



Raised Intracranial Pressure STG-002

Standard Treatment Guideline (STG)



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Standard Treatment Guidelines (STGs) for paediatric critical care are essential to ensure safe, evidence-based, ethical, and standardized management of critically ill children in Nepal. Given the wide variation in healthcare infrastructure, human resources, and availability of critical care services across the country, uniform clinical guidance is necessary to minimize unnecessary variations in practice and improve patient outcomes. These guidelines assist paediatricians, medical officers, residents, and other healthcare professionals in making timely, consistent, and appropriate clinical decisions, particularly in resource-limited settings. STGs also reinforce adherence to the Nepal Medical Council's Code of Ethics and Professional Conduct by promoting professional competence, patient safety, informed consent, appropriate documentation, and accountability. Furthermore, adherence to nationally accepted guidelines helps establish the expected standard of care, thereby reducing the risk of preventable errors, medico-legal disputes, and litigation while supporting defensible clinical practice. As practical bedside references, STGs facilitate rapid decision-making, enhance resident training, improve communication among multidisciplinary teams, and promote rational utilization of available resources. They also provide a framework for quality assurance, clinical audit, and continuous professional development. The adoption and implementation of national paediatric critical care STGs will strengthen clinical governance, promote equitable delivery of critical care services, and contribute to improved survival and health outcomes for critically ill children throughout Nepal.

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Raised Intracranial Pressure STG-002

Introduction and Definition

Normal intracranial pressure (ICP) ranges between 5 to 15 mmHg. Raised ICP is defined as an ICP greater than 20 mmHg. Brain Trauma Foundation (BTF) guidelines recently increased this threshold to 22 mmHg in adults. However, the duration above these thresholds and waveform analyses are more important than a single value. In the absence of direct ICP monitoring, intracranial pressure is assumed to be greater than 20 mmHg when suggestive signs and symptoms are present, and treatment is initiated. Common causes in children are head trauma, hypoxic brain injury due to various etiologies, central nervous system infections, hydrocephalus, metabolic encephalopathies, and brain tumors.

Intracranial pressure (ICP) Normal range	Cerebral Perfusion pressure (CPP)
Term infants: 1.5-6 mm Hg	CPP = Mean arterial pressure (MAP)-ICP
Young children: 3-7 mm Hg	Targets
Older children: 10-15 mm Hg	Infants/toddlers: 40– 50 mmHg
Adults: 5-15 mm Hg	Children: 50–60 mmHg

Clinical features: Signs and symptoms depend on underlying etiology, age of the children, and the rate of increase of ICP. Common clinical features include irritability, headache, vomiting, confusion, drowsiness, abnormal gaze, seizure, tense and/or bulging anterior fontanelle, papilledema, posturing (decorticate, decerebrate), and unequal pupils. Cushing's triad (hypertension, bradycardia, irregular breathing) is a late sign.

Diagnostic Approach/Investigations

Neurological assessment: A thorough history and clinical examination focusing on the nervous system, is performed to determine the possible etiology and further course of management.
CT scan head: to rule out the surgical cause, to look for midline shift or hemorrhage, poor gray and white matter differentiation, effacement of basal cisterns, radiological signs of herniation
Fundoscopy: papilledema

Ultrasonography (based on availability): Optic nerve sheath diameter (ONSD) greater than 6 mm is suggestive of raised ICP greater than 20 mmHg over 5 minutes; transcranial doppler may be done to track changes and trends on ICP over time.

ICP >20 mmHg for > 5mins- based on availability and feasibility

Management

The goal of management is focused on early recognition, and treatment directed at reducing ICP and reversing its underlying cause to prevent neurologic sequelae and death.

A. Primary assessment and stabilization of airway, breathing and circulation:

Consider securing airway in all patients with altered mental status

Maintain oxygenation and ventilation

Maintain euvolemia, adequate perfusion, and avoid hypotension or hypertension

B. General measures for raised ICP

First tier therapy

Head end elevation by 30° while maintaining a head in midline position

Minimal stimulation, reduce painful interventions

Maintain blood pressure by targeting MAP

Maintain normal body temperature, fever should be treated with antipyretics

Maintain adequate analgesia

Maintain hemoglobin >7 g/dl in traumatic brain injury (TBI)

Target random blood sugar (RBS) around 150 mg/dl. Avoid Hypoglycemia (<60 mg/dl) and hyperglycemia (>180 mg/dl).

GI bleed prophylaxis in high-risk population: Pantoprazole 1 mg/kg/dose Q 12 h in cases on mechanical ventilation, on steroids, post neurosurgery or trauma.

Osmotherapy— IV Hypertonic Saline (3% Saline): 3-5 ml/kg (max 250 ml) over 20 minutes followed by 0.1-1 ml/kg/hr to target serum sodium of 145-155 meq/L. IV Mannitol (20%): 0.25-1 g/kg (2.5-5ml/kg) over 20-30 minutes, if a further doses are required, administer 0.25 g/kg/dose/6 hourly. Check osmolality, if available prior to the each dose: to maintain osmolality less than 320 mOsm/kg.

