Neurological Assessment, Monitoring & Nursing Care of the Critically Ill Adult in Intensive Care- Full Clinical Guideline

Reference no.:CG-CRITCARE/4508/24

These are nursing guidelines for use within critical care to support best practice. They are not prescriptive and as with all nursing practice should be utilised in conjunction with the registrant's clinical judgement

Introduction

Critically ill patients have the potential to develop neurological dysfunction because of their underlying illness or injury or as an unavoidable consequence of the intensive therapies they require.

Causes include:

- Status Epilepticus
- Direct Central Nervous System Insults
  - Encephalitis
  - Meningitis
  - Cerebral Vascular Accident (CVA)
  - Brain Tumour / Space Occupying Lesion (SOL)
  - Traumatic Brain Injury (TBI)
  - Raised Intracranial Pressure (ICP)
- Metabolic Derangements
  - Hypo / Hyperglycaemia / Diabetic Ketoacidosis (DKA)
  - Hepatic Encephalopathy
  - Hypo / Hypernatraemia
  - Hypocalcaemia
  - Hypomagnesaemia
  - Uraemia
  - Abnormal Serum Osmolarity
  - Sepsis
  - Cerebral Anoxia / Hypoxia / Hypoperfusion
  - Renal Failure
  - Liver failure
- Drug and Alcohol Intoxication / Withdrawal

Aim and Purpose

The purpose of this nursing guideline is to ensure that safe and effective neurological monitoring, therapy and care is delivered to critically ill adults in ICU.

It aims to promote the maintenance of a safe environment for patients, relatives and the multidisciplinary team, to direct the delivery of informed nursing care and to ensure the nurse acts as patient advocate. (NMC. 2018)

Keywords – Neurological, Critically Ill Adult, Intensive Care Unit

Main Body of Guidelines

Neurological Assessment, Monitoring & Nursing Care

1. Assess the patient's neurological status as a minimum 4 hourly, where sedative agents have not been administered OR during a 'sedation hold' in mechanically ventilated, using the Glasgow Coma Score (GCS) (Teasedale *et al* 1974). Record the Eye-Opening Response Score (E), the Verbal Response Score (V), the Motor Response Score (M) and the cumulative GCS score on the 24-hour observation chart. Report changes immediately and increase observation frequency to a minimum of 1 hourly if deterioration is observed.

2. Assess pupil size and reaction to light stimulation as a minimum of 4 hourly. (Royal Marsden 2020). Record on the 24-hour observation chart and report changes in pupil shape, size, equality and speed of consensual constriction to light stimulation. Increase the frequency of observations to a minimum of 1 hourly if deterioration is observed.

3. Observe the patient for signs of seizure activity and escalate immediately to medical staff. Maintain patient safety throughout and record a description of the seizure, the duration of the seizure, any accompanying incontinence (if able to assess) along with the patients pupil size and response to light stimulation on the UHDB Seizure Record Chart or appropriate local document.

4. Where clinically directed by a Medical Practitioner, administer prescribed anticonvulsant medication, assess effectiveness and document appropriately.

5. Where the patient has a history of an acute head injury OR has had an un-witnessed fall, undertake observations and escalation as directed by the UHDB Head Injury +/- Cervical Spine Injury Guideline CG-T/2013/112.

6. Where the patient with a history of acute head injury or neurological dysfunction requires invasive mechanical ventilation the following care may be instituted to minimise the development of secondary brain injury / raised intracranial pressure.

    a) Place the patient's head in a neutral position, 30^0 - 45^0 head-up, unless spinal injury is confirmed or suspected and ensure that the endotracheal / tracheostomy tube ties do not restrict or inhibit venous drainage (Girling, 2004).

    b) Where clinically directed by a Medical Practitioner, maintain normotension and a systolic BP > 100 mmHg OR Mean Arterial Pressure (MAP) 70 - 90mmHg (Girling 2004, Helmy *et al* 2007, Tobi 2019) to optimise cerebral perfusion pressure (CPP). Normotension may be achieved by the administration of prescribed isotonic fluids to

achieve euvolemia, followed by the administration of prescribed vasopressors to achieve circulatory endpoints (Girling 2004).

N.B. Hypotension must be avoided as it will cause a reduction in cerebral blood flow (CBF) and may result in cerebral ischaemia. Conversely, hypertension may exacerbate vasogenic oedema and ICP (Helmy *et al* 2007).

c) Where clinically directed by a Medical Practitioner, maintain normoxia to achieve peripheral oxygen saturations (SpO_2) > 95% with a partial pressure of arterial blood oxygen level (PaO_2) > 10 kPa (Tobi 2019). Hypoxia must be avoided given its association with worsened outcomes (Girling 2004).

d) Where clinically directed by a Medical Practitioner, induce mechanical hyperventilation to maintain mild hypocapnia and a partial pressure of arterial blood carbon-dioxide level ($PaCO_2$) or end-tidal CO_2 between 4 - 4.5 kPa (Girling 2004).

N.B. The major determinant of cerebral blood vessel diameter is carbon-dioxide. A reduction in $PaCO_2$ will result in cerebral vasoconstriction, reducing cerebral blood volume and ICP. The benefits of induced hyperventilation on intracranial pressure must be titrated carefully to avoid its potentially deleterious effect on cerebral blood flow which may precipitate cerebral ischaemia (Helmy *et al* 2007).

e) Where clinically directed by a Medical Practitioner, maintain normothermia or a core temperature < 37.5^0C and avoid hyperthermia with the use of prescribed anti-pyretics and / or surface cooling measures (Girling 2004).

