Study Guide

for the

ATLS

Course Manual

11th Edition

Dr. Ken Evans, MD

Contents

SECTION I: EVALUATION, MANAGEMENT, and RESUSCITATION of the INJURED PATIENT (xABCDE)

Chapter 1 Initial Assessment: Primary Survey

The “x” step of the xABCDE primary trauma survey is _____.
immediate identification and control of exsanguinating external hemorrhage

Clinicians should decide as early as possible if all care can be delivered at the emergency treating facility or if the patient requires _____.
transfer

A cast-cutter should be used to remove a trauma victim's helmet if there is evidence of a C-spine injury or if _____ .
the patient experiences pain or paresthesias during an initial attempt to remove the helmet.

Shock is defined as _____ tissue perfusion and oxygenation.
insufficient

Any patient who is cool and tachycardic is considered to be _____ until proven otherwise.
in shock

The definition of tachycardia depends on the patient's age. What heart rate is considered tachycardic for infants, toddlers/preschoolers, school age/prepubescent, and adults?
Infants (1 year old) > 160,
toddlers/preschoolers (between 3 and 5 years old) > 140,
school age/prepubescent (between 6 and 12 years old) > 120, and
adults (18 years old and older) > 100

Compensatory mechanisms may preclude a measurable fall in systolic blood pressure until up to _____ % of the patient's blood volume is lost.
30%

In a hemodynamically abnormal patient with clinical findings of a spinal cord injury, the clinician should still exclude _____ before assuming hypotension is due only to the spinal cord injury.
hemorrhagic shock

What is the trauma triad of death?
The trauma triad of death is the combination of hypothermia, coagulopathy, and acidosis. Severe hemorrhage in trauma diminishes oxygen delivery, and may lead to hypothermia. Hypothermia, in turn, can halt the coagulation cascade, which exacerbates the hemorrhage. Since tissues are hypoperfused, anaerobic metabolism increases, causing the release of lactic acid and other acidic compounds. Such an increase in acidity can reduce myocardial

performance, further exacerbating tissue hypoperfusion. And so, the viscious cycle continues, ultimately ending in death, unless someone trained in ATLS intervenes.

A patient may be abusive and belligerent because of _____ , so don't just assume it's due to drugs, alcohol, or personality.

hypoxia

Frequent _____ is critical to the performance of the Primary Survey - a trauma patient's status may change _____.

reevaluation; quickly

Clinicians should make use of available and appropriate adjuncts to optimize completion of the Primary Survey, such as:

continuous electrocardiography (ECG)
pulse oximetry
capnography
chest and pelvis radiographs
FAST
eFAST
DPL
urinary catheter
gastric catheter
ABGs

Chapter 2 Resuscitation Team Function and Communication

Trauma evaluation and management can be organized into six discrete phases of care. They are:

1. Preplanning and administration
2. Prearrival team huddle
3. Arrival handover
4. Initial Assessment team function
5. Departure handover
6. Event debrief

Key components of the prearrival team huddle include the following:

1. Emergency medical services (EMS) report
2. Staff introductions — who is present and their roles
3. Staff preparation — appropriate personal protective equipment (PPE), security presence, etc.
4. Clear expectations and goals
5. Room preparation—warm room, warm fluids, functioning equipment available

A high-functioning team leader will actively encourage _____.

communication

During a resuscitation, the following dialogue occurred:
Trauma Team Leader (TTL): “David, could you transfuse one unit of packed RBCs under pressure and let me know when the transfusion is complete.”
David: “I will transfuse one unit of packed RBCs under pressure and let you know when it's complete.”
A few minutes later.
David: “One unit of packed RBCs transfused.”
TTL: “Good.”
This is an example of _____ communication.

closed-loop

A reflective conversation about performance, or _____ , following trauma resuscitations can be beneficial to:

event debrief;

1. address team member stress
2. identify strengths
3. identify weaknesses
4. improve team functioning
5. build mutual respect and empathy

Chapter 3: x: Control of eXsanguinating Hemorrhage

Immediate identification and control of exsanguinating external hemorrhage is the _____ step of the primary survey.

"x"

In situations of non-life-threatening external hemorrhage, the clinician proceeds to the _____ step of the primary survey.

airway assessment and management

All clothing around and proximal to the area of exsanguination is _____.

removed

Direct pressure is applied with a gauze dressing as precisely as possible over the site of bleeding. Larger and deeper wounds are packed with gauze while pressure is applied. If bleeding control is accomplished, a _____ is applied and the wound is observed for resumption of hemorrhage while other steps of the primary survey are completed.

pressure dressing

If extremity bleeding control is not rapidly achieved with direct pressure and wound packing, a _____ is applied.

tourniquet

A tourniquet is applied _____ proximal to the bleeding site and not over a _____.