Antiseizure medication: seizure should be treated with levetiracetam or phenytoin. Short term prophylactic antiseizure medication is suggested to prevent status epilepticus in severe TBI (GCS ≤ 8)

Corticosteroids: indicated only for vasogenic edema (tumors or abscess): IV dexamethasone 0.15 mg/kg/dose every 6 h (max.16 mg/day)

Antibiotics/ Antiviral: whenever indicated; meningitis or encephalitis

Early neurosurgical consultation should be done to determine the need for surgical intervention (e.g., External Ventricular Drain (EVD) or ICP monitor placement, evacuation of hematoma, or excision of mass lesion)

Additional measures in intubated patients

For patients with TBI requiring intubation, lidocaine @1-2 mg/kg IV as a single dose can be used before intubation.

Ventilator settings: Ensure normal oxygenation and ventilation (blood gas, pulse oximetry, endtidal CO₂). PaCO₂: 35-40 mmHg. Avoidance of high PIP and PEEP

Adequate sedation and analgesia: Fentanyl 0.5-3 mcg/kg/hr or morphine 0.005-0.01mg/kg/hr. Appropriate sedation scale should be used to titrate sedation level if possible

Second tier therapy

Therapeutic hyperventilation: may be initiated temporarily (PaCO₂ 30–35 mmHg) only in the presence of acute signs of impending herniation under supervision of consultants

Cerebrospinal fluid (CSF): intracranial or lumbar drain may be placed by neurosurgeon in cases of uncontrolled intracranial hypertension

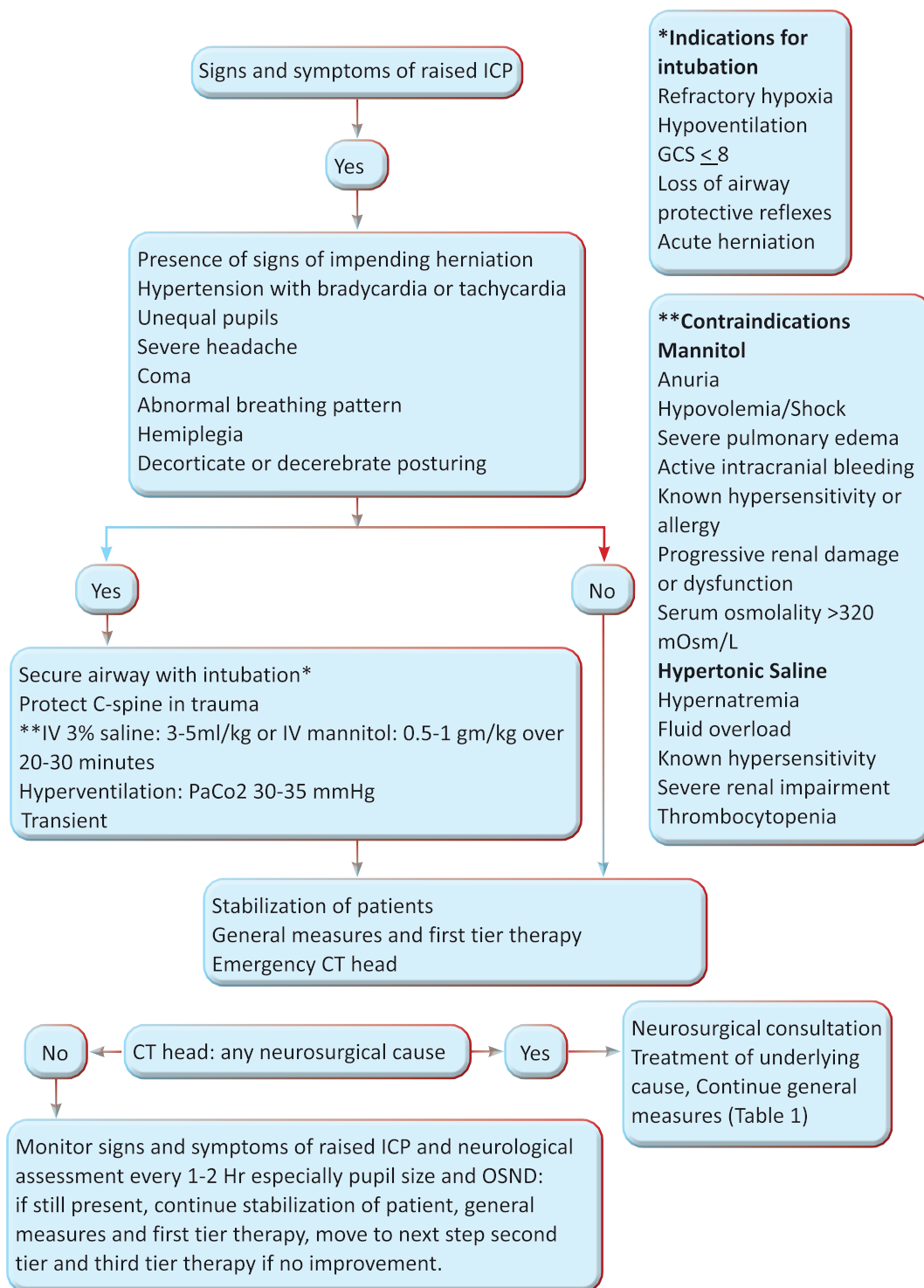
Barbiturates coma- Thiopental or pentobarbital (for burst suppression on EEG) are used for refractory intracranial hypertension.

Moderate hypothermia(32–34°C)

Third tier therapy

Surgical decompression: Decompressive craniectomy or temporal lobectomy

Algorithm: Approach to the management of raised ICP



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