Care of a Client with Head Trauma
Understanding neuro trauma, nursing management, and prevention of complications.

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### Learning Objectives

1. Discuss appropriate assessment of patients with brain injury.
2. Describe the nursing interventions to maintain or decrease ICP in patients with severe TBI.
3. Identify nursing interventions for patients with brain injury.
Head injury

- Head injury is a name used to describe a collection of injuries to the scalp, skull and brain.
- Each year in the United States approximately 1.5 million people sustain a TBI; 50,000 of them die from the injury and as many as 90,000 experience long-term disability.
- Falls are the leading cause of TBI and recent data shows that the number of fall-related TBIs among children aged 0-4 years and in older adults aged 75 years or older is increasing.
- People aged 65 years old and older have the highest rates of TBI-related hospitalizations and death.
- Among all age groups, motor vehicle crashes and traffic-related incidents result in the largest percentage of TBI-related deaths (31.8%).
- Direct medical costs and indirect costs of TBI, such as lost productivity, totaled an estimated approximately $76.5 billion in the United States in the year 2010.

Brain injury may lead to conditions ranging from a mild concussion to coma and death. The most serious head injury is brain injury (traumatic brain injury, or TBI). Symptoms ranges from headaches and dizziness to loss of consciousness. Even minor scalp injuries (laceration) can bleed profusely because the scalp has numerous blood vessels very close to the skin. The degree of external head injury may have little to do with the degree of brain injury. Traumatic brain injury (TBI) can significantly affect many cognitive, physical, and psychological skills. Physical deficit can include ambulation, balance, coordination, fine motor skills, strength, and endurance. Cognitive deficits of language and communication, information processing, memory, and perceptual skills are common. In an individual with a severe head injury, the neck should be immobilized until trauma to the spine and spinal cord is ruled out. The goal of management for people with s head injuries is to ensure adequate brain tissue perfusion and maintain normal intracranial pressure.

Head injuries can be classified as primary or secondary.

**Primary head trauma:** Primary damage occurs at the time of the impact or incident.
Secondary head trauma: Secondary damage can arise in the hours and days that follow. Secondary injury occurs in response to the primary injury and leads to cerebral edema, ischemia, increased intracranial pressure (ICP), and other changes within the brain tissue. Causes of secondary injury include hypoxia, hypercapnia, and hypertension.

Primary or secondary brain injury can result in cell death. Minimizing or preventing secondary injury greatly increases a patient’s chances of preserving or recovering function.

Types of head trauma

- Injury to the scalp,
- Skull fractures
- Concussion
- Cerebral Contusions and Lacerations
- Diffuse Axonal Injury (DAI)
- Intracranial hemorrhage/Hematomas

Injury to the scalp

Scalp injuries are usually the result of direct impact but may not be apparent in inflicted head injuries. When present, these may manifest as abrasion, bruising, laceration, or a burn; subcutaneous hemorrhage or edema (caput succedaneum); subgaleal hemorrhage or a subperiosteal hemorrhage (cephalhematoma). If the scalp is cut, bleeding may be profuse because the scalp has many blood vessels close to the skin surface. Consequently, a scalp injury may appear to be more serious than it is.

Concussion: A concussion is defined as a transient and reversible posttraumatic alteration in mental status (e.g., loss of consciousness or memory, confusion) lasting from seconds to minutes and, usually less than six hours (< 6 hrs.) without obvious damage to brain structures. Concussion is classified as mild traumatic brain injury which is defined as:

A patient with mild traumatic brain injury is a person who has had a traumatically induced physiological disruption of brain function as manifested by at least one of the following:

1. any period of loss of consciousness;
2. any loss of memory for events immediately before or after the accident;
3. any alteration in mental state at the time of the accident (e.g., feeling dazed, disoriented, or confused);
4. focal neurological deficit(s) that may or may not be transient but where the severity of the injury does not exceed the following:
   a. loss of consciousness of approximately 30 minutes or less;
   b. after 30 minutes, an initial Glasgow Coma Scale (GCS) of 13-15; and
   c. posttraumatic amnesia (PTA) not greater than 24 hours.

Postconcussion syndrome: Postconcussion syndrome refers to certain symptoms that sometimes occur for a few weeks to months after a concussion. The patient may experience headache, the sensation of spinning, light-headedness, fatigue, poor memory, inability to concentrate, sensitivity to light or noise, irritability, depression, and anxiety. The patient may develop impaired thought process. Postconcussion syndrome symptoms are common during the week after concussion and commonly resolve during the second week.

Management of concussion

Healthcare providers should use Acute Concussion Evaluation (ACE) Forms


- Head CT or MRI may be done to exclude any damage to the brain structures. If there is no structural damage, only patients’ symptoms are treated.
- Rest is the best treatment for a concussion.
- Pain management: acetaminophen is the drug of choice for pain management in a client with concussion.
- Aspirin or another nonsteroidal anti-inflammatory drug (NSAID) should not be given to the client because of their interference with blood clotting which contribute to bleeding from damaged blood vessels.
- Treatment for postconcussion syndrome is based on the severity of the symptoms.

Rest and close observation are important.
- Instruct patient or family to contact the physician if:
  - Worsening headaches
  - Weakness, numbness, or decreased coordination
  - Repeated vomiting
  - Patient should be brought to the ER immediately if
    - They cannot be awakened from sleep
    - Have one pupil larger than the other
    - Have convulsions or seizures
    - Have slurred speech
    - Are getting more and more confused, restless, or agitated

**Patient should be instructed not return to contact sports after a concussion until all ill effects have resolved and medical evaluation has been completed.**

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**Resources for Health Care Providers**

- For more information on care After a Mild Traumatic Brain Injury visit [http://www.cdc.gov/traumaticbraininjury/recovery.html](http://www.cdc.gov/traumaticbraininjury/recovery.html)
- Provide information to client using

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**Cerebral contusions and lacerations**

**Cerebral contusions** are bruises of the brain, usually caused by a direct, strong blow to the head.

**Cerebral lacerations** are tears in brain tissue, caused by a foreign object or pushed-in bone fragment from a skull fracture.

