

Cooling in Mild Encephalopathy (COMET) trial

Expanded Modified Sarnat Staging

Encephalopathy can be diagnosed only by a clinical examination. Although neurological examination is a subjective assessment, standardisation of the assessment and certification minimises examiner variability and promotes enrolment of appropriate babies.

This examination has 6 categories (Table 1); each category contributes one point. Primitive reflexes (suck and Moro) and the autonomic nervous system (pupils, heart rate, and respiration) have multiple signs, but these contribute only one point; when multiple signs within a category are in mild or moderate, the higher severity of encephalopathy is noted; that is, if suck is normal and Moro is mild, mild encephalopathy is selected for the primitive reflexes category.

The neurologic examination should be conducted in 2 phases. The first phase is the observation phase (assessment of spontaneous activity, posture, heart rate, and respiration); the second phase is the active manipulation phase (assessment of level of consciousness, tone, suck, Moro, and pupils) whereby the least noxious part should be performed first, leaving the pupils for the last part of the examination. The infant should be assessed in the awake state and when stimuli are applied to assess activity; the examiner should start with a mild stimulus before proceeding to a more severe one (Shankaran et al NEJM 2005)

A. Observation part of the assessment

1. Spontaneous activity

Assess spontaneous activity when the baby is awake. The first examination should be performed before sedation. If the baby is markedly sedated a clinical judgment must be used to decide whether the examination is reliable. Muscle relaxation will preclude a meaningful exam.

- 0. Circle normal if infant is active.
- 1. Circle mild if spontaneous activity is slightly reduced.
- 2. Circle moderate if spontaneous activity is markedly reduced.
- 3. Circle severe if spontaneous activity is absent.

2. Posture

Observe infant in awake state.

- 0. Circle normal if infant is moving around and does not maintain one posture but have flexion of lower extremity at hip and/or knees.
- 1. Circle mild if there is mild flexion of distal joints (fingers and wrist usually)
- 2. Circle moderate if there is moderate flexion of distal joints, complete extension or frog-legged" position (complete abduction)
- 3. Circle severe if decerebrate or decorticate with or without stimulation. If posture is

abnormal, but does not fit moderate or severe, code as a circle moderate.

3. Respiratory pattern (Autonomic Nervous System)

- 0. Circle normal if breathing spontaneously.
- 1. Circle mild if tachypnoeic.
- 2. Circle moderate if periodic breathing.
- 3. Circle severe if apnoeic or requiring ventilator support

An intubated infant with spontaneous breaths is coded as severe as it cannot be ascertained if the spontaneous breaths can sustain respiration without ventilator support.

4. Heart rate (Autonomic Nervous System)

Heart rate should be evaluated based on documented rate over the previous min/hrs. If cooling has been already initiated heart rate cannot be assessed.

- 0. Circle normal if the heart rate is between 100 to 160.
- 1. Circle mild if there is tachycardia (>160 per minute)
- 2. Circle moderate if there is bradycardia (< 100/min) with only occasional increases to >120/min.
- 3. Circle severe if the heart rate is not constant and varies widely between <100 and >120.

B. Active manipulation part of the assessment

1. Level of consciousness

Level of consciousness can be assessed only by stimulating the baby and assessing the response to stimuli, and not by merely observing the baby. *Level of consciousness is the deciding factor if categories of mild or moderate categories are equal.*

0. Circle normal if the baby is alert and responsive to external stimuli when awake.
1. Circle mild if infant is hyper-alert, has an exaggerated response to minimal stimuli, has a stare, is inconsolable.
2. Circle moderate if the baby is lethargic. Lethargy is delayed but complete response to external stimuli (start with mild stimuli first then proceed to more noxious stimuli). It is important not to confuse reduced spontaneous activity with lethargy.
3. Circle severe if baby is in stupor or coma and is not arousable and is non-responsive to external stimuli. There may have a delayed but incomplete response to stimuli.

2. Tone

Tone is the response to passive movement. Evaluate extremities, trunk and neck tone and make clinical judgment of tone based on tone in these areas. If possible, evaluate infant prone over your hands to assess neck and trunk. If varying tone, code the predominant state

0. Circle normal if there is strong flexor tone in all extremities, including at the hip.
1. Circle mild if there is slightly increased peripheral tone.
2. Circle moderate if hypotonic or floppy either focal or generalized, or if increased tone noted.
3. Circle severe if flaccid (like a rag doll) or if rigid (stiffness or inflexibility)

3. Suck (Primitive reflex)

Put a gloved finger inside baby's mouth to assess suck.

