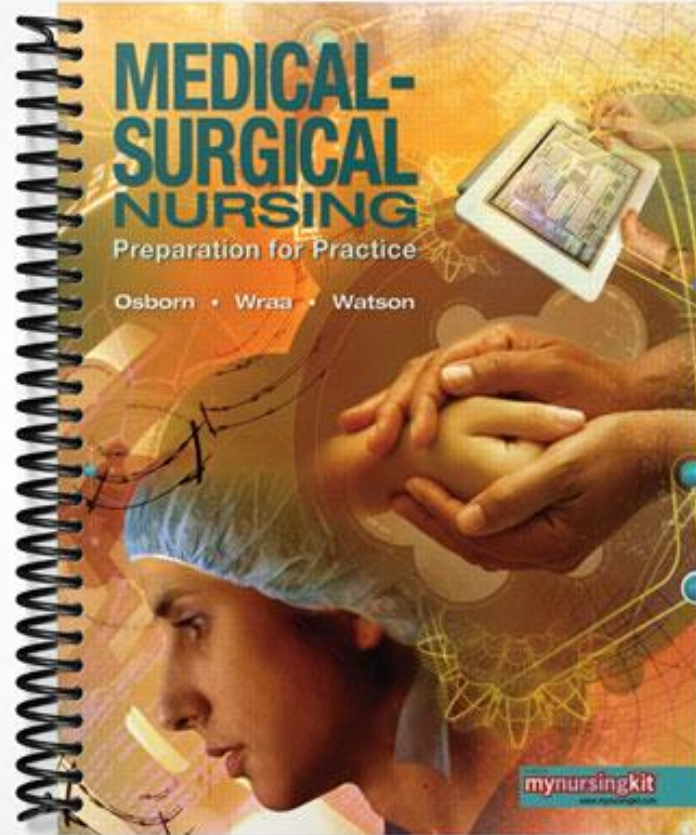


SOLUTIONS MANUAL



CHAPTER 74

CARING FOR THE PATIENT WITH MULTIPLE-SYSTEM TRAUMA

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Figure 74–1 Seatbelt injury.

Figure 74–2 Unrestrained frontal impact.

Figure 74–3 Rear impact.

Figure 74–4 Cavitation.

Figure 74–5 Trauma team.

Figure 74–6 Cervical stabilization.

Figure 74–7 Flail chest.

Figure 74–8 Tension pneumothorax.

LEARNING OBJECTIVE 1

Discuss the correlation between mechanism of injury with patient assessment based on an understanding of the kinematics of trauma.

CONCEPTS FOR LECTURE

1. Trauma injury occurs when a source of energy makes contact with the body and the body cannot tolerate the exposure to that injury. The extent of injury depends on the type and amount of every force and the tissue response to the force. Injury patterns have been identified through the evaluation of the type of trauma that occurred and the amount of force that was generated. The predictive pattern of trauma injuries are referred to as kinematics.
2. Motor vehicle accidents cause some commonly seen injuries. To help better predict what injuries have occurred it is important to identify the speed of the vehicle and where it impacted and object or other vehicle.
3. In frontal impact accidents a properly worn seat belt can absorb most of the energy and prevent the body from hitting immovable objects like a windshield. An airbag can also assist with this. Abrasions and/or ecchymosis from the seat belt are important indicators of possible underlying injury. Unrestrained

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passengers and no air bag deployment will cause injury at the body's point of impact with the vehicle. Patterns of injury that are anticipated are:

- Cervical spine fracture
 - Traumatic brain injury
 - Anterior flail chest
 - Myocardial contusion
 - Pneumothorax
 - Traumatic aortic disruption
 - Fractured spleen or liver
 - Posterior fracture/dislocation of the hip, knee, and/or ankle
4. Side impact injuries are dependent on whether the vehicle remains in place or moves away from the point of impact. Patterns of injury that are anticipated are:
- Contralateral neck sprain
 - Cervical spine fracture
 - Brachial plexus injury
 - Lateral flail chest
 - Pneumothorax
 - Traumatic aortic disruption
 - Diaphragmatic rupture
 - Fractured spleen/liver and/or kidney depending on the side of impact
 - Fractured pelvis or acetabulum
5. In a rear impact collision the initial impact accelerates the stationary vehicle and may force the vehicle into a frontal collision. Hyperflexion of the neck may occur. Patterns of injury that are anticipated are:
- Cervical spine injury
 - Soft tissue injury to the neck
6. Vehicle rollovers can be difficult to predict a pattern of injury. Injury occurs at the points where the body contacts the vehicle. This type of mechanism can result in more severe injury than other types. When a person is ejected from a vehicle this is a risk for all injury mechanisms and mortality is significantly increased.
7. Motorcycle crashes are common causes of traumatic injuries. Frontal impact patterns of injury include fractured femurs, tibias, and fibulas; chest and abdominal injuries; and traumatic brain and cervical spine