Cerebral contusions and lacerations involve structural brain damage. Small contusions and lacerations may cause only minimal damage to the brain, with few symptoms or symptoms
of minor head injury. However, for larger injuries, or severe swelling or bleeding from a small injury is present, leading to brain edema and increased intracranial pressure (ICP). Patient may have symptoms of severe head injury, such loss of consciousness, drowsiness, confusion, restlessness, or agitation. Patient may also present with vomiting, seizures, or impaired balance or coordination. Contusions may enlarge in the hours and days following the initial injury and cause neurologic deterioration. Therefore close monitoring of the client is very important, and neurological changes need to be reported to the physician.

**Diffuse Axonal Injury (DAI):** Widespread shearing that produce damage throughout the brain (rotational force). Diffuse axonal injury occurs when the nerve cells are torn from one another. The brain stem, frontal lobe, and temporal lobes are particularly vulnerable to this because of their location near bony protrusions.

**Skull Fracture**

Skull fracture is a break in a cranium (the bone surrounding the brain). Skull fractures can occur after severe blunt trauma to the head, with or without brain damage. Skull fracture can affect bones of the face, ears (temporal bone fractures), or/and the basal skull fracture. Temporal bone fractures sometimes involve structures of the ear, causing hearing loss, vertigo, balance disturbance, or facial paralysis.
Intracranial hemorrhage/Hematomas

Bleeding within the cranium. Intracranial hemorrhage can be epidural, subdural or subarachnoid. See the images in figure 1. for the different types of intracranial hemorrhage.

Epidural hematomas, which form between the skull and the outer layer (dura mater) of tissue covering the brain (meninges). Epidural hematomas are caused by bleeding from an artery or a large vein (venous sinus) located between the skull and the outer layer of tissue covering the brain. Bleeding often occurs when a skull fracture tears the blood vessel.

A severe headache may develop immediately or after several hours. The headache sometimes disappears but returns several hours later, worse than before. Deterioration in consciousness, including increasing confusion, sleepiness, paralysis, collapse, and a deep coma, can quickly follow. Some people lose consciousness after the injury, regain it, and have a period of unimpaired mental function (lucid interval) before consciousness deteriorates again.

Patients may develop hemi-paralysis on the side of the body opposite the hematoma, speech or language impairment, or other symptoms, depending on which area of the brain is damaged. Early diagnosis is crucial and is usually based on results of CT. Treatment involves evacuation of the hematoma using boreholes or craniotomy, and stopping the source of bleeding.

Subdural hematomas, which form between the outer layer and the middle layer (arachnoid mater. Subdural hematomas may be acute, subacute, or chronic. Rapid bleeding after a severe head injury can cause acute subdural hematomas, with symptoms that develop over minutes or a few hours, or subacute subdural hematomas, with symptoms that develop over several hours or days. Chronic subdural hematomas can develop over weeks, months, or years. By the time symptoms occur, the hematoma may be very large.
Chronic subdural hematomas are more common among people with alcoholism, older people, and people who take anticoagulant drugs (blood thinners). People with alcoholism, who are relatively prone to falls as well as bleeding, may ignore or forget minor to moderately severe head injuries. These injuries can lead to small subdural hematomas that may become chronic.

Symptoms may include a persistent headache, fluctuating drowsiness, confusion, memory changes, hemi-paralysis and speech or language impairment. Small subdural hematomas in adults do not require treatment because the blood is absorbed on its own. Large symptomatic subdural hematoma may be drained surgically.

Subarachnoid hemorrhage is bleeding between the arachnoid mater and the inner meninges (pia mater).

Intracerebral hematomas are common after a severe head injury. They are caused by bruising of the brain (a cerebral contusion).

Intracerebral hematomas and subarachnoid hemorrhages can also result from strokes. Large hematomas press on the brain and may cause swelling and herniation of the brain.

Diagnosis is usually based on results of computed tomography (CT). Treatment depends on the type and size of the hematoma and how much pressure has built up in the brain.

Diagnostic tests.
- After the patient has been stabilized, a computed tomography scan is typically done to determine whether the injury is hemorrhagic or non-hemorrhagic.

- Subarachnoid hemorrhage refers to hemorrhage beneath the arachnoid mater. In most cases, subarachnoid hemorrhage is caused by the rupture of a cerebral aneurysm.

- When one of the blood vessels running through this space between the arachnoid membrane and brain (the subarachnoid space) ruptures, it causes a subarachnoid hemorrhage.

- This results in blood mixing with the cerebrospinal fluid that flows through the subarachnoid space.
- Computed tomographic angiography (CTA), a procedure that evaluates the intracranial and extracranial vessels.

Note: Certain pathology types (subdural hematoma, contusion) carry higher risk for the development of early seizures.

- Intracerebral hemorrhage involves the breakage of one of the small vessels that penetrates and transports blood to the inside of the brain, resulting in hemorrhage.
- The sudden increase in pressure within the brain can cause damage to the brain cells surrounding the blood.
- The most common cause of intracerebral hemorrhage is high blood pressure (hypertension). Other causes include; trauma or abnormalities of the blood vessels (aneurysm or angioma)

> Box 3: Intracerebral hemorrhage

- Cerebral angiography may be performed if a vascular injury, such as carotid or vertebral artery dissection, a traumatic pseudoaneurysm, or an arteriovenous fistula, is suspected.
- Magnetic resonance imaging scanning is useful when a patient's CT scan doesn't provide a clear picture of the injury.
  - MRIs can provide valuable information on posterior fossa structures and allow for better definition of mass lesions than CT; however, because MRI requires more time than CT, it's usually not done on acute or unstable patients.
- Magnetic resonance angiography (MRA) and magnetic resonance venograms (MRV) are useful if vascular or sinus injuries are suspected.
**Prehospital survey and care**

Initial assessment, triage, and resuscitation of severe TBI patients are directed towards preventing and limiting secondary brain injury (SBI) while facilitating rapid transport to facility capable of providing definitive neurocritical care. The goals of pre-hospital assessment are:

- To establish whether trauma to the head has occurred.
- To estimate the severity of any injury to the brain.
- To identify and prevent hypoxia and/or hypotension.
- To identify risk factors for acute complications of TBI which may require intervention.
- To identify other injuries that may require urgent treatment.

