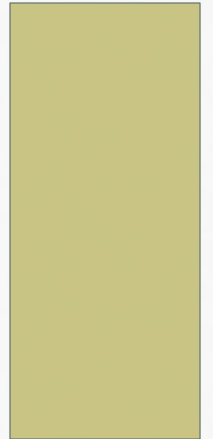


COMMON NEUROLOGICAL SYMPTOMS

THE APPROACH TO COMA AND ALTERED
CONSCIOUSNESS



DEFINITION

- Coma is defined as a state of unarousable unresponsiveness. Typically, the patient lies with eyes closed and does not open them even to vigorous stimulation, such as sternal rub, nasal tickle, or nailbed pressure.
- Alterations in consciousness short of coma are often described using terms such as drowsiness, lethargy, obtundation, and stupor, but these terms tend to be used imprecisely and it is generally best to describe simply how the patient responded to various degrees of stimulation
- The neurologic evaluation and management of a patient with coma or altered consciousness can be intimidating for the student, because such patients are usually critically ill and may require prompt intervention.

GCS

- The Glasgow Coma Scale assigns a numerical score to a patient's level of responsiveness and is commonly used by neurosurgeons in cases of head trauma.
- Its utility lies in its ease of use by nurses and paramedics, its inter-rater reproducibility, and its prognostic value following head injury.
- Although the GCS describes a level of responsiveness, it does not assist in determining the cause of coma.

CONT...

TABLE 38-2

Glasgow Coma Scale

BEHAVIOR	RESPONSE	SCORE
Eye opening response	Spontaneously	4
	To speech	3
	To pain	2
	No response	1
Best verbal response	Oriented to time, place, and person	5
	Confused	4
	Inappropriate words	3
	Incomprehensible sounds	2
	No response	1
Best motor response	Obeys commands	6
	Moves to localized pain	5
	Flexion withdrawal from pain	4
	Abnormal flexion (decorticate)	3
	Abnormal extension (decerebrate)	2
	No response	1
Total score:	<i>Best response</i>	15
	<i>Comatose client</i>	8 or less
	<i>Totally unresponsive</i>	3

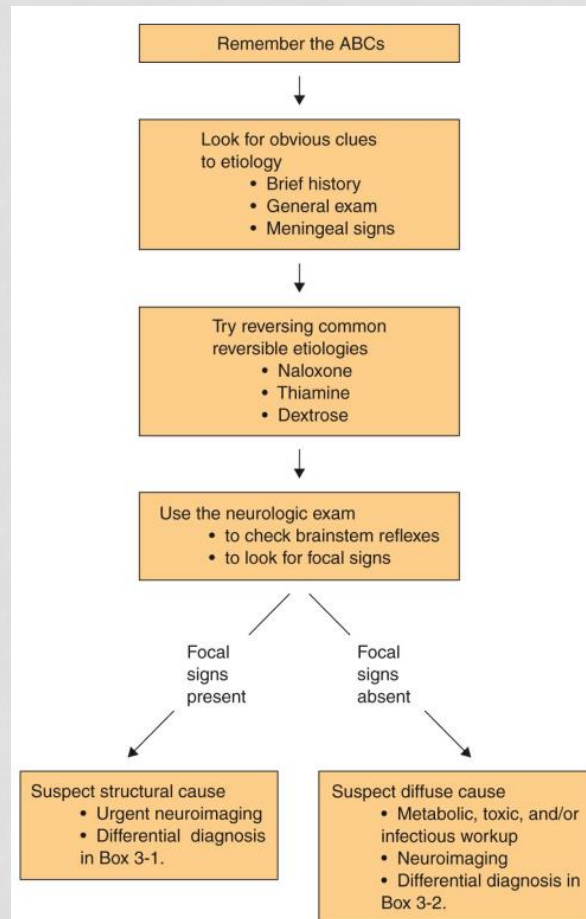
CLINICAL APPROACH

- An algorithm for approaching patients with coma or altered consciousness is presented in Figure 3-1. The initial steps of stabilization and evaluation culminate in the neurologic exam, which is performed with two goals in mind: to assess brainstem function and to look for focal signs. The differential diagnosis and further investigations stem from this clinical assessment.
- 1- Remember the **ABCs**. In any patient with altered consciousness, the airway, breathing, and circulation (ABC) should be checked and maintained.
- 2- Look for obvious clues to etiology . A brief history and general exam should be performed to search for obvious clues.

