 4	186
43	bacterial culture of CSF: positive findings	187
44	Apgar score at 10 minutes < 4	187
45	multiple seizures and > 2 drugs needed to treat	183
46	level of consciousness: stupor obtundation coma	187
47	Apgar score at 05 minutes < 1	193

from Table 1 page 704 Verma 1999

Separation into Related Groups

Group	Description	Value	Item
Apgar	Apgar score at 05 minutes < 1	193	47
Apgar	Apgar score at 05 minutes < 4	162	35
Apgar	Apgar score at 05 minutes < 7	125	8
Apgar	Apgar score at 10 minutes < 4	187	44
Apgar	Apgar score at 10 minutes < 7	154	26
bilirubin	serum bilirubin 251-340 µmol/L OR need for phototherapy	103	3
bilirubin	serum bilirubin > 340 µmol/L OR need for exchange transfusion	179	38
blood	bleeding skin lungs or GI tract OR thrombocytopenia	147	22
blood	transfusion for anemia or low platelet count	170	36
CNS	intraventricular hemorrhage: Grade 1 or 2	152	25
CNS	intraventricular hemorrhage: Grade 3 or 4	186	42
CNS	subdural or intracranial hematoma	179	39
CNS	level of consciousness: drowsy or lethargic	137	16
CNS	level of consciousness: stupor obtundation coma	187	46
culture	bacterial culture of CSF: positive findings	187	43

culture	bacterial culture of blood: positive findings	162	34
general	altered color: central cyanosis or dusky	145	21
general	cord blood pH < 7.1	151	23
general	facial or peripheral nerve injury at birth	183	40
general	fracture of long bone clavicle or skull	176	37
general	hypoglycemia (< 2.2 mmol/L)	151	24
general	low systolic blood pressure (< 30 mm Hg for 28-32 weeks < 40 mm Hg for 32-42 weeks)	136	14
general	low urine output (< 2 mL per kg per hour)	141	20
general	persistent vomiting	136	15
lung	apnea and need for oxygen	115	4
lung	apnea corrected by resuscitation	140	18
lung	meconium below cords	155	28
lung	respiratory rate > 100 per minute 3 to 24 hours	140	19
lung	respiratory rate < 30 per minute or > 60 per minute at 3-24 hours	131	12
pulse	heart rate < 100 beats per minute	157	31
pulse	heart rate > 160 beats per minute	120	7
pulse	heart rate > 200 beats per minute	183	41
resuscitation	resuscitation at birth with intubation	127	9
resuscitation	cardiopulmonary resuscitation at any time	162	33
seizures	single seizure OR tremors	137	17
seizures	multiple seizures	155	29
seizures	multiple seizures and > 2 drugs needed to treat	183	45
muscle	flaccidity at 1-120 hours	154	27
muscle	hypotonia at 1-120 hours	129	10
muscle	hypotonia persisting beyond 120 hours	156	30
sucking	poor sucking within 24 hours	81	1
sucking	poor sucking at 24 hours to 7 days	98	2
sucking	poor sucking beyond 7 days	119	6
ventilation	assisted ventilation beyond 24 hours	117	5
ventilation	mechanical ventilation within 24 hours	130	11
ventilation	mechanical ventilation at 24 hours to 7 days	135	13
ventilation	mechanical ventilation beyond 7 days	161	32

where:

- I used a platelet count < 150 0 per μ L to indicate thrombocytopenia in the implementation.

- The best way to handle hypotonia sucking and mechanical ventilation is uncertain due to the use of time intervals. One method is to include a score for the occurrence at each time interval. The second is to take the maximal value in each group.

- The following need to be measured on at least 2 occasions: level of consciousness low urine output apnea respiratory rate flaccidity hypotonia assisted ventilation and heart rate.

MAIN = SUM(points for items present)

Interpretation:

- minimum score: 0

- maximum score: > 5 0

MAIN Score	Morbidity
<= 300	very mild to mild
301 - 600	mild
601 - 2 0	mild to moderate
> 2000	moderate to severe

References:

Verma A Okun NB et al. Morbidity Assessment Index for Newborns: A composite tool for measuring newborn health. Am J Obstet Gynecol. 1999; 181: 701-708.