**Assessment**

Perform a Glasgow Coma Scale. Patients with severe TBI-GCS scores of 3 to 8 are considered comatose and will not follow commands and may further exhibit decerebrate or decorticate posturing. See nursing care at the end of the discussion for more details.

**Management of Traumatic Brain Injury**

Managing a patient with severe TBI begin with assessment with the ABCDs: airway, breathing, circulation, and disability. Establishing and maintaining an airway is top priority. Deliver supplemental oxygen using a bag-valve-mask device until a definitive airway is placed. Intubation and mechanical ventilation are necessary if the patient can't maintain or protect his/her airway because of altered level of consciousness (LOC). Intubation and ventilation are also necessary if the patient is in danger of losing his airway because of swelling from a neck or pharyngeal injury or if he is expected to deteriorate neurologically.

Once the patient is hemodynamically stable and his airway is secure, the most important part of the assessment will be neurological assessment.

**Assessment**

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**Classification of TBI**

The Glasgow Coma Scale (GCS) is the most commonly used system for the classification of TBI.

1. **Sever TBI**: Persons with GCS scores of 3 to 8 are classified with a severe TBI,
2. **Moderate TBI**: those with GCS scores of 9 to 12
3. **Mild TBI**: those with GCS scores of 13 to 15
A basic neurologic assessment should be conducted. Components of the neurologic assessment should include:

- Level of consciousness (the Glasgow Coma Scale (GCS) is the most frequently used tool for determining LOC following a TBI.) A score of 8 or less may indicate a severe head injury and a high probability of permanent or long-term damage.
- Spontaneous movement and muscle tone
- Pupil size and reactivity
- Reflexes
- Muscle tone and posturing
- Respiratory pattern
- Somatic complaints (typically communicated nonverbally)
- Response to pain.

Assess for increased intracranial pressure (ICP).

**Table: Early and late indicators of increased intracranial pressure**

<table>
<thead>
<tr>
<th>Early indicators of ICP</th>
<th>Late indicators of ICP</th>
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<tbody>
<tr>
<td>alteration or deterioration in the level of consciousness (LOC)</td>
<td>decreased responsiveness or reduced LOC</td>
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<tr>
<td>personality changes</td>
<td>impaired speech (including aphasia)</td>
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<tr>
<td>confusion, restlessness, or irritability</td>
<td>projectile vomiting without nausea</td>
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<tr>
<td>visual disturbances</td>
<td>motor weakness or hemiplegia</td>
</tr>
<tr>
<td>sensory loss</td>
<td>flexion–extension posturing</td>
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<tr>
<td>increasing severity of headache</td>
<td>decreased or absent reflexes (including the cough, gag, corneal, Babinski, and deep-tendon reflexes)</td>
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<tr>
<td>nausea and vomiting</td>
<td>Cushing’s triad (increased systolic pressure with widened pulse pressure and decreased heart rate)</td>
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<tr>
<td>diminished voluntary movement or sensation</td>
<td>slowing of the respiratory rate</td>
</tr>
<tr>
<td>pronator drift</td>
<td>pupillary changes, including decreased reactivity</td>
</tr>
<tr>
<td>contralateral hemiplegia</td>
<td>altered breathing pattern.</td>
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| subtle changes in speech, such as slowing or slurring                                  | Infusions of mannitol immediately increase vascular volume and produce an osmotic effect within 15–30 minutes. However, the diuretic effect of mannitol can cause increased sodium and serum osmolarity levels, and should be monitored at regular intervals.
Table 3 describes the nursing management of adults with severe traumatic brain injury with a resultant level of consciousness categorized by a Glasgow Coma Scale score of 8 or lower.

| 1. Maintaining or Decreasing Intracranial Pressure (ICP) | • Maintaining ICP at less than 20 mm Hg improves outcomes.  
• Draining cerebrospinal fluid (CSF) decreases ICP.  
  ○ Removal of CSF via ventriculostomy temporarily decreased ICP  
• Do not induce hyperventilation to decrease ICP.  
• Vasoconstriction associated with hyperventilation results in decreased cerebral blood flow and can result in further cerebral ischemia  
• Administering sedation prevents ICP increases.  
  ○ Short-acting anesthetic and sedative-analgesic agents, such as propofol and fentanyl, typically are given  
• Agitation and coughing in patients with severe TBI increase the cerebral metabolic rate for oxygen consumption, which could negatively affect secondary cellular brain injury.  
• Administering mannitol is effective in decreasing ICP. |

Uncontrolled intracranial hypertension leads to an absence of cerebral perfusion and results in brain death.
| 2. Maintaining Adequate Cerebral Perfusion Pressure (CPP) or Increasing CPP | M | The diuretic effect of mannitol can cause increased sodium and serum osmolarity levels, and should be monitored at regular intervals.  
- Elevate the head of the bed (HOB) 30 degrees to maintain or decrease ICP. Keep the patient's head and neck properly aligned.  
- Removing or loosening rigid cervical collars may decrease ICP.  
  - Cervical collars may impede venous outflow and cause pain and discomfort, elevating ICP.  
- Administering intensive insulin therapy may reduce ICP.  
- Maintaining normothermia may prevent ICP increases.  
  - Continuous ICP monitoring and display successfully guide nursing interventions. |
|---|---|---|
| | | • Maintaining CPP between 50–70 mm Hg optimizes cerebral perfusion.  
• Administering norepinephrine may maintain adequate CPP or increase CPP.  
• Elevating the HOB 0–30 degrees may maintain adequate CPP or increase CPP. (Level 3)  
• CSF drainage may be an effective treatment for low CPP.  
  - Continuous CCP monitoring and display may successfully guide nursing interventions. |
| 3. Preventing Deep Venous Thrombosis (DVT) | M | Pharmacologic treatment may be safe for DVT prophylaxis.  
  - low-dose heparin (LDH) and low-molecular-weight heparin (LMWH)  
• Applying mechanical prophylaxis on admission may prevent DVT in patients who cannot receive immediate pharmacologic prophylaxis due to risk of bleeding (Venodyne booths) |
| 4. Adequate Nutrition | M | Initiating adequate nutrition within 72 hours of injury may improve outcomes.  
• Providing continuous intragastric feeding may improve tolerance.  
• Provide full caloric intake by post injury day 7.  
• Prokinetic agents such as Metoclopramide (Reglan) have shown no effect on feeding tolerance. |
| 5. Glycemic Control  
**Goal to maintain glucose level between 90 and 110 mg/dL.** | M | Insulin administration protocol to prevent elevated serum glucose level.  
  - Glucose levels exceeding 170 mg/dl during the first 5 days post-severe TBI correlate with prolonged hospital length of stay and increased mortality  
• Administering intensive insulin therapy for elevated serum glucose (greater than 110 mg/dL) can improve outcomes. |
Subcutaneous insulin administration has been shown to be unsafe and less effective than intravenous insulin administration in critically ill patients.

