**NUR 211**  
**Intracranial Regulation**

**Description:** This module continues the application of the concept of intracranial regulation. The module will focus on the exemplar of increased intracranial pressure (IICP) and the associated nursing responsibilities.

**Learning Outcomes:**
Upon completion of this module the student will be able to:

1. Identify the physiologic mechanisms that maintain normal intracranial pressure (ICP).
2. Identify the etiologies and clinical manifestations of the patient with IICP.
3. Describe the collaborative care and nursing management of the patient with IICP.
4. Describe a systematic approach to assessment of an unconscious patient which includes the Glasgow Coma Scale and body functions.
5. Describe the diagnostic studies used to identify the presence and cause of IICP.
6. Explain how ICP monitoring via ventriculostomy is used to guide the clinical care of a patient with IICP.

**Learning Resources:**

Read assigned article from Nursing 2006, October, “Alarming Complications”

Search web for research based articles on ICP

DVD: Nursing Assessment of the Neurological System

**Learning Activities:**
Discuss “The Patient with a Head Injury” case study

Role play using Glasgow Coma Scale

Discuss web research results with class

Practice neurologic assessment skills in lab

**Evaluation:**
Unit exam  
Lab competencies  
Clinical Performance Evaluation
CASE STUDY
“The Patient with a Head Injury”
(Adapted from Lewis, Medical Surgical Nursing: Assessment and Management of Clinical Problems, 7th ed.)

Patient Profile: Corey L. is a 27-year-old telephone lineman who is brought to the ED by ambulance following a fall from the telephone pole on which he was working. At the scene, according to paramedics, he was unconscious, but regained consciousness in the ambulance. His cervical spine was immobilized at the scene and an IV of D5W was started en route.

Present Findings: On admission to the hospital, he is lucid, but complaining of a headache and nausea. The nurse’s initial assessment reveals a boggy, left temporal muscle, Battle’s sign behind the left ear, and clear drainage from the left ear canal. His initial VS were B/P 128/78, HR 66 and regular, RR 16 and regular. Shortly after, he closes his eyes and will open his eyes if spoken to. His verbal responses become inappropriate and disorganized. Responses to painful stimuli include opening his eyes and flexion withdrawal of his left arm. Stat skull x-rays and a CT scan indicate a linear fracture of the temporal bone with epidural hematoma. Corey’s wife is present.

Critical Thinking Questions:

1. What three factors the nurse will assess to calculate a Glasgow Coma Scale score for Corey?

2. Based on assessment findings noted in the patient profile, what would Corey’s score be after his change in consciousness?

3. Which of the following findings would the nurse expect with increasing intracranial pressure? (There are five)
   a. Dilation of the right pupil with sluggish or no response to light
   b. Irregular respiratory pattern
   c. Slowing heart rate
   d. Vomiting
   e. Weak, thready pulse
   f. Widening pulse pressure

Clinical update: Corey’s condition is deteriorating rapidly and an emergency craniotomy is scheduled to control the bleeding and evacuate the hematoma to prevent cerebral herniation. While awaiting preparation of the surgical room, the following interventions are initiated. Match the interventions with their rationales.

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Rationale</th>
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<tr>
<td>Administration of 100% oxygen</td>
<td>Causes constriction of cerebral vessels</td>
</tr>
<tr>
<td>Elevation of head of bed to 30 degrees</td>
<td>Maintains airway and ventilation</td>
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</tbody>
</table>
Endotracheal intubation and mechanical ventilation prevents hypercapnia and hypoxia, decreasing ICP.

Hyperventilation to maintain PaCO2 of 33 mm Hg promotes venous return from the brain.

Following surgery, Corey is admitted to the neurologic intensive care unit. He is in semi-Fowler’s position, has ICP monitoring with a ventricular catheter, is on a mechanical ventilator, has telemetry, and an arterial catheter as an access for ABGs. He has a bulky dressing on his head which is dry and intact. An IV is infusing at 75 mL/h and he has an NG suction tube in place. Postop orders include ICP measurements q 1h and HOB up 30-45 degrees. The first ICP measurement is 12 mm Hg, and the waveform shows P waves in which P1 is higher than P2 and P3. Your action at this time is to:

A. Raise the HOB from 30 to 45 degrees.
B. Lower the HOB to increase cranial perfusion pressure.
C. Notify the health care provider of the elevated ICP.
D. Document your findings and continue with planned care.

The health care provider orders the following drugs postoperatively. Match the drug with its action.

<table>
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<th>Action</th>
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<tr>
<td>Dexamethasone (Decadron)</td>
<td>Decreases cerebral metabolic rate, decreases cerebral blood flow and ICP</td>
</tr>
<tr>
<td>Mannitol (Osmitrol)</td>
<td>Prevents seizures</td>
</tr>
<tr>
<td>Pentobarbital (Nembutal)</td>
<td>Decreases edema and inflammation</td>
</tr>
<tr>
<td>Phenytoin (Dilantin)</td>
<td>Decreases cerebral edema by promoting osmotic diuresis</td>
</tr>
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During Corey’s recovery period, the nurse should plan interventions that prevent an increase in ICP. Select six correct interventions from the following list.

1. Abdominal distention
2. Deep breathing and coughing
3. Endotracheal suctioning
4. Fear and anxiety
5. HOB at 30 degrees
6. Lateral positioning
7. PaCO2 of 48 mm Hg
8. PaO2 of 80 mm Hg
If Corey’s ICP were to increase to the point of needing immediate intervention, the nurse would place the drip chamber and drainage bag of the ventricular catheter at the level of the ventricular reference point, approximately at the foramen of Monroe. This point is located how many cm above the ear canal?

Laboratory results on Corey’s first postop day include: Na+ 140 mEq/L; K+ 4.5 mEq/L; Cl 100 mEq/L; WBCs 12,500 mm³; Hgb 13.9 g/dl; Hct 40%; ABGs: pH 7.43, PaO2 98 mm Hg, PaCO2 35 mm Hg, HCO3 23 mEq/L, SaO2 98%. Based on these results, the nurse would notify the health care provider and

A. question the need for a change in IV solution.
B. anticipate a change in drugs administered to lower ICP.
C. decrease the respiratory rate and volume on the ventilator.
D. check the site of his invasive monitoring device and odor of his dressing.

Corey begins to recover from his surgery. His LOC is improves, he is weaned from the ventilator and receives O2 by mask. His wife is very excited about his progress and asks how long it will take for him to get better and come home. The nurse’s best response is

A. Corey will require long-term rehab for his motor and sensory losses before he can come home.
B. Unfortunately, patients who have had brain trauma will always have some degree of neurologic impairment.
C. Corey will be expected to show gradual, continuous improvement in neurological functioning until he has returned to normal status.
D. Recovery is very individualized and may continue for 6 months or longer before a plateau is reached and a prognosis for recovery can be made.
ROLE PLAYING GAME WITH GLASCOW COMA SCALE
(Adapted from Lewis, Medical-Surgical Nursing: Assessment and Management of Clinical Problems, 7th ed.)

Prepare several pieces of paper each with one response from each of the three categories (Eyes Open, Best Verbal Response, and Best Motor Response) on the Glasgow Coma Scale. Have several students pick a paper out of a hat and then, one at a time, act these responses out after receiving the appropriate stimuli in each of the categories from another student. Have the rest of the class try to assess what score the student should be given based on the responses they observe.

In order to encourage everyone to participate, you could have each student respond by writing down a number and then comparing it to the right answer or, if you would prefer to encourage group work, the students can be divided into teams where they would consult with each other and compete for points or a prize.