2–3 inches (5–8 cm); joint

The tourniquet is tightened sufficiently so that a _____ is not be palpable distal to the tourniquet and _____ should cease.

pulse; bleeding

A properly applied tourniquet will _____ arterial flow.

occlude (occluding only the venous system can actually increase hemorrhage)

The tourniquet is _____ when tightened adequately.

painful

If bleeding continues, a _____ is placed 2–3 inches proximal to the first device.

second tourniquet

The _____ of application is recorded, preferably on the device itself.

time

If the tourniquet duration is less than _____ hours, there does not appear to be an increased rate of amputations or other tourniquet-related adverse events.

two

Chapter 4: Airway Assessment and Management

The "A" in xABCDE stands for _____ .

Airway; however, always be cautious about and protect the cervical spine.

Massive amounts of oropharyngeal matter can be managed by placing the patient in the _____ position, digital removal of the material, and suctioning.

left lateral

Jaw thrust involves moving the mandible _____ to displace oropharyngeal soft tissues and create an air passage.

anteriorly

Patients with multiple facial and airway injuries often assume the most comfortable and efficient airway position, frequently _____. These patients should be _____ to maintain this spontaneous effective position, even if other injuries are suspected.

sitting upright; allowed

Airway edema from multiple injuries or airway burn may progress and lead to _____ over time. _____ observation and reassessment are crucial.

obstruction; Continuous

Factors suggestive of airway burn are:

history of confinement in a burning environment;
inhalation of smoke, heated gasses, and/or toxic chemicals (e.g. burning foam in furniture, industrial locations);
singed facial or nasal hairs;
carbonaceous deposits in the mouth;
carbonaceous sputum;
hoarseness;
dysphagia;
drooling;
wheezing; and
large body surface area burns

Signs of potentially imminent airway obstruction include:

Decreased level of consciousness
Dyspnea
Decreased oxygen saturation (SpO_2)
Stridor
Suprasternal, substernal, or subcostal retraction
Full-thickness facial burns
Edema of oral structures and/or the tongue

When any of the above are present, _____ intubation is generally indicated.

urgent

Measures to mitigate the risk of precipitous cardiorespiratory deterioration during airway management and positive-pressure ventilation include:

pre-intubation fluid resuscitation
oxygenation
monitoring
preparation of vasopressors (just in case)

Even though there is no respiratory effort during the apneic phases of intubation, such as during laryngoscopy, hypoxia may be delayed by passive administration of oxygen via either standard nasal cannula (flow can be increased once RSI is initiated) or high-flow nasal oxygen (HFNO). This called _____.

apneic oxygenation

During RSI, gentle _____ _____is continued until intubation and resumed between intubation attempts.

mask (also known as bag-valve-mask or BVM) ventilation

Along with mask ventilation, a _____ and an _____ is often employed to move the tongue more anterior.

jaw thrust; oropharyngeal or nasopharyngeal airway

Nasopharyngeal airways are contraindicated in _____.

facial and basilar skull fractures

The proper size ET tube for an infant is _____.

the same size as the infant's nostril or little finger (usually size 3 for neonates; 3.5 for infants)

How do you calculate what size ET tube to use for children?

Internal diameter = (age / 4) + 3.5 mm

What size cuffed endotracheal tube do you use for an emergency cricothyroidotomy?

5 or 6.

Size of needle for needle cricothyroidotomy?

12 gauge

Rapid-sequence intubation (RSI) is intubation that is facilitated by _____ in a relatively short _____ between drug administration and securing the airway.

drugs; time

RSI drugs are not used when a patient is in _____,

cardiac arrest

The three broad categories of drugs for RSI are:

Sedative and anesthetic agents
Neuromuscular blockers

Vasopressors and inotropes

Sedative and anesthetic agents have the potential to produce significant _____.
hypotension

_____ and _____ produce relatively fewer hemodynamic alterations.
Ketamine; etomidate

Sustained _____ detection of exhaled CO_2 is the best practical indicator to confirm successful intubation.
capnographic

In this context, "sustained" is defined as CO_2 being adequately detected for a minimum of _____ breaths.
seven

Visualization of the tube passing between the cords, clinical examination (breath sounds, chest rise, SpO_2), and chest radiography are unreliable in confirming _____.
tube position