6 Preventing Seizures

Seizure activity is a known cause of secondary rain injury, causing increased metabolic demand and neurotransmitter release.

- Administer antiepileptic agent for the first 7 days to decrease the incidence of early posttraumatic seizures.
  - Chronic prophylaxis should be avoided.
- Electroencephalogram (EEG) technology may help to identify patients at risk for seizures.
  - The use of anticonvulsants to decrease the incidence of posttraumatic seizure within the first 7 days of injury when the brain is particularly vulnerable to secondary injury.

Source: AANN Nursing Management of Adults with Severe Traumatic Brain Injury

Ensure that the patient has two large-bore IVs and that they’re still intact and patent. If volume resuscitation becomes necessary, use warmed isotonic saline (0.9% NaCl); it’s the fluid of choice for head injury patients because it won't aggravate cerebral edema.

Hypertonic saline has also been used for volume resuscitation in TBI patients and has been shown to reduce ICP. Dextrose 5% in water (D5W) should be avoided because it tends to leave the vascular space rather quickly, therefore promoting swelling. Fluids given to trauma patients, especially those to be given in large volumes, should be placed on a fluid warmer to prevent hypothermia.

Maintain a systolic blood pressure above 90 mm Hg.

**ICP:** Administer mannitol (Osmitrol) 0.25 – 1 gm/kg IV as ordered. High doses of mannitol significantly increase a patient's risk of acute renal failure, particularly if the serum osmolality exceeds 320 mOsm/kg, maintain the patient's serum osmolality at <320 mOsm/kg. Ensure that the patient is well hydrated and not hypovolemic before administering mannitol.

*Note: Hyperthermia increases the metabolic demands of the brain and may indicate brain stem damage.*
Surgical Treatment

Surgical treatment is often used for patients of Traumatic Brain Injury (TBI). The overall goal of all surgical treatment is to prevent secondary injury by helping to maintain blood flow and oxygen to the brain and minimize swelling and pressure.

After emergency care

After they're given emergency treatment for their injuries, TBI patients are usually transferred to an intensive care unit.

Patient is moved from the ICU to a stepdown unit or other appropriate floor when the patient is stabilized. The patient is usually more awake and alert, the family may begin to ask about the speed of recovery and long-term outcome. It is important to caution them that the recovery period may be long and slow, and no one knows exactly what the outcome may be; time is required to evaluate the patient's progress.

The physical, cognitive, behavioral, and psychological changes that result from a TBI depend on the areas of the brain that are damaged (See figure on cover page). Some patients have no long-term physical deficits; others will suffer a variety of disabilities. Physical disabilities are often similar to those seen in people who have had a stroke. Some patients may physical disability requiring wheelchair, experience memory impairment, delayed amnesia, affective disorders, post-traumatic epilepsy, post-traumatic psychosis, depression, and dementia. In the early stages of recovery, a patient with a TBI may begin to achieve varying levels of awareness. Responding to familiar voices, turning towards sounds, pull on tubes, respond to simple command, and as they continue to improve will spontaneously sit, reach, and walk, but without apparent purpose. At this time safety and injury prevention is very important.
The patient should be evaluated by the physiatrist soon after admission to develop a plan for rehabilitation that includes physical therapy, occupational therapy, and speech therapy. TBI patients' ability to process information is limited, excessive stimulation can lead to unpredictable, eccentric behavior like screaming and angry outbursts.

**Care giver involvement and stress.**

- Be sensitive about the words you use when talking with families about how their loved one is doing.
- Involve the family in the care of the patient.
- Point out small improvements, such as eye contact and simple, purposeful movements, however be careful not to give false hope.
- During recovery, encourage the family to participate as much as possible in their loved one's care, such as grooming, feeding, and bathing.
- Suggest to the family to participate in the patient's therapy, which the family or caregivers may need to continue once the patient goes home.
- Knowing how to assist appropriately in the recovery of their loved one gives the family a sense of control and competence, and decreases the feelings of helplessness.
- Encourage families to document their loved one's progress with diaries, photos, and videos. This will help them truly appreciate the patient's achievements and will also provide the patient with a record of the missing pages in her life. Charting the patient's progress on a weekly or monthly graph can also provide a visual clue that allows the patient to appreciate her gains.
- Suggest support organizations, such as the Brain Injury Association of America (BIA) and other community resources.

The timing of seizure activity after trauma is categorized as acute/immediate (within 24 hours of injury), subacute/early (within the first 2–7 days postinjury) and late (after 7 days; Phenytoin and valproate administration after TBI has been shown to decrease the risk of early posttraumatic seizures without effect on the development of late seizure disorders.
Rehabilitative care

The goals of rehabilitative care are to:

- Prevent secondary complications such as pressure sores, pneumonia and contractures.
- Restore lost functional abilities. Functional changes could include limited ability to move, use the bathroom, talk, eat and think.
- Provision of adaptive devices or strategies to enhance functional independence.
- Work with the family and the patient to identify changes that might be required when the person goes home.
- Behavioral issues: There may be behavioral changes—such as impulsiveness, lack of inhibition, and lack of emotional control.
  - Some patients are unable to assess or even understand their actions, which results in poor judgment and may endanger their own safety.
  - Patients can be excessively talkative, and their conversation may be disorganized or chaotic.
  - They may fabricate information, possibly in defense of poor memory and lack of ability to recall personal history or circumstances.
  - Since both short- and long-term memory can be impaired, they may accept, without question, information and stories about themselves, whether they are true or not (Others may take advantage of the person).
  - Individuals with a TBI may frequently be socially rejected because of their social awkwardness or ineptitude.

