

GUIDELINES FOR BASIC ADULT NEUROLOGICAL OBSERVATION

Critical Care Services Ontario
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**These Guidelines are a product of
Critical Care Services Ontario (CCSO)**

The Guidelines for Basic Adult Neurological Observation are the result of a collaborative effort between CCSO, the Neurosurgery Education and Outreach Network (NEON) and Provincial Neurosurgery Advisory Committee (PNAC). NEON supports system-wide improvements for Ontario's neurosurgery services through education and outreach across neurosurgery and non-neurosurgery centres. Aligned with the mandate of CCSO and work through PNAC, NEON works to increase spread of knowledge and expertise to Ontario's nurses to support equitable and timely access to neurosurgery care and maintenance of provincial neurosurgery capacity.

How to Use This Document

This document aims to ensure consistency within and across organizations by providing guidance on performing bedside neurological assessments. It was collated (from current evidence informed practice) by a sub-group of NEON and is intended for use by nurses across Ontario when assessing neurological status. These Guidelines are not meant to be exhaustive and its contents are recommended but not mandated for use. The Guidelines were reviewed and approved by Provincial Neurosurgery Ontario (now Provincial Neurosurgery Advisory Committee) in 2014. The revised Guidelines have been reviewed and approved by Critical Care Services Ontario. Nurses should use their core training, clinical judgment and utilize other assessment parameters if determined necessary.

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Disclaimer: The contents of these guidelines may change over time. Clinicians and hospital administrators should use sound judgment for individual patient encounters. Critical Care Services Ontario, NEON, and PNAC strongly recommend evidence-informed practices.

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Introduction

Provincial Neurosurgery Strategy

In 2011, under direction of the Ministry of Health and Long-Term Care (MOHLTC) the mandate of Critical Care Services Ontario (CCSO) was expanded to include implementation of recommendations from the Neurosurgery Expert Panel Report and to work with neurosurgery centres in Ontario to improve coordination of access to neurosurgery care. Dr. Robert Bell, then President and CEO of University Health Network and Dr. James T. Rutka, Chair, Department of Surgery, University of Toronto, and then Chair of the Neurosurgery Expert Panel, were asked to co-chair a committee advisory (then Provincial Neurosurgery Ontario – PNO, now Provincial Neurosurgery Advisory Committee – PNAC) to CCSO in developing a comprehensive neurosurgical strategy to meet the needs of adult and pediatric patients across Ontario. This work resulted in a final report (July 2012) outlining recommendations aimed at improving the access, quality and responsiveness of neurosurgery care.

As part of the Strategy to support delivery of neurosurgery services in Ontario, the MOHLTC committed funding for 66 new Nursing Positions, including 11 Neurosurgical Nurse Educator (NNE) positions, to support the management of specialized neurosurgery patients in critical care units at adult neurosurgery centres. NNEs provide education to staff within their centres and work collaboratively in a provincial network to identify educational needs and disseminate materials to support nursing practice in non-neurosurgery hospitals.

The NNE Network was established in May 2013 to work in collaboration with CCSO and PNAC. Comprised of nurse educators and program directors from each of the province's adult neurosurgery centres, their work formed part of an educational outreach program to educate non-neurosurgery centres on neurosurgery patients' signs, symptoms, clinical best practices, and post-surgical care. In 2014, NEON replaced the NNE network to incorporate neurosurgery outreach.

About these Guidelines

These Guidelines were collated by the Neurosurgery Education and Outreach Network (NEON) to outline the processes associated with the basic assessment of a patient's neurological status. The Guidelines are intended to complement core competencies of nursing training and provide direction for local development of bedside neurological observation protocols. With widespread implementation, this will help to ensure consistency of neurological assessment within and across different organizations. For the individual patient, this provides a baseline from which changes in the patient's neurological status may be identified, reported, and managed in a timely manner.

Nurses assess a patient's neurological status as part of their patient assessments and per physician's orders and as needed. The frequency of neurological assessments may depend on the severity of the patient's presenting illness, other comorbidities, and the probability for changes in a patient's neurological status. The physician's order of frequency may range from every 15 minutes for the more critically ill patient to once daily for a stable patient. The nurse should use his or her clinical judgment to determine the need for an increase in the frequency of neurological observations and whether observations should be expanded to include other assessment parameters. A physician's order is not necessary for the nurse to increase the frequency of neurological assessments, which are within their scope of practice.