injury. Side impact accidents can result in open fracture of femur, tibia/fibula, and malleolus due to being crushed between the motorcycle and a second object. If the motorcyclist anticipates the collision and lays down the motorcycle, abrasions with embedded asphalt may be found due to insufficient protective clothing.

8. Pedestrian patterns of injuries from being struck by a motor vehicle can be predicted depending on the age and size of the victim and the size of the vehicle. Children tend to freeze and face the vehicle ending up with more frontal injuries. Depending on the height of the child and the vehicle, injuries are expected to the chest or femurs from impact of the bumper, and/or to the head or upper back on impacting the ground. A very small child may end up under the vehicle. Adults typically try to escape and turn away from the vehicle thus sustaining lateral injuries. Injury patterns include lower extremity fractures, fractured pelvis, and head injury.
9. Falls are the leading cause of death for Americans 65 years of age and older. The injury is similar to that of an MVA due to the abrupt change in velocity. In falls greater than 15 feet, adults typically land on their feet. In falls less than 15 feet, adults typically land in the position in which they fell. Children have larger heads in proportion to their body; therefore they tend to land headfirst. Patterns of injury include calcaneus fractures, compression fractures to T₁₂ to L₁, bilateral wrist fractures, and traumatic brain injury.
10. Severity of injury from penetrating trauma depends on the velocity or speed of the penetrating object. Energy created by the object is dissipated into the surrounding tissues much like a shock wave.
 - Stab wounds are low velocity and produce injury directly as the object penetrates the tissue.
 - The severity of damage from gunshot wounds depends on the amount of energy transferred from the bullet to the body. Also the degree of deformation of the bullet also influences the degree of tissue damage.
 - It is important to assess the patient for the number of wounds present.
11. Blast injuries can occur in three phases:
 - The concussive effects of the pressure wave can cause CNS injury, rupture of air-containing organs, and tearing of membranes and small vessels.
 - Fragments of glass, rock, and metal debris become high-velocity projectiles that can cause penetrating injury.
 - The victim may be thrown into the air and sustain injury similar to that sustained when ejected from a vehicle or when a person falls from a height.

POWERPOINT LECTURE SLIDES

1 Trauma Injury

- A source of energy makes contact with the body
- The body cannot tolerate the exposure to that injury
- Extent of injury depends on the type and amount of every force and the tissue response to the force
- Injury patterns identified
- Predictive pattern of trauma injuries are referred to as kinematics

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2 Motor Vehicle Accidents

- Cause some commonly seen injuries
- To help anticipate injuries it is important to
 - Identify the speed of the vehicle
 - Where the vehicle impacted an object or other vehicle

3 Frontal Impact Accidents

- A properly worn seat belt can absorb most of the energy and prevent the body from hitting immovable objects like a windshield
- Abrasions and/or ecchymosis from the seat belt indicate possible underlying injury
- Patterns of injury that are anticipated are:
 - Cervical spine fracture
 - Traumatic brain injury
 - Anterior flail chest
 - Myocardial contusion
 - Pneumothorax
 - Traumatic aortic disruption
 - Fractured spleen or liver
 - Posterior fracture/dislocation of the hip, knee, and/or ankle

4 Side Impact Injuries

- Depends on whether vehicle remains in place or moves away from the point of impact
- Patterns of injury that are anticipated are:
 - Contralateral neck sprain
 - Cervical spine fracture
 - Brachial plexus injury
 - Lateral flail chest
 - Pneumothorax
 - Traumatic aortic disruption
 - Diaphragmatic rupture
 - Fractured spleen/liver and/or kidney

- Fractured pelvis or acetabulum

5 Rear Impact Collision

- Initial impact accelerates the stationary vehicle and
- May force the vehicle into a frontal collision
- Hyperflexion of the neck may occur
- Patterns of injury that are anticipated are:
 - Cervical spine injury
 - Soft tissue injury to the neck