Selected Nursing diagnosis

Airway (A) and Breathing (B)

Nursing Diagnosis: Ineffective airway clearance, related to decreased LOC, loss of protection of airway and inability to maintain positioning.

Outcomes: Patient will be free of respiratory distress or aspiration pneumonia.
Interventions: Airway and cervical spine are immobilized in a neutral position. Nursing actions aimed at maintaining adequate airway clearance include clearing the mouth and oral pharynx of foreign bodies and suctioning the oropharynx and trachea every 1 to 2 hours and as needed. An airway should be established, by the most appropriate means available, in patients who have severe TBI, the inability to maintain an adequate airway, or hypoxemia not corrected by supplemental oxygen (O2). Current recommendations state that 100% supplemental O2 via non-rebreather mask, bag-valve-mask/advanced airway should be provided immediately to any TBI patient. Avoidance of suctioning the nasopharynx is recommended until after a basilar fracture or meningeal tear is ruled out. A semiprone lateral position with the head of bed (HOB) elevated 30 degrees reduces the risk of secretions from entering the lungs. This position is contraindicated with increased ICP or a cervical fracture.

Circulation (C)

Nursing Diagnosis: Ineffective cerebral tissue perfusion: related to edema from TBI.

Risk for ineffective cerebral tissue perfusion secondary to hypotension, hypertension, intracranial hemorrhage, hematoma, or other injuries.

Outcomes: Patient will maintain cerebral perfusion. The patient will have adequate CPP. The patient will have a stable or improving LOC with a stable GCS score and an ICP < 15 mm Hg. Temperature will be maintained at less than 38.5º C (101.3). The patient's BP will be maintained within established parameters. Urine output will be a minimum of 0.5ml/kg/hour and not greater than 200 ml/hour. Laboratory values will remain within normal limits.

The goal of resuscitation in TBI is to preserve cerebral perfusion and minimize neuronal injury. Hypotension and hypoxemia are associated with poor outcomes in patients with severe TBI, thus systemic resuscitation is the highest priority in early management.

Interventions: Maintaining all physiologic parameters within normal limits, positioning the patient for optimal venous return, and monitoring extracerebral systems for complications,
communicating a patient's neurologic status accurately and documentation are essential to early identification of change and early intervention. ICP monitoring may be required.

Monitor for hypoxemia (< 90% arterial hemoglobin SpO2) or hypotension (< 90 mmHg SBP). SpO2 should be measured continuously with a pulse oximeter, and oxygenation. SBP and diastolic blood pressure should be measured as often as possible using the most accurate method available and should be monitored continuously if possible.
References


NCLEX style questions

1. The nurse caring for a client admitted with head trauma will expect to find which of the following orders for managing increased intracranial pressure?

   a. Corticosteroid  
   b. Mannitol  
   c. Phenobarbital  
   d. Phenytoin

2. The nurse is preparing to administer mannitol to a client who is unresponsive after a head injury from a fall. The nurse will explain the purpose of administering mannitol is to:

   a. increase cerebral edema.  
   b. increase cerebral blood flow.  
   c. decrease intravascular volume.  
   d. decrease osmolality of the intravascular space.

3. The significant other for a client admitted to the ICU after a traumatic brain injury said to the nurse “I am worried he has not had anything to eat for 3 days.” The nurse will explain that the nutritional needs of a patient with TBI should be met by:

   a. placing a small-bore feeding tube in the small intestine.  
   b. placing a small-bore feeding tube in the large intestine.  
   c. starting parenteral or enteral nutrition 48 hours after admission.  
   d. starting parenteral or enteral nutrition 72 hours after admission.

4. Which of the following should the nurse implement to promote safety for a patient with TBI?

   a. Avoid using a netted safety bed.  
   b. Transfer the patient to a netted safety bed on admission.  
   c. Apply restraints on admission and leave them in place until the patient is conscious.  
   d. Use restraints only as needed and apply them for the shortest time necessary.

5. Family of clients with TBI require a great deal of emotional support. Which of these approach can best help the family of patients with TBIs?
a. Explain that full recovery may not be evident for many months or years.
b. Explain that full recovery is usually evident in 1 to 3 months.
c. Rotate nurses daily to provide variety for the patient.
d. Rotate nurses at least weekly to provide limited variety.

6. The nurse instructor is reviewing the medical record of the client with TBI with students. Which statement by one of the students about use of sedatives and analgesics in patients with TBI is correct?

a. As the patient improves, sedative and analgesic dosages should be reduced quickly.
b. Avoid wake-up assessments in patients receiving sedation.
c. Enterally administered analgesia should be considered to manage pain.
d. Phenobarbital is a first-line therapy to control increased intracranial pressure.

7. The nurse is assessing a client admitted with head injury after a motor vehicle accident. Which of these assessment findings is an early indicator of increased ICP that the nurse should report?

a. aphasia.
b. Cushing’s triad.
c. pronator drift.
d. projectile vomiting without nausea

8. A client with TBI is placed on a ventilator. To reduce the risk of ventilator-associated pneumonia, the nurse should:

a. perform good oral care every 12 hours.
b. perform good oral care every 8 hours.
c. keep the patient flat in bed.
d. keep the head of the patient’s bed at 30 degrees.

9. The nurse caring for a client admitted with TBI has an order to insert nasogastric tube (NGT). Which of this is the most appropriate rationale for inserting NGT in this client?

a. To feed the client and prevent muscle wasting.
b. To administer analgesics and decrease restlessness and increased ICP.
c. To decompress the stomach and reduce the aspiration risk.
d. To minimize tactile stimulation from oral feeding.

