Chapter 1
Altered Sensorium in the ICU

1.1 Introduction

Altered sensorium is a broad term encompassing various levels of impaired consciousness, ranging from confusion to complete unresponsiveness. This condition can be caused by numerous underlying pathologies, including metabolic disorders, infections, neurological injuries, and psychological factors. Prompt identification and management are crucial in the intensive care unit (ICU) to prevent morbidity and mortality. This write-up elaborates on the step-by-step approach depicted in the flowchart for managing patients with altered sensorium in the ICU (Ref. Algorithm 1.1).

1.2 Immediate Assessment and Stabilization (Fig. 1.1)

1.2.1 Ensure Oxygenation, Airway, and Ventilation

The first step is to ensure that the patient's airway is open and that they are adequately ventilated. Use suction if necessary, administer oxygen to maintain SpO2 > 94%, or intubate if the Glasgow Coma Scale (GCS) is less than 8 or if there are signs of airway obstruction such as pooling of secretions. Maintaining proper oxygenation prevents hypoxic brain injury, which can exacerbate altered sensorium [1].

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Call-Out Box

Critical Action: If a patient presents with altered sensorium and a GCS ≤ 8, immediate preparation for intubation is necessary to secure the airway and prevent hypoxia.

Mnemonic: "AEIOU TIPS"
The common causes of altered mental status:

- **A: Alcohol**
- **E: Epilepsy**
- **I: Insulin**
- **O: Overdose/Oxygen deficiency**
- **U: Uremia**
- **T: Trauma/Temperature**
- **I: Infection**
- **P: Psychogenic/Poisoning**
- **S: Stroke/Shock**

Mnemonic: "DON'T": Key Steps in Initial Management

- **D: Dextrose (check and correct glucose)**
- **O: Oxygen (ensure adequate oxygenation)**
- **N: Naloxone (consider in opioid overdose)**
- **'T': Thiamine (administer before glucose in suspected deficiency like alcoholic)**

Fig. 1.1 Call-out box

1.2.2 Maintain Circulation

It is vital to ensure hemodynamic stability with a systolic blood pressure (SBP) > 100 mmHg or a mean arterial pressure (MAP) > 65 mmHg. This can be achieved using intravenous fluids and vasopressors if needed. Adequate perfusion is essential to prevent further neurological deterioration.

1.2.3 Measure Glucose

Hypoglycemia can cause altered sensorium, so blood glucose levels should be checked immediately and maintained above 70 mg/dL. Administer intravenous glucose if necessary to correct hypoglycemia quickly [2].

1.2.4 Look for Seizures

If seizures are present, follow a specific seizure management algorithm. Seizures can significantly impact neurological status and require immediate intervention with antiepileptic medications.

1.3 Rapid Examination

1.3.1 Conduct a Thorough Physical Examination

A comprehensive physical examination should be conducted to identify possible causes (Fig. 1.1):

Trauma: Check for external injuries, bruises, or signs of head trauma.
Infection: Look for fever, neck stiffness (signs of meningitis), skin rashes, or other signs of systemic infection.
Other Visible Clues: Needle marks, breath odor (indicative of alcohol), or jaundice can provide critical insights into the underlying cause.
Neurological Status: Refer to Table 1.1 for a detailed assessment of the comatose patient, including pupillary reactions, spontaneous eye movements, and deep tendon reflexes [3].

Apply Specific Antidotes As outlined in Table 1.2, antidotes should be administered if specific toxicological causes are suspected, such as thiamine for suspected thiamine deficiency, naloxone for opioid overdose, and flumazenil for benzodiazepine overdose [4–7].

Table 1.1 A score sheet for examination of the comatose patient

History: (from relatives or friends)

Onset of coma ☐
Recent complaints ☐
Previous medical illness ☐
Previous psychiatric history ☐
Access to drugs ☐
Occupation ☐
Exposure to pathogens ☐

General physical examination:

Vital signs ☐
Evidence of trauma ☐
Evidence of acute or chronic systemic illness. ☐
Evidence of drug ingestion ☐
Nuchal rigidity ☐

Neurologic profile:

Respiratory pattern:

Regular ☐
Periodic ☐
Ataxic ☐

Pupillary reactions:

Present ☐
Asymmetric (describe) ☐
Absent ☐

Spontaneous eye movements:

Orienting ☐
Roving conjugate ☐
Roving dysconjugate ☐
Abnormal movements (describe) ☐
None ☐

Oculocephalic responses:

Normal awake (nystagmus) ☐
Full comatose ☐
Abnormal (describe) ☐
Minimal ☐
None ☐