6 Vehicle Rollovers

- Can be difficult to predict a pattern of injury
- Injury occurs at the points of contact
- Can result in more severe injury than other types of MVA
- Ejection from vehicle—risk for all injury mechanisms
- Mortality significantly increased

7 Motorcycle Crashes

- Common causes of traumatic injuries
- Frontal impact patterns of injury include:
 - Fractured femurs
 - Tibias and fibulas
 - Chest and abdominal injuries
 - Traumatic brain and cervical spine injury
- Side impact accidents can result in:
 - Open fracture of femur, tibia/fibula, and malleolus due to being crushed between the motorcycle and a second object
- Laying down the motorcycle
 - Embedded asphalt may be found due to insufficient protective clothing

8 Pedestrian Injuries

- Can be predicted with victim's age and size, vehicle size
- Children tend to freeze and face the vehicle

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- End up with more frontal injuries
- Chest and head injuries from bumper and/or ending up under the vehicle
- Adults typically try to escape and turn away from the vehicle
 - Sustaining lateral injuries
 - Injury patterns:
 - Lower extremity fractures
 - Fractured pelvis
 - Head injury

9 Falls

- Leading cause of death for Americans 65+ years of age
- Injury similar to that of an MVA due to the abrupt change in velocity
- In falls > 15 feet, adults typically land on their feet
- In falls < 15 feet, adults typically land in the position in which they fell
- Children tend to land headfirst
- Patterns of injury:
 - Calcaneus fractures
 - Compression fractures to T₁₂ to L₁
 - Bilateral wrist fractures
 - Traumatic brain injury

10 Penetrating Trauma

- Severity depends on velocity of the penetrating object
- Energy dissipates into surrounding tissues like a shock wave
- Stab wounds are low velocity
- Produce injury directly as the object penetrates the tissue
- Severity of damage from gunshot wounds depends on
 - Amount of energy transferred from the bullet to the body
 - The degree of deformation of the bullet

11 Blast Injuries Can Occur in Three Phases:

- Concussive pressure wave
- Penetrating injuries from flying debris
- Injury similar to that from a fall or MVA

SUGGESTIONS FOR CLASSROOM ACTIVITIES

- Divide the class into small groups and provide case descriptions of several accidents (include victim ages along with a description of how the accident occurred). Have the students make a list of anticipated injuries to each victim. Have student groups present selected cases and share their lists with the rest of the class.
- Invite a nurse from a local trauma center to discuss common injuries and types of accidents treated. Ask the nurse to additionally discuss his/her role as part of the trauma team.

SUGGESTIONS FOR CLINICAL ACTIVITIES

- As part of a clinical conference, ask students (who are willing) to share experiences they have had as a provider or as a family member dealing with trauma. Help students consider common patient/family responses related to trauma experiences and beginning nursing approaches to support these individuals.
- Arrange for the students to tour a local trauma center.

LEARNING OBJECTIVE 2

List the priorities of the primary and secondary surveys.

CONCEPTS FOR LECTURE

1. It is important to develop a systematic approach to the trauma assessment. Initial nursing management follows a systematic approach to care and includes a rapid primary survey, resuscitation of vital functions, a detailed secondary survey, and initiation of definitive care. During the initial assessment the health care team must identify injuries, intervene when life-threatening injuries are present, and prioritize care.
2. The primary survey follows a specific sequence:
 - A Airway maintenance with cervical spine immobilization
 - B Breathing and ventilation
 - C Circulation and hemorrhage control
 - D Disability (neurological status)
 - E Exposure/environmental control (e.g., remove all clothing but prevent hypothermia)
3. A secure and patent airway is the first priority for the trauma patient. While assessing the airway, the patient's cervical spine should not be moved. All multiple- system trauma patients should be treated as if they have a cervical spine injury until proven otherwise. Adequate function of the lungs, chest wall, and diaphragm is necessary for adequate ventilation. Expose the chest to visualize and assess chest wall excursion. Potential injuries to assess for include:
 - Flail chest—occurs when two or more ribs are fractured in two or more places and are no longer