Communication of the *cannot intubate, cannot oxygenate* situation by any team member is a signal that a _____ is likely imminently necessary.
surgical/incisional airway

Chapter 5: Breathing and Ventilation Assessment and Management

_____ for injured patients is beneficial until breathing status is assessed and managed.
Supplemental oxygen

What two places would you look at on a patient if you suspected hypoxemia?
Lips and fingernail beds - looking for cyanosis

You are unable to obtain a reading on the pulse oximter. Possible reasons are:
severe hypoxemia
hypoperfusion (e.g. shock or hypothermia)

The pulse oximter reading is falsely high. This may be due to _____.
CO poisoning

An injury to the alveolar capillaries without a tear in the lung tissue is termed _____ .
pulmonary contusion

This may be caused by blunt or penetrating mechanisms, or by the cavitation effect of _____.
explosions, high-velocity projectiles

A pulmonary contusion may cause mismatch between ventilation and perfusion and loss of lung compliance, leading to _____ and _____.
hypoxia; hypercapnia

A pulmonary contusion may enlarge for up to _____ hours post-injury.
72

Management of pulmonary contusion consists of:
monitoring
oxygen;
pain management;
pulmonary hygiene;
avoidance of volume overload;
antibiotics if pneumonia ensues;
mechanical ventilation in severe cases.

Patients with tension pneumothorax and patients with cardiac tamponade may present with many of the same signs. What findings will you see with a tension pneumothorax that you will not see with tamponade?
Absent breath sounds and hyperresonance to percussion over the affected hemithorax; and tracheal deviation away from the affected hemithorax.

Immediate thoracic decompression is warranted for anyone with absent breath sounds, hyperresonance to percussion, tracheal deviation, _____ and _____.

acute respiratory distress; subcutaneous emphysema

The _____ denotes the fourth to fifth intercostal spaces, where the pleural space can be safely decompressed with a needle or tube thoracostomy with less risk of entering the peritoneal cavity.

inframammary fold (IMF)

Size of needle for needle thoracentesis?

14 gauge

Size of thoracic catheter for pneumothoraces and most hemothoraces?

14 French

The extended FAST (eFAST) exam is an extension of the traditional FAST exam, adding a lung component to detect _____ and _____ in addition to the abdominal and pericardial fluid assessed by FAST.

pneumothorax; hemothorax

The most common cause of morbidity and mortality after rib fractures is _____ due to pain precluding appropriate pulmonary hygiene.

pneumonia

Pain management uses a multimodal approach, with emphasis on _____ therapies (e.g. acetaminophen/paracetamol, nonsteroidal anti-inflammatory drugs, ketamine) and regional nerve _____.

nonopioid; blocks

Chapter 6: Circulation Assessment and Volume Resuscitation

Shock is defined as _____.

insufficient tissue perfusion and oxygenation

Any injured patient who is tachycardic and has cool skin is considered to be in _____ until proven otherwise.

shock

Shock may be classified as:

cardiogenic (e.g. blunt cardiac injury, myocardial infarction)
hemorrhagic
obstructive (e.g. cardiac tamponade, tension pneumothorax)
distributive (e.g. neurogenic, septic, anaphylactic)
endocrine (e.g. diabetic ketoacidosis, adrenal insufficiency)
(Memory aid: "CHODE")

The most common cause of shock in the injured patient is _____.

hemorrhage

The most effective method of restoring adequate cardiac output and end-organ perfusion is to restore venous return by stopping the source of _____, along with appropriate _____ repletion.

bleeding; volume

As the severity of hemorrhage increases from moderate to severe, what happens to various observable parameters?

HR	increases
sBP	decreases
pulse pressure	decreases
respiratory rate	increases
LOC	decreases
lactate	increases
base deficit	increases (i.e. becomes more negative)

The earliest measurable sign of hypovolemia is _____.

tachycardia

Tachycardia is diagnosed when the heart rate is greater than
_____ beats per minute (BPM) in infants (1year old),
_____ BPM in preschool (between 3 and 5 years old) children,
_____ BPM in children from school-age to puberty (between 6 and 12 years old), and
_____ BPM in adults (18 years old and older).

160 BPM in infants,
140 BPM in preschool-aged children,
120 BPM in children from school age to puberty, and
100 BPM in adults

When you don't have a blood pressure reading, what are three things to look for when evaluating perfusion?

level of consciousness (brain perfusion)
skin color (ashen face and grey extremities)
pulses (thready and rapid)

Which arm should you not place a pulse oximeter?