The patient's neurological status is assessed according to, and documented in, a neurological observation record or an equivalent patient care record, providing a concise and accurate record of the assessment. Importantly, this also records any pertinent changes in a patient's neurological status over time. The neurological observation record is used to assess the patient's neurological status unless other neurological testing tools are ordered (i.e. the Canadian Neurological Scale (CNS) or the National Institute of Health Stroke Scale (NIHSS)). The basic neurological evaluation includes assessment of the patient's:

- Level of consciousness (LOC) using the Glasgow Coma Scale (GCS)
- Pupillary response
- Limb movement/ strength
- Vital signs

Precise performance and documentation of neurological assessment has important implications for patient care. The assessment provides a snapshot in time of the patient's neurological condition and establishes a baseline. Changes from this baseline may indicate a deterioration in the patient's condition, necessitating an increase in the frequency of monitoring by the nurse, a notification to the physician and/or calling the Critical Care Response Team (CCRT) as per defined calling criteria. In order to improve the accuracy and decrease variability in the neurological observations related to an individual's perception of a patient's response to applied stimuli, it is recommended that observations during a particular shift are performed primarily by the same nurse/healthcare provider. During handover of care between shifts, it is recommended that one set of neurological observations be performed together by nurses of both the outgoing and oncoming shifts.

Note: These Guidelines are for adult neurological assessments only.

Definitions

Glasgow Coma Scale (GCS)

The GCS is an assessment scale developed by Teasdale and Jennett (1974), which provides a standardized measure of the patient's level of consciousness (LOC), by observing the patient's behaviour in response to a gradually increasing stimulus. This stimulus ranges from a mild stimulus (i.e. speaking to the patient), to the application of pressure in order to obtain a behavioural response. The scale contains three subscales: best eye opening response, best verbal response, and best motor response. It has a collective maximum score of 15 indicating a fully alert person, and a minimum score of 3 indicating a comatose person.

Stimulation

In the absence of any spontaneous behaviours or movements, assessing the patient's neurological status is initiated with the use of auditory stimuli. If no response is elicited, a physical stimulus is applied. The following techniques are suggested as physical stimuli:

Peripheral Stimuli (previously referred to peripheral painful stimuli)

Peripheral stimuli may be used to check individual limb movement, however this response may simply reflect a spinal reflex. If, when assessing GCS, there is a difference in motor response to central and peripheral stimuli, response to central stimuli should be considered more relevant and documented. The following methods have been suggested for applying peripheral stimulus using pressure:

Interphalangeal joint pressure: Apply pressure with a pen/pencil to the lateral outer aspect of the proximal or distal Interphalangeal joint (lateral aspect of the patient's finger or toe).

Fingertip pressure: Apply pressure to the distal part of the nail bed to elicit a response.

Varying the finger that is used should minimize the potential for injury from repeated assessments.

Apply the stimulus for up to 10 seconds to ensure adequate time for a possible response to be elicited

Central Stimuli (previously referred to as central painful stimuli)

Trapezius pinch (cranial nerve XI): Using the thumb and two fingers as pincers, feel for the mass of the trapezius muscle located at the angle where the neck and the shoulder meet. Grasp the trapezius muscle at a depth of approximately two inches and pinch. Apply gradually increasing pressure for up to 10 seconds until the patient's best response is observed.

Note: High level spinal cord injuries may interfere with any expected response using the trapezius pinch.

Supraorbital pressure (cranial nerve V): Place the flat of the thumb on the supraorbital notch (small notch located on medial third of supra-orbital ridge) while the other fingers rest on the head of the patient.

Apply gradually increasing pressure for up to 10 seconds until the patient's best response is observed.

Note: Supraorbital pressure is NOT to be used with orbital, skull, facial fractures, or frontal craniotomies.

The patient should not be rated as having no response until the maximum central stimulus has been applied.

Pressure behind the angle of the jaw is difficult to apply accurately and is, therefore, not recommended for routine use.

Note: Sternal rub is NOT recommended due to potential for severe bruising and residual pain and discomfort. In addition, responses may be inconsistent between users and hence difficult to interpret.

Pupillary response

The pupil response to light assesses the function of cranial nerve (CN) II and III. Differences in degrees of change in pupil size, or unequal response between the left or right pupils may be an indicator of a change in intracranial conditions. This could be caused by a number of conditions, such as increased intracranial pressure (ICP), brainstem damage, anoxia, ischemia, or oculomotor nerve compression.

Vital signs

Vital signs include respiratory rate and pattern, oxygen saturation, heart rate, blood pressure, and temperature. Changes in vital signs in the patient with acute neurological diagnosis may be an indicator of neurological deterioration, in particular for patients with brainstem pathology or increased ICP.