N.B. Any increase in body and brain temperature will increase cerebral blood flow, cerebral metabolism and cerebral oxygen demand which may increase ICP and further cerebral ischaemia (Girling 2004, Tobi 2019).

f) Where clinically directed by a Medical Practitioner, maintain normoglycaemia by titrating the administration of prescribed intravenous sliding scale insulin to achieve the prescribed blood glucose range and document appropriately (Girling 2004, Helmy *et al* 2007).

N.B. Activation of the stress response following traumatic brain injury can generate a hypercatabolic state that results in hyperglycaemia which is associated with increased cerebral ischaemia, a rise in ICP, worse neurological outcomes and reduced survival (Rovlias *et al* 2000).

g) Ensure patient stimulation is minimised and where clinically directed by a Medical Practitioner, administer prescribed sedation to achieve a RASS Score - 5 (Sessler *et al* 2003) unless directed otherwise and document appropriately. This will help to decrease cerebral metabolism and ICP and to prevent agitation and pain (Girling 2004, Helmy *et al* 2007, Tobi 2019).

h) Where elevated ICP remains of concern and where clinically directed by a Medical Practitioner, administer prescribed pharmacological paralysing agents and assess

effectiveness (ICU Pharmacological Paralysis Guidelines 2024).

i) Where clinically directed by a Medical Practitioner, administer prescribed Mannitol as an osmotic diuretic to remove brain tissue water and reduce an acute rise in intracranial pressure (Girling. 2004, Helmy *et al* 2007).

References

Girling. K. (2004) — Management of head injury in the intensive-care unit. Continuing Education in Anaesthesia, Critical Care & Pain. Vol. 4. Nº. 2. pp.52-56.

Helmy. A., Vizcaychipi. M. (2007) Gupta. A.K. — Traumatic brain injury: intensive care management. British Journal of Anaesthesia 99. (1) pp. 32-42

NMC (2018) — The Code. Professional standards of practice and behaviour for nurses, midwives and nursing associates. http://www.nmc.org.uk/code.

Rovlias. A., Kotsou.S. (2000) — The influence of hyperglycaemia on neurological outcome in patients with severe head injury. Neurosurgery 46. pp. 335-342

Royal Marsden (2020) — Neurological observations and assessment The Royal Marsden Manual of Clinical and Cancer Nursing Procedures. Chapter 14

Sessler. C., Gosnell. M., Grap. M *et al* (2002) — The Richmond Agitation-Sedation Scale: validity and reliability in adult intensive care unit patients. American Journal of Respiratory Critical Care Medicine.166: pp. 1338- 1344

Teasedale. G., Jennette. B. (1974) — Assessment of coma and impaired consciousness. A practical scale. Lancet 13.2(7872) pp. 81-84.

Tobi. K.U. (2019) — Management of traumatic brain injury in the intensive care unit: A useful mnemonic and a review of the literature. http://www.alliedacademies.org/anaesthesiology-clinical-science-research/

UHDB (2024) — ICU Pharmacological Paralysis Guidelines

UHDB (2013) Head Injury +/- Cervical Spine Injury - Guideline for Investigations & Monitoring CG-T/2013/112

Documentation Controls

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	1	11/2024	Cath Rowe	Brief reference / description as to why an amendment has been made
Intended Recipients: This guideline is for the nursing team on both ICU RDH and ICU QHB sites. The target population for this policy includes all Trust health care staff, bank workers or external agency, who are responsible for the care of patients within Critical Care.				
Training and Dissemination: : Cascaded electronically through lead sisters/nurses/doctors/outreach. Published on Intranet, Article in ICU newsletter; emailed via NHS.net				
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APPENDIX 1

Abbreviations

CBF – Cerebral Blood Flow

CO_2 – Carbon-Dioxide

CPP – Cerebral Perfusion Pressure

CVA - Cerebral Vascular Accident

DKA – Diabetic Ketoacidosis

ICP – Intracranial Pressure

kPa - Kilopascals

MAP - Mean Arterial Pressure

mmHg – Millimetres of Mercury

$PaCO_2$ – Partial Pressure of Carbon-Dioxide in Arterial Blood

PaO_2 – Partial Pressure of Oxygen in Arterial Blood

RASS – Richmond Agitation Sedation Scale

SOL – Space Occupying Lesion

SpO_2 - Saturation of oxygen as measured by a pulse oximetry probe

TBA – Traumatic Brain Injury

APPENDIX 2

Definitions

Consensual Constriction – The change in pupil size in the eye opposite to the eye to which light is being shone

End-Tidal CO_2 Monitoring - End Tidal CO_2 monitoring or capnography depicts the partial pressure of carbon-dioxide detected at the end of exhalation as a number or waveform.

Euvolaemia – The normal volume of body fluid or normovolaema.

Hyperosmolar Therapy – The administration of intravenous Mannitol OR Hypertonic Saline is used to reduce intracranial pressure by the creation of an osmotic gradient that draws fluid from brain tissue.

Isotonic Fluids - An intravenous fluid that contains the same concentration of solutes as blood plasma.

Normotension – Where the blood pressure is considered to be within normal range.

Normoxia – Where the blood oxygen level is considered to be within normal range.