Brain injury is divided into primary and secondary injury. Primary injury is the result of the initial traumatic impact to the skull and the intracranial contents. Little can be done to reverse clinical signs of a primary injury. Secondary brain injury results from biochemical and systemic events which contribute to cell death after the initial trauma. Common factors contributing to secondary brain injury include hypotension, hypoxia, hypocapnia, hypercapnia and hyperthermia.

Understanding the brain and its protective mechanisms with a review in physiology is important to understanding management and patient care of the traumatic brain injury patient. This skull is a rigid compartment containing the brain, blood and cerebral spinal fluid. Intracranial pressure will increase with an elevation of any one of these compartments. Measuring intracranial pressure is usually not performed, so it is important to recognize clinical signs and patients that could be prone to an increase in intracranial pressure. A change in intracranial pressure can be seen on physical exam by monitoring pupil and ocular position, mental alteration, breathing pattern, including apneustic breathing or Cheyne-Stokes breathing, or through the Cushing reflex. The Cushing reflex is a late stage sign that is a cardiovascular sympathetic response that shows itself clinically as systemic hypertension and bradycardia.

Life threatening injuries such as pulmonary contusions or pneumothorax can lead to severe compromise in oxygenation, ventilation and perfusion. These conditions need to be identified and managed immediately because they are successful management will be beneficial for the brain injured patient. Maintaining cerebral perfusion pressure, ensuring oxygen delivery to the brain and management of intracranial hypertension always require immediate attention when stabilizing extracranial injuries. Assessing the neurological status of these patients should include evaluation of patient’s level of consciousness, breathing pattern, pupil size and responsiveness, ocular position, eye movement and motor responses. A complete exam should be done every 30 to 60 minutes in these patients. A modified Glasgow coma scale can be used to record progression or regression of the brain injured patient over a period of time. The modified Glasgow coma scale involves three separate categories, including an examination to determine the level of consciousness, motor activity and brainstem reflexes. Based on your patient's clinical findings a score of 3 to 18 is given to the patient. A higher score will correlate with a better prognosis.

Patient care of the traumatic brain injury patient can be very time-consuming and tedious. The basics include head elevation, airway management, fluid therapy, drug therapy, nutrition, urinary care, positioning, and eye care. These patients require 24-hour care, and usually cannot be left alone for long periods of time.
Elevating the head 15 to 30° may decrease cerebral blood flow volume by increasing venous drainage and then decreasing the intracranial pressure. It is important to use a firm surface that tilts the entire patient and not only tilt the head. Using pillows or rolled up towels can bend the neck placing pressure on the jugular veins which in return increases intracranial pressure. Elevating the head higher than 15 to 30° may cause too much of a decrease in cerebral perfusion and worsen the brain injury. Avoiding jugular veins for venipuncture should be done at all costs and educating all members of the support staff to use caution when restraining these patients around the head is a must. Making sure these patients can adequately oxygenate and ventilate properly is important. Monitoring these patients with a pulse oximeter and providing oxygen is usually necessary. Some of these patients have to be intubated and ventilated to maintain their PaCO2 between 35 and 45 mmHg and their PaO2 above 80 mmHg. Decreased oxygen delivery is one of the main contributors to secondary brain injury. Adequate oxygen delivery should be an absolute priority in the management of head trauma. Volume resuscitation to avoid hypotension and hypovolemic shock should be performed. A goal of a mean arterial blood pressure of 80 to 100 mmHg should be obtained. Isotonic crystalloid's and colloids at their appropriate dosages are effective for managing hypovolemic shock. 0.9% NaCl, Normosol-R, and Plasmalyte are good choices for a crystalloid solution. Synthetic colloids such as Hetastarch can be used to help manage brain injury patients.

Corticosteroids, mannitol, furosemide, analgesics, anesthetics, anticonvulsants, G.I. protectant, and antinausea medications can be used to help manage the brain injured patient. All drugs should be prescribed by veterinarian and used on an individual basis. Hyperthermia is common in the brain injured patients and should be controlled. Hyperthermia will lead to vasodilation and increase intracranial pressure. Nutrition is an important part of patient care and if the patients are unwilling or unable to eat on their own feeding tubes can be placed for support. Monitoring vitals, rotating position, eye care, urinary care, including drainage of urinary catheters should be performed regularly to help manage the brain injured patient.