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- 3- Try reversing common reversible etiologies. Most emergency departments make it standard practice to administer naloxone, thiamine, and dextrose to any patient with depressed consciousness and no obvious etiology (coma cocktail: Dextrose, oxygen, naloxone, and thiamine)
- 4- check brainstem reflexes and look for focal signs.
- 5- Assess for all medication exposure. All comatose patients should have a toxicology screen for substances of abuse and other drugs.

CONT...



EXAMINATION

- When examining a comatose patient, it's essential to follow a systematic approach despite distractions. Start by assessing the level of consciousness with increasing stimuli and note responses. If the patient can be briefly aroused, evaluate attention, language, and visuospatial functions for issues like aphasia or neglect. Cranial nerve assessment is crucial for brainstem function. In arousable patients, standard tests can be used, while in non-arousable patients, focus on key brainstem reflexes (pupillary, corneal, oculoccephalic, gag) and conduct a funduscopic exam. Visual fields can be assessed by checking for a blink to visual threat, and facial symmetry can be tested with stimuli like supraorbital pressure. Maintain focus on the exam despite the patient's condition and clinical environment.

CONT...

TABLE 3-1. Brainstem Reflexes

Reflex	Cranial Nerves Involved	How to Test
Pupillary	II (afferent); III (efferent)	Shine light in each pupil and observe for direct (same side) and consensual (contralateral) constriction
Oculocephalic (doll's eyes)	VIII (afferent); III, IV, VI (efferent)	Forcibly turn head horizontally and vertically and observe for conjugate eye movement in opposite direction (contraindicated if cervical spine injury has not been ruled out)
Caloric testing (if necessary) ^a	Same	Inject 50 mL ice water into each ear and observe for conjugate eye deviation toward the ear injected
Corneal	V ₁ (afferent); VII (efferent)	Touch lateral cornea with cotton tip and observe for direct and consensual blink
Gag	IX (afferent); X/XI (efferent)	Stimulate posterior pharynx with cotton tip and observe for gag

^aCaloric testing should be performed if turning the head is contraindicated or does not result in eye movement. The external auditory canal should be examined first with an otoscope to exclude tympanic perforation or obstruction by wax. Never assume the eyes are immobile unless caloric testing has been done.

CONT...

- Motor tone should be assessed in all extremities of a comatose patient. If the patient can cooperate, check for hemiparesis by having them extend their arms or legs. If not, look for spontaneous movement asymmetry or ask caregivers about limb movement. Apply noxious stimuli to assess withdrawal responses, keeping in mind that this may indicate sensory loss. Watch for decorticate or decerebrate posturing, which indicates brainstem dysfunction. Test muscle stretch reflexes and check for a Babinski sign. Sensory testing typically includes light touch or pain sensation. If invasive tests are needed, explain the procedures to family members beforehand, and assess coordination if the patient is arousable.

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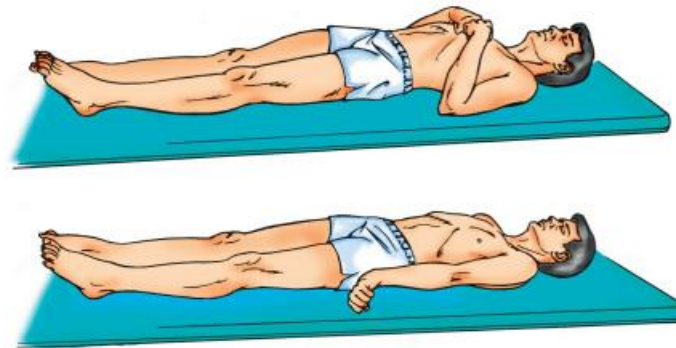


FIGURE 3-2. Decorticate (above) and decerebrate (below) posturing. Both indicate brainstem dysfunction, although decorticate posturing suggests dysfunction slightly more superior than decerebrate posturing. (LifeART image Copyright © 2012 Lippincott Williams & Wilkins.)