attached to the thoracic cage, resulting in a free-floating segment

- Pulmonary contusion—damage to the underlying lung tissue, initially a hemorrhage followed by alveolar and interstitial edema
 - Tension pneumothorax—occurs when an injury perforates the chest or pleural space
 - Massive hemothorax—an accumulation of 1,500 mL or more of blood in the thoracic cavity
 - Open pneumothorax—an open communication between the atmosphere and intrathoracic pressure and is usually caused by penetrating trauma
4. Hemorrhage is the predominant cause of preventable death in the injured patient. During the primary survey hypotension should be considered hypovolemic in nature until proven otherwise. If external hemorrhage is identified, measures to control the bleeding should be taken immediately. Treatment of hemorrhage consists of administration of fluids, blood, and blood products. Fluid resuscitation has traditionally been the treatment for hemorrhagic shock.
 5. The Glasgow coma scale should be used to assess the patient's neurological status.
 6. The trauma patient should be completely undressed to facilitate a thorough assessment. Care should be given to prevent hypothermia including using warm blankets or an external warming device.
 7. Adjuncts to the primary survey include use of a cardiac monitor to diagnose dysrhythmias. One complication from blunt cardiac injury is cardiac tamponade, which is bleeding into the pericardial sac. Findings suggestive of cardiac tamponade are called Beck's triad. It includes neck vein distention, muffled heart sounds, and hypotension. Pulse oximetry, bedside radiographs, placement of an indwelling urinary catheter, and a gastric catheter should be initiated at this time. Blood pressure should be monitored frequently.
 8. The secondary survey includes a detailed head-to-toe evaluation of the patient with a reassessment of all vital signs. Observation/inspections should include:
 - Battles sign—ecchymosis over the mastoid area indicates a basilar skull fracture
 - Raccoon eyes—ecchymosis over the orbit of the eyes may indicate a basilar skull fracture
 - Inspect the ears and nose for blood and any CSF.
 - Inspect the mouth for loose or broken teeth.
 - While maintaining cervical spine precautions, the neck should be palpated for any spinous process deformity or crepitance. There is controversy surrounding which patients require radiographs, how much imaging should be necessary and exactly what sort should be done to evaluate for a cervical spine injury.
 - The chest and abdomen should be inspected, palpated, and auscultated appropriately.
 - The pelvis should be assessed for stability by gently compressing the iliac wings and symphysis pubis.
 - The genitalia should be inspected.
 - Each extremity should be inspected for deformity and swelling.

POWERPOINT LECTURE SLIDES

1 Trauma Assessment

- Systematic approach to the assessment is essential
- Initial nursing management follows a systematic approach:
 - Rapid primary survey
 - Resuscitation of vital functions
 - A detailed secondary survey
 - Initiation of definitive care

2 The Primary Survey Follows a Specific Sequence:

- A Airway maintenance with cervical spine immobilization
- B Breathing and ventilation
- C Circulation and hemorrhage control
- D Disability (neurological status)
- E Exposure/environmental control (i.e., undress but prevent hypothermia)

3 Primary Assessment

- First priority is a secure and patent airway
- While assessing the airway, do not move cervical spine
- Assume a cervical spine injury until proven otherwise
- Expose the chest to visualize and assess chest wall excursion
- Potential injuries to assess for while inspecting the chest:
 - Flail chest
 - Pulmonary contusion
 - Tension pneumothorax
 - Massive hemothorax
 - Open pneumothorax

4 Hemorrhage—Predominant Cause of Preventable Death in the Injured Patient

- Consider hypotension as hypovolemic in nature until proven otherwise
- Immediate efforts to control external hemorrhage

- Treat hemorrhage by administering fluids, blood, blood products
 - Fluid resuscitation has traditionally been the treatment for hemorrhagic shock
- 5 Assess the patient's neurological status on GCS
- 6 Complete undressing facilitates a thorough assessment
- Prevent hypothermia including using warm blankets or an external warming device
- 7 Adjuncts to the Primary Survey:
- Cardiac monitoring to diagnose dysrhythmias
 - One complication from blunt cardiac injury is cardiac tamponade
 - Beck's triad—neck vein distention, muffled heart sounds, hypotension
 - Pulse oximetry
 - Bedside radiographs
 - Placement of an indwelling urinary catheter and a gastric catheter
 - Blood pressure should be monitored frequently
- 8 Secondary survey
- Detailed head-to-toe evaluation
 - Reassessment of all vital signs
 - Observation/inspections should include:
 - Battle's sign—basilar skull fracture
 - Raccoon eyes—basilar skull fracture
 - Inspect the ears and nose for blood and CSF
 - Inspect the mouth for loose or broken teeth
 - Palpate the neck for spinous process deformity or crepitance
 - Maintain cervical spine precautions
 - Lack of consensus re: radiography
 - Inspect, palpate, auscultate the chest and abdomen
 - Assess pelvis for stability
 - Inspect genitalia
 - Inspect each extremity for deformity and swelling