10. Which of these statement from a client’s family regarding neurological assessment in TBI requires clarification by the nurse?

a. “When dosages of short-acting anesthetic and sedative-analgesic medications are decreased, the patient can be awakened quickly.
b. “When dosages of short-acting sedative-analgesic medication, are decreased the patient will wake up to a pre-injury condition.”
c. “Patient can be given pain medication through the tube in his stomach when the sedatives are decreased or stopped.”
d. “The nurses will check the patient frequently throughout the day to see if his pupils will react and change to light.”

11. The nurse is caring for a client with a head injury with a nursing diagnosis of ‘risk for deep venous thrombosis related to immobility.’ Which of these actions by the nurse would represent appropriate care for this client? (select all that apply).

a. Apply antiembolic stockings to bilateral lower extremity.
b. Loosen the client’s cervical collar to allow for free blood flow.
c. Use pneumatic compression devices
d. Administer lowmolecular-weight heparin as ordered.
e. Elevate bilateral lower extremity to 10-15 degree above the heart.

12. During a review of a client’s medical record, the student nurse noted that the nurse had documented Cushing’s Triad on the client’s record. What assessment findings supports the nurse’s documentation?

a. A late sign of increased intracranial pressure indicated by increased systolic blood pressure.
b. Sign of herniation, the shifting of the brain from one compartment of high pressure to one of low pressure.
c. Brain death related to bradycardia, diastolic hypertension and decreased oxygen saturation.
d. A rise in blood pressure usually with widening pulse pressure, bradycardia and abnormal respiratory patterns (bradypnea).

13. The nurse has an order to administer mannitol 1 gm/kg to a client with TBI. Which of the following assessment would require the nurse to withhold the client’s meds?

a. Urine output of 100 mL in the 3 hours  
b. Serum osmolality level of 340 mOsm/kg  
c. Client is receiving normal saline at 100 mL per hour.  
d. Client has a Glasgow Coma Scale score of 10.

14. The parent of a patient admitted after a TBI from ski accident asked the ICU nurse, “This transfer to the unit is a good sign right, she will start eating and walking soon?” the best response by the nurse is;

a. “The recovery period may be long and slow, and no one knows exactly what the outcome may be; time is required to evaluate the patient's progress.”  
b. “I have no idea what to expect after head injury, you should hope for the best, in the mean time you can keep her company and help with her care.”  
c. “I understand you are anxious about your daughter immediate and long-term outcome, but I have no information at this time.”  
d. “The doctor will give you a realistic idea of what to expect and how to find the information.”  
e. You have to understand that people who suffer head injury will never be 100 percent, so take it one day at a time.”

15. The nurse on a medical surgical unit is caring for a group of clients. Which of the following clients should the nurse see first?

a. A client with concussion who reported a headache and difficulty concentrating.  
b. A client with concussion who the nursing assistant reported is vomiting in the room.  
c. A client with TBI who is being discharged to the rehabilitation facility.  
d. A client who is 3 days post brain surgery asking to speak to the nurse immediately.
16. The nurse is caring for a 16 year old client who has suspected mild head injury during a football game. The client reported headaches. To monitor the client the nurse should:

   a. Place the client on bed rest immediately and elevate the head of the bed.
   b. Ambulate the client up and down the hallway so he does not fall asleep.
   c. Determine whether there was an alteration of consciousness and the duration.
   d. Assess the client level of consciousness, motor strength, and pupillary reactivity.

17. The nurse is discharging an 18 year old college student home after a concussion. Which of these will the nurse include in the discharge instruction? (Select all that apply.)

   a. Get plenty of sleep at night, and rest during the day.
   b. Avoid contact or recreational sports, until your doctor Okays it.
   c. You can take NSAIDS such as Ibuprofen for headaches.
   d. Expect episodes of restlessness and lack of concentration that may occur.
   e. If you have difficulty remembering things write them down.
   f. Return to your normal activities gradually.

18. The nurse is planning care for a client with TBI and suspected basilar fracture. The client has a nursing diagnosis of ineffective airway clearance. Which of the following intervention will not be essential for the nurse to include in the clients plan of care.

   a. Suction the oropharynx and trachea every 1 to 2 hours and as needed.
   b. Administer 100% supplemental O2 via non-rebreather mask.
   c. Place the client in a semiprone lateral position with the head of bed elevated 30 degrees.
   d. Perform endotracheal intubation if needed to establish using a jaw thrust maneuver.
   e. Continuous pulse oximetry monitoring to maintain SpO2 of > 90% on supplemental O2.

19. A client admitted with traumatic brain injury has the following assessment data. Which of these is a priority nursing intervention for the client?
Temperature: 100.1° F; heart rate: 100 beat/min; SBP: 88 mm Hg; O2 sat: 94% on 100% non-rebreather mask; serum glucose level 130mg/dl; Urine output: 120ml in one hour.

a. Intravenous normal saline at 100 mL/hour
b. Regular insulin 6 units subcutaneously
c. Administer 0.45% sodium chloride IV at 125 mL/hour.
d. Acetaminophen 1 gm rectally every 6 hours.

20. The nurse is discussing care with the family of a client who has subdural hematoma. Which image illustrated below should the nurse plan to use to for this discussion?

21. The ED nurse is caring for a patient who has been brought in by ambulance after sustaining a fall at home. What physical assessment finding is suggestive of a basilar skull fracture?
a. Epistaxis
b. Periorbital edema  
c. Bruising over the mastoid  
d. Unilateral facial numbness

22. The nurse is caring for a patient with increased intracranial pressure (ICP) caused by a traumatic brain injury. Which of the following clinical manifestations would suggest that the patient may be experiencing increased brain compression causing brain stem damage?

a. Hyperthermia  
b. Tachycardia  
c. Hypertension  
d. Bradypnea

23. A patient is brought to the ED by her family after falling off the roof. A family member tells the nurse that when the patient fell she was “knocked out,” but came to and “seemed okay.” Now she is complaining of a severe headache and not responding to questions appropriately. The care team suspects an epidural hematoma. Based on the information provided the nurse should prepare for which priority intervention?

a. Insertion of an ICP monitoring device  
b. Treatment with antihypertensives  
c. Emergency craniotomy  
d. Administration of anticoagulant therapy

24. Paramedics have brought an intubated patient to the ED following a head injury due to acceleration-deceleration motor vehicle accident. Increased ICP due to large epidural hematoma is suspected. Which image below accurately depicts epidural hematoma?

a. A  
b. B  
c. C  
d. D
25. The nurse is observing a new co-worker who is caring for a client who is admitted following a head injury. Which of the following actions by the co-worker would require the nurse to intervene?

   a. Applying pneumatic compression stockings to the lower extremities.
   b. Teaching the client deep breathing and coughing exercise.
   c. Keep the head of the bed at 30° at all times.
   d. Talking to the client during care even though the client is not responding.