DIFFERENTIAL DIAGNOSIS

- In theory, there are two main ways in which consciousness can be depressed: the brainstem can be dysfunctional or both cerebral hemispheres can be dysfunctional simultaneously.
- As examples, acute disease in the brainstem (e.g. pontine hemorrhage) can lead to coma, as can processes affecting both cerebral hemispheres at once (e.g., hypoglycemia)
- Unilateral cerebral hemispheric lesions, however, can also lead to coma if they are large or severe enough to cause swelling and compression of the opposite hemisphere or downward pressure on the brainstem.

- Most neurologists interpret the information using the following principle:
- 1-The presence or absence of brainstem reflexes suggests how deep the coma is
- example >> in milder cases of depressed consciousness, the pupillary, corneal, and gag reflexes may all be preserved. In more severe cases, some or all of these brainstem reflexes may be lost, no matter what the etiology.
- 2-- the presence or absence of focal signs >> if a brainstem reflex is abnormal in an asymmetric fashion, such as a unilateral unreactive pupil, this would be interpreted as a focal sign and suggests compression of, or primary disease in, the brainstem.

The presence of focal signs either on CN testing or in the remainder of the examination including such findings as hemiparesis, aphasia, reflex asymmetry, facial droop, or a unilateral Babinski sign—suggests a structural cause of depressed consciousness.

BOX 3-1. Structural Causes of Depressed Consciousness

- Acute ischemic stroke
 - Brainstem
 - Unilateral cerebral hemisphere (with edema)
- Acute intracranial hemorrhage
 - Intraparenchymal
 - Subdural
 - Epidural
- Brain tumor (with edema or hemorrhage)
 - Primary
 - Metastatic
- Brain abscess (with mass effect)

DIFFUSE CAUSES OF DEPRESSED CONSCIOUSNESS

- The absence of focal signs suggests a diffuse cause of depressed consciousness, including metabolic, toxic, or hypoxic-ischemic etiologies .
- Examples include coma from fulminant hepatic failure, barbiturate overdose, or anoxia following cardiac arrest.
- Remember to review medications that were administered to the patient prior to the exam when interpreting these findings because sedatives and paralytics can influence the clinical findings and may mask brainstem function transiently .

BOX 3-2. Diffuse Causes of Depressed Consciousness

Metabolic
Electrolyte abnormality
Hyponatremia, hypernatremia, hypocalcemia, hypercalcemia, hypomagnesemia, hypermagnesemia, hypophosphatemia
Glucose abnormality
Hypoglycemia, nonketotic hyperosmolar coma, diabetic ketoacidosis
Hepatic failure
Uremia
Thyroid dysfunction
Myxedema coma, thyrotoxicosis
Adrenal insufficiency
Toxic
Alcohol

Sedatives
Narcotics
Psychotropic drugs
Other exogenous toxins (carbon monoxide, heavy metals)
Infectious
Meningitis (bacterial, viral, fungal)
Diffuse encephalitis
Hypoxic-ischemic
Respiratory failure
Cardiac arrest
Other
Subarachnoid hemorrhage
Carcinomatous meningitis
Seizures or postictal state

KEY POINTS

- In theory, consciousness can be depressed either by dysfunction of the brainstem or dysfunction of both cerebral hemispheres simultaneously; in reality, large unilateral hemispheric lesions (with pressure on the other side) qualify as well.
- The presence or absence of brainstem reflexes suggests how deep the coma is.
- The presence of focal signs suggests a structural cause of coma.
- The absence of focal signs suggests a diffuse cause of coma, such as metabolic, toxic, infectious, or hypoxicischemic etiologies.
- Remember to review medications administered to the patient when interpreting the exam.