- Diagnostic testing may be ordered

SUGGESTIONS FOR CLASSROOM ACTIVITIES

- Provide students tips for rapid trauma assessment and triage. Discuss the nurse's role in working as a member of the trauma team.
- Discuss diagnostic tests related to common traumas listed in the chapter. Discuss any nursing implications with each test.
- Identify resources students can access in caring for the trauma patient such as massive transfusion guidelines (listed in Chart 74–1).

SUGGESTIONS FOR CLINICAL ACTIVITIES

- Using a mannequin, have small groups of students role-play and practice primary and secondary assessments in the clinical lab. Ask one student to be the observer and comment on the strengths/weaknesses of the student team's approach to assessment.
- Arrange for the students to shadow a trauma nurse.
- If possible, ask students to participate in a high- fidelity patient simulation of a trauma case.

LEARNING OBJECTIVE 3

Explain the rationale for the tertiary survey.

CONCEPTS FOR LECTURE

1. Many trauma patients are unresponsive or confused when they are first evaluated and are unable to furnish valuable medical history data that may affect their care. In addition, not all injuries are detected by the primary and secondary survey. The tertiary trauma survey (TTS) is completed within 24 hours of admission as a patient evaluation that identifies and catalogs all injuries after the initial resuscitation and operative intervention. The TTS is repeated when the patient is awake, responsive, and able to communicate.
2. The TTS includes a comprehensive review of the medical record, repetition of the primary and secondary surveys, review of all laboratory data, and review of all radiographic studies.

POWERPOINT LECTURE SLIDES

1 Tertiary Survey

- Completed within 24 hours of admission
- Identify and catalog all injuries after initial resuscitation and intervention
- Repeat when the patient is awake, responsive, and able to communicate

2 Include:

- Comprehensive review of the medical record
- Repetition of the primary and secondary surveys

- Review of all laboratory data
- Review of all radiographic studies

SUGGESTIONS FOR CLASSROOM ACTIVITIES

- Discuss the importance of the tertiary survey including points about how injuries may be missed during the initial primary and secondary survey that may affect patient outcomes.
- Ask students to list roles of the trauma nurse as member of the trauma team including specific assessment responsibilities they will have.
- Guide students in discussion of qualities and education required of a good trauma nurse and what interests they might have in such a role in the future.

SUGGESTION FOR CLINICAL ACTIVITIES

- Ask a member of a trauma care team to share assessment forms and standards of practice for common trauma cases.

LEARNING OBJECTIVE 4

Compare and contrast special considerations experienced during the initial resuscitation.

CONCEPTS FOR LECTURE

1. There are clinical situations or conditions that affect the delivery of trauma care. The topics to be discussed are end-of-life considerations, traumatic brain injury, spinal cord injury, trauma in pregnancy, intimate partner violence, nutritional support, gerontological considerations, and trauma rehabilitation.
2. End-of-life: Trauma care has been focused on curing patients. However, when trauma patients do die, they and their families may not receive end-of-life care that results in a death that best reflects the interests of the patient and family. The need to integrate palliative care into trauma care is an essential part of providing excellent trauma care for all patients and families. Policies should be in place to assist the trauma team in making the decision to shift from curative to comfort care and that address the changes in the focus of care for dying patients.
3. Traumatic brain injury: Multiple-system trauma patients who sustain traumatic brain injury can be difficult to assess due to their decreased level of consciousness.
4. Spinal cord injury: Any multiple-system trauma patient must be considered to have a vertebral column injury even if the patient does not have a neurological deficit. It is very important to protect the spine from excessive manipulation. A rigid cervical collar must be properly placed, and manual stabilization is maintained while the patient is logrolled for assessments.
5. Trauma in pregnancy: For any female trauma patient between the ages of 10 and 50, the potential for pregnancy should be considered. Because of the significant physiological changes during pregnancy, patterns of injury may be affected. The most important thing to remember is when caring for a pregnant trauma patient is that the best treatment for the fetus is the provision of optimum resuscitation of the mother and early assessment and monitoring of the fetus.
6. Intimate partner violence: IPV statistics are difficult to obtain due to different definitions of IPV. IPV can result in death and disability. Aside from sexual violence, physical violence may include: scratching,

throwing, grabbing, biting, choking, shaking, slapping, punching, burning, use of restraints, and use of a weapon.