Note: Changes in vital signs related to neurological deterioration are often a late sign of deterioration. Changes to pupils, LOC, and motor strength and symmetry are more sensitive as signs of change in clinical status and possible deterioration.

Procedures

Documentation

During the neurological observation assessment, document the data on the patient's neurological observation record. The GCS is documented by placing a dot or number in the appropriate space to document the patient's best response.

Document a total score, which may include a "C" (eyes closed due to swelling or trauma), or "T" (tracheostomy/ endotracheal tube) depending on the assessment as outlined in the following sections.

Note: Additional documentation related to neurological assessment should be included in the nursing or interdisciplinary notes. The placement of an asterisk (or other institutional specific indicator) on the neurological observation tool, can be used to indicate that further documentation is included in the nursing or interdisciplinary notes. This should include documenting the stimulus used as a means of communicating to other health care providers that any noted changes are not merely due to different techniques.

Glasgow Coma Scale (GCS)

When completing the GCS, four general steps below should be followed:

1. **Check** for factors interfering with communication, ability to respond and other Injuries (e.g. language barrier, sedation, spinal cord injury).
2. **Observe** for spontaneous behaviours in the three domains of GCS. If no spontaneous behaviours noted, observe response to stimulation.
3. **Stimulate** with increasing intensity (auditory→physical) until response is obtained in each domain of GCS (if present).
4. **Rate** the GCS according to highest response observed.

Assess the following three aspects of behaviour to determine level of consciousness and document the patient's best response as outlined below:

Eye Opening Response:

- a. If eyes are closed by swelling or surgery and are unable to be opened, score 1 and indicate with a "1C" or a "C" in the "none/non-testable" section.
- b. If one eye is closed, document the response from the functioning eye.

Rating	Criterion	GCS Score
Spontaneous	Patient's eyes open spontaneously with no prompting from the nurse as he or she approaches the patient.	4
To sound	Patient's eyes do not open spontaneously but they do open to an auditory (usually verbal) stimulus. Speak in a normal voice initially, and then in a louder voice as needed to consider hearing impairments/medications/status fluctuations.	3
To pressure	Patient's eyes do not open spontaneously or with auditory stimulation, but they do open to peripheral or central stimuli. Central stimulation for testing eye opening may cause the patient to grimace and confound the examination; if so, use peripheral stimulation.	2
None / Non-testable	There is no eye opening to any stimuli or it is non-testable due to local factors (e.g. eye swelling).	1

Best Verbal Response:

- If the patient is unable to vocalize due to presence of endotracheal tube (ETT) or tracheostomy, score 1 and indicate with a "1T" or a "T" in the "none/non-testable" section.

Note: If a patient is unable to vocalize due to the presence of an ETT/tracheostomy, but is able to communicate through the writing or mouthing of words, the response still receives a score of 1 indicated with a "1T" or a "T" in the "none/non-testable" section. In addition, a description of the patient's response should be described in the nursing or interdisciplinary notes.

- If the patient is able to verbalize despite the presence of a tracheostomy, enter a "T" in the appropriate section.
- If the patient has a language or communication barrier and there is no interpreter or family present at the time of the assessment, document the language barrier across the "none/non-testable" section and expand in the nursing or interdisciplinary notes.

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Rating	Criterion	GCS Score
Orientated	<p>The patient answers all of the following correctly:</p> <ul style="list-style-type: none">• Person (their name)• Place where he or she is (e.g. hospital)• Time (the month and year) <p>When testing orientation, change the order of the questions as the patient may memorize the answers.</p> <p>If the patient is oriented but exhibits inappropriate behaviour, score the patient as oriented in that section and expand in the nursing or interdisciplinary notes, describing the behaviour as clearly as possible.</p>	5
Confused	Unable to correctly answer all of "person", "place", and "time".	4
Words	The patient clearly articulates words, but his/her verbal responses bear no relation to the context of the orientation questions (Previously referred to as inappropriate words).	3
Sounds	The patient fails to articulate words, but does utter sound, e.g., moans or groans (Previously referred to as Incomprehensible sounds).	2
None / Non-testable	There is no verbal response to any form of stimuli or it is non-testable due to local factors (e.g. presence of an endotracheal tube).	1

Best Motor Response (usually best arm response):

If a patient is obeying commands or clearly localizing spontaneously (e.g. he or she is purposefully attempting to remove oxygen mask, nasogastric tube or when being suctioned), further stimulation is not needed to assess motor response. If further stimulation is needed:

- A central stimuli is preferred over peripheral stimuli to avoid mistaking simple spinal reflex for normal flexion response.
- If there is a difference in response to central versus peripheral stimuli, response to central stimuli is a more sensitive indication of neural function and should be recorded
- Use trapezius pinch first. If no response to this, try supraorbital pressure.
- If there is a difference in motor response between left and right side, document the best response.