LABORATORY AND RADIOLOGICAL STUDIED

- When evaluating a patient with depressed consciousness, it's
- crucial to differentiate between structural causes (like a stroke) and diffuse causes (like metabolic issues), This guides the diagnostic pathway.
- The presence of Focal Findings such as changes in gait , weakness , speech changes suggests a structural cause , and urgent head imaging is required. The go-to method is usually a non-contrast CT scan to quickly identify issues such as:
 - Acute stroke
 - Brain hemorrhage
 - Mass lesions (such as tumors)

- Why Non-Contrast CT? In cases of suspected bleeding in the brain, contrast-enhanced CT should be avoided because it can mimic the appearance of a hemorrhage, leading to confusion.

❑ Non-contrast CT is ideal because:

1. It clearly shows hemorrhages.
2. Contrast can obscure findings by looking like blood.

❑ CT vs. MRI While MRI is excellent for detailed imaging, **CT is often the first choice for initial imaging**. This is because:

1. CT scans are more widely available in emergencies.
2. They're quicker to perform Even when brainstem problems are suspected, CT is preferred initially to rule out critical conditions like large lesions compressing the brainstem.

□ If the examination does not point to a specific part of the brain

being affected (no focal findings), then the cause is likely more generalized (diffuse).

- In these cases, the doctor needs to look for metabolic, toxic, or infectious causes. This includes the following investigations :

1. Blood tests (to check for things like infections, blood sugar levels, etc.)

2. Toxicology screen (to check for drugs or poisons)

3. Electrolytes and liver function tests

4. If the patient is a woman of reproductive age, a pregnancy test

is important to manage medications safely.

❑ If an infection is suspected, further tests like :

- a chest X-ray, urinalysis, and blood or urine cultures might be needed. If the results are still unclear, doctors may perform a lumbar puncture (LP) to check for conditions like meningitis.
- They may also look for more uncommon causes, such as myxedema coma by checking thyroid function.

❑ if the cause is suspected to be diffuse, head imaging (CT scans) is usually necessary. This is because it can reveal:

- Global brain injuries (such as lack of oxygen to the brain)
- Swelling (edema)
- Bilateral lesions that mimic diffuse issues

❑ A CT scan is especially important before performing a lumbar puncture because a large brain mass could lead to brain herniation, which is life-threatening.

- ❑ If bacterial meningitis is suspected, antibiotics should be given quickly, even before the CT scan is performed.
- ❑ EEG (Electroencephalogram) is often done for patients in a coma or with altered consciousness. It measures the brain's electrical activity and can help:
 - Assess the depth of a coma by looking at the brain's background Activity.
 - Identify specific patterns that may indicate particular conditions (like hepatic encephalopathy or anoxic brain injury)
 - Diagnose non-convulsive status epilepticus as a cause of coma.

TREATMENT AND PROGNOSIS

OVERVIEW

- Treatment varies based on diagnosis.
- Types of causes:
 - Metabolic
 - Infectious
 - Toxic
 - Structural

MANAGEMENT

- Metabolic, infectious, and toxic causes require:
>> Primarily medical management.

Structural causes may need >> Neurosurgical intervention.

MANAGING INCREASED ICP

- When ICP is suspected:
 - 1-Raise head of bed.
 - 2-Hyperventilation.
 - 3-Osmotic diuretics (e.g., mannitol)
- Use corticosteroids for edema in brain tumors.
- The lowering of ICP may be a neurologic or neurosurgical emergency if the patient shows signs of brain herniation.
- In Cases of Brain Herniation Immediate treatment may be necessary.

PROGNOSTIC FACTORS

- Prognosis linked to etiology:

The prognosis of depressed consciousness is mostly depends on etiology.

A patient with a barbiturate overdose may recover completely, whereas one with a severe anoxic injury often does not.

- Age is a significant prognostic factor.
- One of the most frequent reasons for admission to an intensive care unit or for neurologic consultation is to estimate the prognosis of a patient in coma following cardiopulmonary arrest.

CARDIAC ARREST CARE

- **Standard care: Therapeutic hypothermia (32°C to 34°C)**
- The standard of care for patients with cardiac arrest is usually to undergo therapeutic hypothermia (aiming for a core body temperature between 32°C and 34°C) in the acute phase, which has been demonstrated to lead to better neurologic outcomes Compared with normothermia or hyperthermia.
- **Prognosis affected by:** Circumstances and duration of cardiac arrest.

- **Done by group c(10):**

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- **References**

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