7. Nutritional support is important in regard to healing. National Guidelines for Nutritional Support should be followed (p. 2442).
8. Gerontological considerations: Trauma is the seventh leading cause of death in patients 65 and older and accounts for 25% of all injury fatalities.
 - The increased risk in death is attributed to preexisting medical conditions that make it difficult for the patient to tolerate changes in their normal physiological parameters during the acute stress of trauma or major surgery.
 - Falls, motor vehicle crashes and burns are the three leading causes of death in the elderly. Prevention of falls includes fall assessments and a survey of the patient's home surroundings for hazards.
 - Decreases in vision, hearing, cognitive function, and physical impairment put elderly drivers at risk for motor vehicle crashes. Research is being done to develop risk assessment tools and prevention programs to increase awareness and assist elderly people to be safe drivers.
9. Trauma rehabilitation is the multidisciplinary plan of care that maximizes an impaired individual's function by minimizing the deficits to achieve the highest quality of life possible.

POWERPOINT LECTURE SLIDES

1 Special Considerations in Delivery of Trauma Care

- End-of-life considerations
- Traumatic brain injury
- Spinal cord injury
- Trauma in pregnancy
- Intimate partner violence
- Nutritional support
- Gerontological considerations
- Trauma rehabilitation

2 End-of-Life Considerations

- Trauma care primarily focuses on curing patients
- When patients die, they and their families may not receive end-of-life care that results in a death that best reflects the interests of the patient and family
- Palliative care must be integrated into trauma care
 - An essential part of providing excellent trauma care

- Policies should be in place to assist the trauma team
 - In making the decision to shift from curative to comfort care
 - Address the changes in the focus of care for dying patients

3 Traumatic Brain Injury

- Multiple-system trauma patients who sustain traumatic brain injury can be difficult to assess due to their decreased level of consciousness

4 Spinal Cord Injury

- Suspect vertebral column injury in any multiple-system trauma patient
- Very important to protect the spine from excessive manipulation
 - Rigid cervical collar
 - Manual stabilization while the patient is logrolled

5 Pregnancy

- Consider pregnancy for any female trauma patient aged 10–50
- Physiological changes may change patterns of injury
- Most important thing to remember when caring for a pregnant trauma patient is that the best treatment for the fetus is the provision of optimum resuscitation of the mother and early assessment and monitoring of the fetus

6 Intimate Partner Violence (IPV)

- Statistics difficult to obtain due to different definitions of IPV
- IPV can result in death and disability
- Physical violence takes many forms

7 Nutritional Support

- Important in regard to healing
- National Guidelines for Nutritional Support (p. 2442)

8 Gerontological Considerations

- Trauma—7th leading cause of death in patients 65+
- Accounts for 25% of all injury fatalities
- Attributable to preexisting medical conditions
 - Can make it difficult for the patient to tolerate stress of trauma or major surgery

- Falls, MVA, and burns are the three leading causes of death in the elderly
- Prevent falls: assess and survey the home for hazards
- Sensory decreases put elderly drivers at risk for MVA
 - Research into risk assessment tools and prevention programs

9 Trauma Rehabilitation

- Multidisciplinary plan of care that maximizes an impaired individual's function by minimizing the deficits to achieve the highest quality of life possible

SUGGESTIONS FOR CLASSROOM ACTIVITIES

- As appropriate, ask students to develop posters or fliers on strategies to promote safety and help individuals avoid common traumas.
- Provide case studies for patients of different age groups and situations (such as pregnancy, older adult, adolescent abuse victim). Ask students in small groups to list major concerns and possible approaches for each case study. Debrief with the larger group.

SUGGESTION FOR CLINICAL ACTIVITIES

- Ask representatives from local agencies that work with trauma victims (such as the Red Cross, Veteran's Administration, or other community initiatives) to talk about common family issues and needs related to trauma experiences. Help students identify strategies for working with families during and after trauma experiences.