Oculovestibular responses:

Normal awake ☐
Tonic conjugate ☐
Abnormal ☐
Minimal ☐
None ☐

Corneal responses:

Present ☐
Absent ☐

Deep tendon reflexes:

Normal ☐
Increased ☐
Absent ☐

Skeletal muscle tone:

Normal ☐
Paratonic ☐
Flexor ☐
Extensor ☐
Flaccid ☐

Table 1.2 Antidotes

Thiamine and glucose	Administer 100 mg IV thiamine, followed by glucose if blood glucose is less than 70 mg/dL. Provide 100 ml aliquots of a 25% glucose solution until blood glucose exceeds 70 mg/dL
Naloxone	If opioid overdose is suspected, administer 0.4–2.0 mg IV every 3 minutes as needed, or use a continuous IV infusion
Flumazenil	If benzodiazepine overdose is suspected, administer 0.2 mg/min IV, with a maximum total dose of 1 mg
Hyperventilation	Apply hyperventilation if there is clinical evidence of increased intracranial pressure (ICP) or herniation
Gastric lavage with activated charcoal	Perform gastric lavage with activated charcoal after intubation if drug intoxication is suspected

Table 1.3 Emergency laboratory evaluation of metabolic coma

Immediate tests:	
1	Kidney function test
2	Complete blood count (CBC)
3	Coagulation test
4	Arterial blood gas (ABG)
5	Electrocardiogram (ECG)
If required:	
1	Liver function test
2	Thyroid and adrenal function tests
3	Blood culture
4	Lumbar puncture

1.4 Obtain Immediate Diagnostic Imaging

1.4.1 Non-contrast CT Brain

A non-contrast CT scan of the brain should be performed to rule out structural causes such as hemorrhage, stroke, or mass effect.

1.4.2 Laboratory Tests

Refer to Table 1.3 for a comprehensive list of laboratory tests, including kidney function tests, electrolytes, complete blood count (CBC), coagulation tests, arterial blood gas (ABG), and electrocardiogram (ECG). These tests help identify metabolic or systemic causes of altered sensorium [8].

1.5 Measure Optic Nerve Sheath Diameter

This measurement can help assess intracranial pressure, which is critical in evaluating patients with suspected increased intracranial pressure or herniation [9].

1.6 Diagnostic Categories

1.6.1 Infection

Signs of infection include fever, neck stiffness, skin rashes, elevated white blood cell count, and positive blood cultures or lumbar puncture findings. Management involves antimicrobial therapy tailored to the suspected pathogen.

1.6.2 Metabolic

Metabolic causes are indicated by abnormal lab values, evidence of organ failure, and history of diseases such as diabetes, liver, or renal disease. Treatment focuses on correcting metabolic imbalances and supporting organ function.

1.6.3 Cerebral Injury

Sudden onset of focal neurological deficits, asymmetrical findings, and abnormal imaging results suggest a cerebral injury. Management includes addressing the underlying cause, such as stroke or trauma, and supporting neurological recovery.

1.6.4 Psychogenic

History of psychiatric disorders or recent psychological stressors, along with the absence of other abnormalities, points to a psychogenic cause. Management involves psychiatric evaluation and appropriate mental health interventions.

1.7 Conclusion

The management of altered sensorium in the ICU requires a systematic approach to identify and treat the underlying cause. Immediate stabilization, thorough examination, and prompt diagnostic testing are essential steps. Understanding the rationale behind each decision point ensures comprehensive care and improves patient outcomes.

1.7.1 Glasgow Coma Scale (GCS)

The Glasgow Coma Scale (GCS) is a widely used scoring system for assessing the level of consciousness in patients with altered sensorium, particularly those with head injuries or neurological conditions. The GCS provides a reliable and objective way of recording the conscious state of a person and helps guide initial management decisions [10, 11].

The GCS assesses three aspects of a patient's responsiveness:

1. **Eye Opening (E)**
   - **Spontaneous (4 points)**: Eyes open spontaneously without any external stimulus.
   - **To Speech (3 points)**: Eyes open in response to verbal commands or speech.
   - **To Pain (2 points)**: Eyes open in response to a painful stimulus.
   - **None (1 point)**: No eye opening, even with painful stimuli.
2. **Verbal Response (V)**
   - **Oriented (5 points)**: Patient is oriented to time, place, and person and can converse coherently.
   - **Confused (4 points)**: Patient is able to speak but is confused and disoriented.
   - **Inappropriate Words (3 points)**: Patient uses inappropriate words or phrases that are unrelated to the conversation.
   - **Incomprehensible Sounds (2 points)**: Patient makes incomprehensible sounds or groans.
   - **None (1 point)**: No verbal response, even to painful stimuli.