0. Circle normal if the infant vigorously sucks the examiners finger.
1. Circle mild if suck is weak or poor.
2. Circle moderate if suck is weak or if infant has a bite.
3. Circle severe if suck is absent.

4. Moro (Primitive reflex)

If neonate has fracture of clavicle or brachial plexus injury, evaluate other extremity.

0. Circle normal if, with stimulus, there is extension of limbs, opening of hands, extension with abduction of upper arm followed by flexion (embrace)
1. Circle mild if incomplete, partial response, low threshold to elicit.
2. Circle moderate if incomplete.
3. Circle severe if absent.

5. Pupil (Autonomic Nervous System)

Pupils are difficult to assess in the newborn infant with edema of eyelids. You will need to gently separate the eyelids while a second person shines light. Always use a pupil torch to assess the size of the pupil.

0. Circle normal if, in the dark size is 2.5-4.5 mm & in light, reactive & 1.5-2.5mm
1. Circle mild if mydriasis.
2. Circle moderate if constricted and reacting to light.
3. Circle severe if skew deviation of eyes, pupils are dilated or non-reactive to light. If pupils asymmetric, assign severe.

COMET trial certification process

1. Read this document carefully.
2. View the animated video of encephalopathy.
3. E-mail comet@imperial.ac.uk to arrange for a virtual certification test.

Please laminate this document and keep in your NICU and refer to it when performing a neurological assessment.

Diagnosis of moderate or severe encephalopathy

The clinical trials of hypothermia for moderate or severe HIE have required 3 or more out of 6 abnormalities in the moderate or severe categories of the neurologic examination or clinical seizures within 6 hours of age for trial eligibility. The Cool-Cap and TOBY trials mandated that one of the abnormal categories of the neurologic examination needed to be level of consciousness (lethargy or coma) and abnormal transcranial (single channel) aEEG background for at least 30 minutes or seizures.

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https://neonatal.rti.org/pdf/Neurocertification_HIE_Trials_SS_05212019.pdf

Table 1. Expanded Modified Sarnat staging for neonatal encephalopathy.

CATEGORIES (TOTAL 6)	CIRCLE THE COMPONENTS OF NEUROLOGICAL EXAMINATION (TOTAL 9 circles)			
	NORMAL	MILD	MODERATE	SEVERE
1. Level of consciousness				
	Alert, Responsive to external stimuli when awake.	Hyper-alert, has a stare, jitteriness, high-pitched cry, inconsolable, exaggerated response to minimal stimuli.	Lethargic – i.e. delayed response to a stimulus.	Stupor/coma
2. Spontaneous activity				
	Changes position when awake	Normal or slightly Decreased	Decreased activity	No activity
3. Posture				
	Predominantly flexed when quiet	Mild flexion of distal joints (fingers, wrist usually)	Moderate flexion of distal joint, Complete extension	Decerebrate
4. Tone				
	Strong flexor tone in all extremities + strong flexor hip tone	Normal or slightly increased peripheral tone	Hypotonia (focal or general) or Hypertonia	Flaccid Rigid
5. Primitive reflexes (Assign based on the highest of the two sub-categories)				
Suck	Strong, easy to elicit	Weak, poor	Weak but has a bite	Absent
Moro	Complete	Partial response, Low threshold to elicit	Incomplete	Absent
6. Autonomic system (Assign based on the highest of the three sub-categories)				
Pupils	In dark: 2.5-4.5 mm. In light: 1.5-2.5 mm.	Dilated	Constricted	Deviation/ dilated/ non-reactive to light
Heart rate	100-160 bpm	Tachycardia (HR > 160)	Bradycardia (HR < 100)	Variable HR
Respiration	Regular respirations	Hyperventilation (RR > 60/min)	Periodic breathing	Apnoea or requires ventilator
TOTAL SCORE (CIRCLES)				

The level of encephalopathy will be assigned based on which level of signs (mild, moderate or severe) predominates among the 6 categories. If mild and moderate categories are equally distributed, the designation is then based on the highest level in level of consciousness. Any neonates with seizure should be classified as moderate or severe encephalopathy depending on the neurologic exam. If there is difficulty in assigning spontaneous activity or tone (normal versus reduced), use level of consciousness as a guide. When multiple signs within a category are in mild or moderate, the higher severity of encephalopathy is noted; that is, if suck is normal and Moro is mild, mild encephalopathy is selected for the primitive reflexes category. The spectrum of mild encephalopathy may vary between 2 categories under mild and 4 under normal (mildest end) to two categories under moderate or severe and remaining under mild (severe end).