Rating	Criterion	GCS Score
Obeys commands	<p>The patient is able to understand and obey verbal/ written/gestured commands. Acceptable commands include: “show me a thumb/two fingers”; “stick out your tongue”.</p> <p>Note: It is not acceptable to ask a patient to squeeze one’s hand unless he or she is also asked to release it. Hand grasping, without a release, may be merely a reflex.</p> <p>If the patient is unable to obey commands, place the patient in a supine position with hands positioned at the groin area if possible. Proceed through the assessment by applying a central stimulus.</p>	6
Localizing	The patient purposefully moves a limb in an attempt to locate and remove the source of the applied central stimulus. If stimuli is applied to head or neck, the patients must be able to move hand above the clavicle towards the applied stimulus	5
Normal flexion	The patient flexes the limb at the elbow, with the limb drawn away from the trunk in response to a central stimulus. There is no direct attempt to remove the source of the stimulus.	4
Abnormal Flexion	The patient flexes the limb at the elbow in response to a central stimulus. Accompanying this movement is shoulder adduction, wrist flexion, and the making of a fist. Abnormal flexion is usually a slow movement, with no attempt to remove the stimulus.	3
Extension	The patient extends the limb at the elbow in response to a central stimulus. Accompanying this movement is adduction of the shoulder, flexion of the wrist while the fingers either make a fist or extend.	2
None / Non-testable	No movement of the limbs occurs in response to a central stimulus or it is non-testable due to local factors.	1

Changes from baseline may indicate deterioration in a patient’s condition. Follow up by increasing the frequency of monitoring, informing the physician and/or calling the Critical Care Response Team (or equivalent) as per defined CCRT activation criteria.

At this point of the assessment, add the numbers from each section (eye opening, best verbal and best motor response), and document in the “total” section of the record. This number may include a “C” or “T”. For example, eye opening = 4, best verbal response = 1T, best motor response = 6, would have a total score = 11T. Remember - C or T is associated with a score of 1.

Assessment of Pupils

Assess baseline pupil size (without light stimulus), equality between left and right, and reaction to light.

- a. Check pupils in ambient light prior to assessing reaction, in order to observe the size of the pupil. The size of the pupil adjusted to ambient light is the pupil size recorded.
- b. Since not every person has equal pupils, assess and document a baseline for each individual patient.
- c. Check the patient's baseline history for any cataracts, surgeries, medications, or dilating drops that will affect the assessment.
- d. Instruct the patient to look forward. If unconscious, the nurse will open the patient's eyes by lifting the eyelids looking for midline status.
- e. Use a concentrated light source (e.g. penlight/ophthalmoscope/otoscope/flashlight) in a dim room (turn off ambient light to attain a response) and assess for:
 - **Direct constriction:** Move the light from the outer aspect of the eye inward toward the pupil. The pupil should constrict. Repeat for the other eye.
 - **Consensual constriction:** Shine the light into one pupil and observe the other pupil for constriction. Repeat for the other eye.
- f. Examine each pupil in sequence for any constriction to direct and consensual illumination.
- g. Record a "+" symbol if the pupil reacts, a "-" symbol if the pupil does not react.

Note: If the eyelids are closed due to edema, attempt to open them gently but do not force the eyelids open, otherwise record a "C" for closed.

Note: If pupils change from baseline or NO pupillary constriction is observed, this may indicate a deterioration in a patient's condition. Follow-up by increasing the frequency of monitoring, informing the physician and/or calling the Critical Care Response Team (or equivalent) as per defined CCRT activation criteria.

Assessment of Limb Movement and Muscle Strength in the Non-Spinal Cord Injured Patient

Note: To assess motor strength and sensory function in a patient with spinal cord injury or suspected spinal cord injury, use the spinal cord testing guidelines per the American Spinal Injury Association.

Limb muscle strength is tested to observe for any sign of asymmetry between limb response, and may provide information about the possible anatomical location of any intracranial pathological process or dysfunction.

In a patient who obeys commands:

- Assess the patient's ability to move limbs against gravity and resistance in response to a command.
- Assess and document each limb separately and observe for difference in strength between left and right side:
 - Arms: Assess for straight arm lift, elbow flexion and extension.
 - Legs: Assess for leg lift, plantar flexion and dorsiflexion.