The arm with a blood pressure cuff attached.

Potential locations for blood loss include:

"Four and the Floor"
thoracic cavity
peritoneal cavity
retroperitoneal space
closed long bone fractures
external hemorrhage ("the floor")

Urinary catheters are good for assessing renal perfusion and volume status. List 5 signs of urethral injury that might prevent you from inserting one.

blood at urethral meatus perineal ecchymosis
blood in scrotum
high-riding, non-palpable, or mobile prostate
pelvic fracture

How do you calculate total blood volume in an adult?

70 mL per kg x ideal weight.
E.g. a 70 kg person has about 70 x 70 = 4,900 mL or nearly 5 L of circulating blood

The blood volume of an obese person is calculated based on their _____ weight.

ideal

How do you calculate total blood volume in a child?

70-80 mL per kg x ideal weight.

Loss of more than _____% of blood volume results in loss of consciousness.

50%

When tissues do not get sufficient oxygen, they are forced to produce ATP anaerobically, producing _____ as a byproduct.

lactic acid

Roughly, base deficit is a measure of the quantity of _____ in the body and is calculated using arterial blood gas (ABG) results

excess acids

Base deficit and/or _____ levels can be useful in determining the presence and severity of shock.

lactate

Massive blood loss may produce _____ acute decrease in the hematocrit or hemoglobin concentration.
only a minimal (so these metrics are not very useful in the acute situation)

Why might you want a Bair Hugger for a patient who smells of alcohol?
Alcohol ingestion causes vasodilation, which can lead to hypothermia.

Vascular access must be obtained promptly. This is best accomplished by inserting two large-caliber (minimum of _____ gauge in an adult) peripheral intravenous catheters before placement of a central venous line is considered.
16 gauge

When peripheral IV access is challenging, an _____ device may be placed.
intraosseous (IO)

Excessive crystalloids may cause _____ and _____.
dilutional coagulopathy; acidosis

If blood products are not available in a timely fashion, resuscitation can be started with _____ mL of crystalloids.
250–500

For children less than 20 kg, the amount is _____.
10 mL/kg

Preferably, _____ should be used, or blood products in a ratio of _____ (packed red blood cells to plasma to platelets)
whole blood; 1:1:1 by number of *units*

Tranexamic acid (TXA) is a reversible competitive _____ of plasminogen, thus reducing fibrinolysis and stabilizing fibrin clots.
inhibitor

TXA may be administered in scenarios of major hemorrhagic shock. It is not recommended to be administered beyond _____ hours from the time of injury unless _____ is present.
3; hyperfibrinolysis

In some situations, a “normal” blood pressure may exacerbate bleeding. To counter this, _____ may be considered. E.g. having a _____ blood pressure goal of 90 mm Hg
permissive hypotension; systolic

For actively hemorrhaging patients and those in extremis, group _____ packed red cells and _____ plasma are rapidly transfused until type-specific and cross-matched products are available.
O; AB

Blood products should be _____ in patients who are pregnant or who may bear children in the future.

Rh negative

Resuscitation fluids should be warmed to 39ºC (102ºF). Can you use a microwave oven to do this?
Yes, for crystalloids only (but not for blood products).

Most patients receiving blood transfusions need calcium replacement. True or false?
False.

Adult patients should maintain urine output of at least ?
0.5 mL/kg/hr (children 1-2 mL/kg/hr)

Which vasopressors should you use to treat hemorrhagic shock?
Trick question. Never use vasopressors for hypovolemicshock - use volume replacement. Pressors will worsen tissue perfusion in hemorrhagic shock.

What physical signs suggest pericardial tamponade?
Beck's Triad: JVD, muffled heart sounds, and hypotension (resistant to fluid therapy). Also likely is tachycardia.

Can isolated intracranial injuries cause neurogenic shock?
No.

Unexplained hypotension or cardiac dysrhythmias (usually bradycardia from excessive vagal stimulation) may be caused by _____. This especially true in _____.
gastric distention; children

Would patients in early hypovolemic shock be acidodic or alkalotic?
Alkalotic - respiratory alkalosis from tachypnea. Then metabolic acidosis from hypoxia ensues.

Fluid replacement should be substantially guided by _____.
the patient's response to initial fluid therapy

The response to initial resuscitation may be stratified into three groups:
responders
transient responders
nonresponders

Responders are those whose _____ and _____ have improved and resolved.
vital signs; signs of tissue perfusion

Transient responders demonstrate improved _____ following initial fluid administration. However, perfusion indices decline as the fluid rate is _____.
hemodynamics; decreased

This indicates either ongoing _____ or inadequate _____ of previously lost blood.
hemorrhage; resuscitation

Failure to respond to volume administration indicates ongoing _____, inadequate _____, and/or _____ shock.

bleeding; resuscitation; nonhemorrhagic

For non-responders what should be done immediately?