3. **Motor Response (M)**

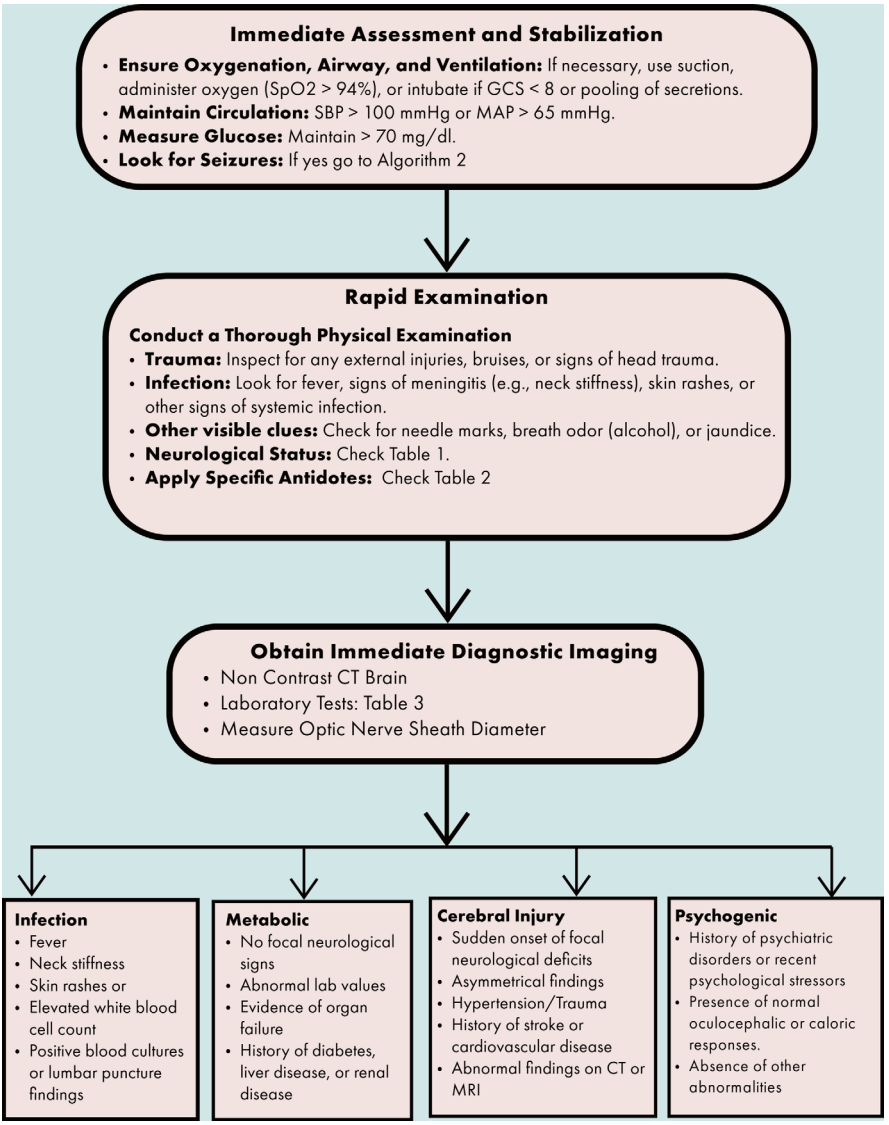
- **Obeys Commands (6 points)**: Patient follows simple commands.
- **Localizes Pain (5 points)**: Patient localizes and attempts to remove the source of pain.
- **Withdraws from Pain (4 points)**: Patient withdraws or pulls away from the source of pain.
- **Flexion to Pain (Decorticate Posturing) (3 points)**: Abnormal flexion in response to pain (bending of the arms at the elbow, bringing the arms to the chest).
- **Extension to Pain (Decerebrate Posturing) (2 points)**: Abnormal extension in response to pain (straightening of the arms and legs, downward pointing of the toes).
- **None (1 point)**: No motor response, even to painful stimuli.

The total GCS score is the sum of the scores for eye opening, verbal response, and motor response. The maximum score is 15, indicating a fully alert and oriented person, and the minimum score is 3, indicating deep unconsciousness or coma.

1.7.2 Interpretation of GCS Scores

- **13–15**: Mild brain injury
- **9–12**: Moderate brain injury
- **3–8**: Severe brain injury (coma).

Algorithm 1.1: Altered sensorium in the ICU



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