In a patient with decreased level of consciousness and does not obey commands:

- If the patient does not respond to commands, assess and document symmetry and strength of each unrestrained limb movement based on assessment of motor function for GCS (i.e., by observing patient's spontaneous movements or patient's best motor response to central stimulation). If peripheral stimulation is used to ascertain individual limb response, and there is a discrepancy between motor response to peripheral and central stimuli, response to central stimuli is more sensitive for the purpose of rating the GCS.

Document the best response of each limb separately on the neurological observation record. A number of different motor strength scales are being used depending on organizational preference, below is an example of one such scale.

Document observed response as described below:

Scale for Muscle Strength:

Grade	Description
5	Limb moves against full resistance.
4	Limb moves against moderate resistance, but strength is diminished.
3	Limb may move against minimal resistance or against gravity, e.g., if the patient lifts the arm off a surface and it immediately drops back.
2	Limb moves on a horizontal surface with the inability to lift against gravity.
1	Limb or muscle flickers.
0	No movement is observed.

Adapted from the Medical Research Council (MRC) muscle grading scale.

If patient is posturing:

- Abnormal Flexion:
 - Arms: Flexes at the elbow in response to central stimuli. Accompanying this movement is shoulder adduction, wrist flexion and the making of a fist.
 - Legs: Extend at the hips and knees
 - Document “F” for flexion under affected limb.
- Extension:
 - Arms: Extends at the elbow in response to central stimuli. Accompanying this movement is adduction of the shoulder; flexion of the wrist while the fingers either make a fist or extend.
 - Legs: Extended with toes pointing downwards.
 - Document “E” for extension under affected limb.

Note: If unable to assess strength and movement of limb due to fracture, cast, traction, etc., document as not applicable (N/A*). Ensure that the reasoning is also documented in the nursing or interdisciplinary notes.

Vital Signs

Obtain and document vital signs per organizational practice.

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Appendix: Glasgow Coma Scale Documentation Record

GCS Aid available at www.glasgowcomascale.org

GLASGOW COMA SCALE : Do it this way

Institute of Neurological Sciences NHS Greater Glasgow and Clyde



CHECK

For factors Interfering with communication, ability to respond and other injuries



OBSERVE

Eye opening , content of speech and movements of right and left sides



STIMULATE

Sound: spoken or shouted request
Physical: Pressure on finger tip, trapezius or supraorbital notch



RATE

Assign according to highest response observed

Eye opening

Criterion	Observed	Rating	Score
Open before stimulus	✓	Spontaneous	4
After spoken or shouted request	✓	To sound	3
After finger tip stimulus	✓	To pressure	2
No opening at any time, no interfering factor	✓	None	1
Closed by local factor	✓	Non testable	NT

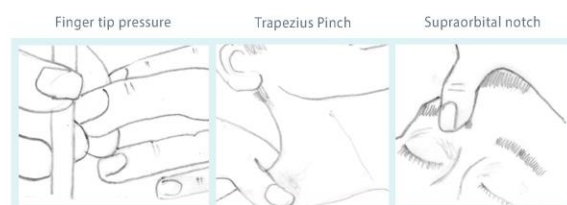
Verbal response

Criterion	Observed	Rating	Score
Correctly gives name, place and date	✓	Orientated	5
Not orientated but communication coherently	✓	Confused	4
Intelligible single words	✓	Words	3
Only moans / groans	✓	Sounds	2
No audible response, no interfering factor	✓	None	1
Factor interfering with communication	✓	Non testable	NT

Best motor response

Criterion	Observed	Rating	Score
Obey 2-part request	✓	Obeys commands	6
Brings hand above clavicle to stimulus on head neck	✓	Localising	5
Bends arm at elbow rapidly but features not predominantly abnormal	✓	Normal flexion	4
Bends arm at elbow, features clearly predominantly abnormal	✓	Abnormal flexion	3
Extends arm at elbow	✓	Extension	2
No movement in arms / legs, no interfering factor	✓	None	1
Paralysed or other limiting factor	✓	Non testable	NT

Sites For Physical Stimulation



Features of Flexion Responses

Modified with permission from Van Der Naalt 2004
Ned Tijdschr Geneesk

Abnormal Flexion
Slow Stereotyped
Arm across chest
Forearm rotates
Thumb clenched
Leg extends



Normal flexion
Rapid
Variable
Arm away from body

For further information and video demonstration visit www.glasgowcomascale.org

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