Repeating the xABCDE survey.

How long can an intraosseous (IO) line be kept in?

To minimize the risk of osteomyelitis, intraosseous infusions should be limited to emergency resuscitation and should be discontinued as soon as other venous access is obtained.

How should you position the patient when inserting a subclavian or internal jugular line?

Supine, Trendelenburg (head down) at 15 degrees (to distend the veins and prevent air embolism), and have the head turned away from you (only if the C-spine has been cleared).

Where is an incision for a saphenous vein cutdown made and how long should the incision be?

The saphenous vein can be accessed approximately 1 cm anterior and 1 cm superior to the medial malleolus. Make a 2.5 cm transverse incision through the skin, taking care not to injure the vein.

Chapter 7: Disability: Neurological Assessment and Management

Head Trauma

A collection of blood between the skull and the dura mater is called an _____.
extradural hematoma (EDH)

A collection of blood in the subdural space is called a _____.
subdural hematoma (SDH)

The presence of blood due to trauma in the subarachnoid spaces, such as the cerebral sulci, fissures, or cisterns is called _____.
traumatic subarachnoid hemorrhage (tSAH)

An injury (bruise) to the brain parenchyma is called a _____.
cerebral contusion

Bleeding in the brain parenchyma is called _____.
intracerebral hemorrhage

Shearing of neurons due to rotational acceleration or deceleration forces is called _____.
axonal injury

What is a normal intracranial pressure (ICP) in the resting state?
7-15 mm Hg (pressures > 20 mm Hg, particularly if sustained, are associated with poor outcomes).

The Monroe-Kellie doctrine states that due to the _____ volume of the skull, the sum of brain, CSF, intracranial blood volume, and any pathological process must remain _____ to maintain a normal ICP. Therefore, an increase in the volume of one component is compensated by a _____ of one or more of the others.
fixed; constant; decrease

The Monro-Kellie doctrine describes compensatory mechanisms to stabilize pressure inside the calvarium. What are the 2 main ones?
Venous Blood and CSF decrease in equal amounts. When this is exhausted, ICP increases, and herniation can occur and brain perfusion will likely be inadequate.

Cerebral perfusion pressure (CPP) is defined as:
CPP = MAP - ICP
It is normally 60-80 mm Hg

The ability of the brain to maintain constant cerebral blood flow across a wide range of blood pressures and ICPs is called cerebral _____.
autoregulation

Cerebral autoregulation is achieved by alteration of cerebral vascular _____. If MAP or CPP falls, blood vessels _____. If MAP or CPP, increases, blood vessels _____.

resistance; dilate; constrict

Describe the Glasgow Coma Scale (GCS).

Component	Result	Score
E (eye opening)	Spontaneous	4
	To sound	3
	To pressure	2
	None	1
	Non-testable	NT
V (verbal response)	Oriented conversation	5
	Confused	4
	Words	3
	Sounds	2
	None	1
	Non-testable	NT
M (motor response)	Obeys commands	6
	Localizing	5
	Normal flexion (withdrawal)	4
	Abnormal flexion	3
	Extension	2
	None	1
	Non-testable	NT

The range of possible GCS scores is _____.

3 to 15

A patient opens her eyes only to painful stimuli, utters inappropriate words, and localizes pain. What is her GCS score?

E = 2
V = 3
M = 5
Therefore, GCS = 2 + 3 + 5 = 10

A sedated patient opens his eyes in response to calling his name loudly but utters no sounds. What is his GCS score?

E = 3
V = 1
M = NT (because he is sedated)
Therefore, GCS = E(3) V(1) M(NT)

Patients with a GSC of less than _____ usually require intubation.

nine

When calculating GCS and there is right/left assymetry in the motor response, which one do you use?

The BEST response (better predictor than the worst response).

Ideally, you want to wait to perform a GCS on a person with SEVERE brain injury until what?

BP is normalized.

Patients with a GCS between 3 and 8 meet the accepted definition of "coma" or "_____ brain injury."

severe

What are the GCS scores for "minor" and "moderate" brain injury?

Minor is 13-15,
Moderate is 9-12

What signs might you see if a patient has a basilar skull fracture?