26. The nurse is teaching the family of a client who has residual cognitive impairment and poor muscle coordination after TBI and is being discharged home after a short rehabilitation. Which of the following statements by the adult child would indicate a correct understanding of the teaching? Select all that apply.

   a. “I will allow my mom to do what she can and assist her as needed.”
   b. “I will assist my parent to get in and out of the bathtub.”
   c. “I will help her fill in words when she forgets things.”
   d. “Joining support group is not usually helpful in this case because everyone is different.”
   e. “I will keep my parent on bed-rest for the first 5 days after discharge.”
   f. “Angry outbursts and impulsiveness are signs of worsening cognitive impairment that should be reported to the HCP.”

27. Which of the following assessment findings in a 44 year old client with intracranial hematoma should be of concern to the nurse?

   a. Hamstring pain when the hip and the knees are flexed and then extended.
   b. Curling of the toes when the bottom of the foot is stroked in upward motion.
   c. Cogwheel and lead pipe rigidity.
   d. Muscle aches and cramping especially at night.

28. The nurse receives report from the nurse caring for an elderly client after transfer to the unit with closed head injury. Which statement if made by the nurse will indicate negligence?

   a. The client was medicated with Tylenol for a head an hour ago.
   b. The client began to have a positive Babinski’s sign an hour ago.
   c. The client had the head of the bed elevate at 30 degrees the entire shift.
   d. The client had a positive bulbocavernous reflex the entire shift.
29. A client is medflighted to the ED after a fall from a third story window. The MRI showed intracranial hematoma. Concerned about expansion the nurse will assess for 

   a. Pupil changes  
   b. Level of consciousness  
   c. Respiratory changes  
   d. Seizure activity

30. While assess airway and breathing, a client presenting with increasing intracranial pressure Cushing triad presents with:

   a. BP- 190/84, HR – 150, and an irregular respiratory pattern  
   b. B/P – 80/50, H/R – 50 and Kussmaul reparation  
   c. B/P – 80/50, H/R – 150 and Cheyne stokes respiration  
   d. BP- 190/84, HR – 50, and an irregular respiratory pattern
Rationale for NCLEX review questions.

1. **Rationale**: (B). Giving steroids does decrease ICP or improve outcomes in patients with TBI. Mannitol (an osmotic diuretic) may be given to decrease cerebral edema, transiently increase intravascular volume, and improve cerebral blood flow. Phenobarbital and Phenytoin are given as sedatives and to prevent seizures.

2. **Rationale**: (B). Mannitol (an osmotic diuretic) may be given to decrease cerebral edema, transiently increase intravascular volume, and improve cerebral blood flow.

3. **Rationale**: (A). TBI patients have increased metabolic demands, so parenteral or enteral nutrition should begin as soon as tolerated. Nutritional target goals should be met by day 7. A small-bore feeding tube may be placed into the small intestine or a percutaneous gastrostomy tube may be used to deliver nutrition and decrease the aspiration risk.

4. **Rationale**: (D). If the patient becomes restless or agitated, investigate the cause and take appropriate interventions. Causes include emergence from coma, analgesic or sedative withdrawal, excessive environmental stimulation, and discomfort resulting from pain, constipation, incontinence, feeling too hot or too cold, wrinkled bed linens, body positioning, or pressure points caused by splints. Explain all care measures even if you’re not sure the patient understands what’s being said. Secure all devices and equipment and keep these out of the patient’s sight and reach; even a seemingly simple device can pose a hazard to a confused or agitated patient. Use a soft voice and speak slowly to give the patient time to process information. The familiar voice of a family member or friend may calm the patient and decrease anxiety. If restraints are needed, they should be applied for the shortest duration possible; in some cases, a netted safety bed may be considered.

5. **Rationale**: (A). It is very important that the nurse offer factual, honest information. Explain that TBI may lead to personality changes and physical and cognitive impairments and that full recovery may not be evident for many months or even years. Prepare them for good days and bad days, and explain that the patient’s progress may be slow. Maintaining caregiver continuity can help establish a good relationship with family members, whose coping skills may be depleted by fatigue, stress, fear, grief, anger, and frustration.

6. **Rationale**: (C). Short-acting anesthetic and sedative-analgesic agents, such as propofol and fentanyl, typically are given. When dosages are decreased, the patient can be
awakened quickly, permitting nonpharmacologically tainted assessment of neurologic status. As the patient improves, dosages are reduced gradually. The patient must be monitored for pain; if needed, enterally administered analgesia should be considered to manage pain without causing significant neurologic status changes. Pentobarbital may be given to control increased ICP in patients who don’t respond to first-line therapies.

7. Rationale: (C). pronator drift is one of the early signs of increased ICP.

8. Rationale: (D). Many TBI patients require prolonged mechanical ventilation and may benefit from a tracheotomy. A tracheotomy helps reduce the risk of ventilator-associated pneumonia (VAP), as do suctioning of secretions above the tracheotomy cuff, maintaining the head of the bed at 30 degrees, and performing good oral care every 4 hours.

9. Rationale: (C.). Initially, a nasogastric or orogastric tube is inserted to decompress the stomach and reduce the aspiration risk. Typically, the nasal route is avoided as it can obstruct sinus drainage, leading to sinusitis or VAP.

10. Rationale: (B). When dosages are decreased, the patient can be awakened quickly, permitting nonpharmacologically tainted assessment of neurologic status. During “wake-up” assessment inform the family members that the patient doesn’t actually wake up and return to a pre-injury condition.

11. Rationale: (A, C, & D). TBI patients are at increased risk for venous thromboembolism (VTE). In some cases, antiembolic stockings or pneumatic compression devices may be used. Once the risk of hemorrhage passes, lowmolecular-weight heparin may be given. Loosening the cervical collar decreases ICP, elevating the client’s legs can increase ICP and not directly affect clot formation.

12. Rationale: Cushing's Triad a late sign of increased intracranial pressure indicated by increased systolic blood pressure, widened pulse pressure, bradycardia <50 beat per minutes and Bradypnea.

13. Rationale: (B). High doses of mannitol significantly increase a patient's risk of acute renal failure, particularly if the serum osmolality exceeds 320 mOsm/kg. The patient's serum osmolality should be maintained at <320 mOsm/kg.

14. Rationale: The patient's family or close friends are usually distressed. Understanding the emotions and other issues the patient and family experience initially and over
time can help you prepare them for the difficult challenges they'll face. Allow frequent visits and provide regular updates about their loved one's condition can also reduce their anxiety. So is answering even the simplest questions. The family will begin to ask about the speed of recovery and long-term outcome once the client is stable. The nurse should caution them that the recovery period may be long and slow, and no one knows exactly what the outcome may be; time is required to evaluate the patient's progress.

15. Rationale: (B). the nurse should check this patient it signifies worsening neurological function and need to be assessed immediately.

16. Rationale: (D). Although a thorough neurologic assessment yields valuable information, at times the nurse need to perform a focused neurologic assessment. In these cases, it isn’t necessary to perform the entire assessment. Limit your examination to LOC, motor strength, and pupillary reactivity.

17. Rationale: A, B, E, & F.

18. Rationale: Avoidance of suctioning the nasopharynx is recommended until after a basilar fracture or meningeal tear is rule out. A semiprone lateral position with the head of bed (HOB) elevated 30 degrees reduces the risk of secretions from entering the lungs. This position is contraindicated with increased ICP or a cervical fracture. If ET intubation is necessary, a jaw thrust maneuver must be used rather than neck flexion to open the airway without possible SCI.

19. Rationale: (A). The goal of resuscitation in TBI is to preserve cerebral perfusion and minimize neuronal injury. Hypotension and hypoxemia are associated with poor outcomes in patients with severe TBI, thus systemic resuscitation is the highest priority management. Standard normal saline is the best management step at this point. Glucose-based solutions should be avoided in adult patients with TBI. Elevated BG in the first 24 hours after TBI, following surgical intervention or during hospital course is associated with worse neurologic outcomes. Dextrose, in the form of IV dextrose (D50W in adults), should be administered only if clinically indicated (BG < 70 mg/dL). The infusion of hypotonic crystalloid such as 0.45 % sodium chloride solutions lowers the serum osmolality within the vascular space, causing fluid to shift from the intravascular space to both the intracellular and interstitial spaces and can worsen increased ICP, can worsen existing hypovolemia and hypotension and cause cardiovascular collapse.
20. Rationale: (B). A subdural hematoma occurs beneath the dura mater, between the tough casing and the more delicate membranes covering the tissue of the brain, the pia-arachnoid.

21. Rationale: (C). An area of ecchymosis (bruising) may be seen over the mastoid (Battle's sign) in a basilar skull fracture. Numbness, edema, and epistaxis are not directly associated with a basilar skull fracture.

22. Rationale: (A). Signs of increasing ICP include slowing of the heart rate (bradycardia), increasing systolic BP, and widening pulse pressure. As brain compression increases, respirations become rapid, BP may decrease, and the pulse slows further. A rapid rise in body temperature is regarded as unfavorable. Hyperthermia increases the metabolic demands of the brain and may indicate brain stem damage. The hypothalamus is located below the thalamus, just above the brainstem.

23. Rationale: (C). An epidural hematoma is considered an extreme emergency. Marked neurologic deficit or respiratory arrest can occur within minutes. Treatment consists of making an opening through the skull to decrease ICP emergently, remove the clot, and control the bleeding. Antihypertensive medications would not be a priority. Anticoagulant therapy should not be ordered for a patient who has a cranial bleed. This could further increase bleeding activity. Insertion of an intracranial monitoring device may be done during the surgery, but is not priority for this patient.

24. Rationale: (A). Epidural hematomas, which form between the skull and the outer layer (dura mater) of tissue covering the brain (meninges).

25. Rationale: (B). Deep breathing and coughing exercise will increase intracranial pressure and should be avoided in patients with head trauma.

26. Rationale: (A & B). to promote independence, the family should allow the client to do as much as she can for herself. Assisting the client in and out of the bathtub ensures safety while client continue rehabilitation. The family should be instructed to allow the client ample time to find the right word to complete a sentence, to decrease frustration. Support group is very important for clients after a head injury. Bedrest rest after discharge is not necessary, client should be encouraged to be active and rest when tired. Depending on the type of head injury, angry outburst should be expected, teach the family how to handle some of these stressful situation.

27. Rationale: (A). A positive Kerning’s sign described in option A, is common in intracranial hematomas. B is negative Babinski’s sign with a hematoma, the nurse
should expect a positive Babinski’s sign, C is specific to Parkinson’s diseases and D is common in many illnesses.

28. Rationale: (B) A positive Babinski’s sign is an indication of upper motor neuron disease of the pyramidal tract. The physician must be contracted immediately when a client reflexes changes from negative to positive Babinski’s as this reflects increased intracranial pressure.

29. Rationale: (B). Changes in level of consciousness, confusion, restlessness, lethargy, and disorientation to place, time and person are the most sensitive early indicators of increased ICP produced by an expanding lesion (hematoma).

30. The brain stem final effort to maintain adequate cerebral perfusion is seen with an increased blood pressure, bradycardia, and an irregular respiratory pattern known as Cushing’s response.
Tags: Head injury, concussion, skull fracture, traumatic brain injury (TBI), intracranial pressure (ICP), Glasgow Coma Scale (GCS), cerebral blood flow (CBF), cerebral perfusion pressure (CPP), NCLEX question, TBI NCLEX question, Head injury NCLEX questions, NCLEX review questions for head trauma, ICP NCLEX questions, NCLEX questions for altered level of consciousness, NCLEX review questions.