Periorbital ecchymosis (raccoon eyes), retroauricular ecchymosis (Battle sign), otorrhea, and rhinorrhea.

Progressively impaired consciousness, a dilated pupil on the side of injury (due to third cranial nerve palsy), and progressive weakness with abnormal posturing are signs of _____.

uncal herniation

When the brain herniates under the falx cerebri into the opposite side, it is termed _____.

subfalcine herniation

Cerebellar herniation can be _____ or _____.

ascending transtentorial; decending transforaminal

A fixed and dilated (blown) pupil in a patient with a traumatic injury is caused by compression of which nerve?

Superficial parasympathetic fibers of the occulomotor nerve (cranial nerve III).

What criteria may make admission necessary for a patient with minor brain injury?

focal neurological deficits,
abnormal CT (or no CT available),
penetrating head injury,
prolonged loss of consciousness, worsening level of consciousness,

moderate to severe headache, significant drug or alcohol intoxication, skull fracture,
otorrhea,
rhinorrhea,
GCS remains < 15,
nobody at home to observe patient.

Preventing hypercarbia is critical in patients who have sustained a _____ injury.

head

High levels of CO_2 will cause cerebral vasculature to _____.

dilate (to increase blood flow). So, you might want to hyperventilate patients with brain injuries.

Your patient has a dilated pupil and you want to give mannitol on the way to the OR. What is the dose?

0.25-1.0 g/kg IV rapid bolus.

What would you want to do if a patient with a minor brain injury failed to reach a GCS of 15 within 2 hours post-injury, had LOC > 5min, is older than 65, had emesis x 2, or had retrograde amnesia > 30 minutes?

Urgent head CT scan. Everything but the 30 min of retrograde amnesia makes him high risk for needing neurosurgical intervention.

What is the difference between retrograde amnesia and anterograde amnesia?

These are terms easily confused. Retrograde amnesia is the inability to recall events that occurred before the trauma. Anterograde amnesia is the loss of the ability to create new memories after the trauma.

What two things do you need to do first for everyone with a moderate or severe brain injury (according to ATLS algorithm)?

1. Transfer to a facility capable of definitive neurosurgical care, and
2. Obtain a head CT scan (however, this should not delay patient transfer).

A FAST scan, DPL, or ex-lap should take priority over a CT scan if you cannot get the brain injured patient's sBP up to _____ mm Hg.

100. If a patient has a systolic BP over 100 with evidence of intracranial mass (e.g. blown pupil, asymmetrical motor exam), then a CT would take priority.

A midline shift of greater than _____ often indicates the need for neurosurgical intervention.

5 mm

Cerebral perfusion pressure (CPP) is defined as mean arterial blood pressure (MAP) minus _____.

intracranial pressure (ICP)

Hyperventilation will _____ ICP in a deteriorating patient with expanding intracranial hematoma until emergent craniotomy can be performed.

lower

In general, it is preferable to keep the $PaCO_2$ at approximately _____ mm Hg, the low end of the normal range.

35 mm Hg

Brief periods of hyperventilation ($PaCO_2$ of _____ to _____ mm Hg) may be a necessary intervention for acute neurologic deterioration.

25 to 30 mm Hg

Mannitol should not be given to patients with hypotension, because mannitol is a potent osmotic _____ and does not lower ICP in hypovolemia. This can further exacerbate hypotension and, therefore, cerebral .

diuretic; ischemia

Acute neurologic deterioration, such as the development of a dilated pupil, hemiparesis, or loss of consciousness, is a strong indication for administering mannitol, provided the patient is _____. If so, a bolus of mannitol (_____ g/kg) should be given rapidly (over 5 minutes).

euvolemic; 1 g/kg

The preferred imaging modality for TBI is _____.

noncontrast CT

Clinical indications for head CT include, but are not limited to,:

Age > 65; focal neurologic deficit; GCS < 15; coagulopathy; severe headache; vomiting; basilar skull fracture.

Indications for head CT based on the mechanism of injury include, but are not limited to:

Fall down ≥ 5 stairs or > 1 meter; ejection from a motor vehicle; pedestrian struck by motor vehicle.

A head CT shows the absence or compression of cisterns, midline shift exceeding 5 mm, and loss of grey-white matter differentiation. This patient has _____.

critically elevated ICP

Compared to CT, MRI is a more sensitive imaging modality for diagnosing and evaluating _____.

diffuse axonal injury (DAI)

Solutions containing _____ are avoided due to the risk of worsening cerebral edema.

dextrose

It is paramount that hypoxia and hypotension are avoided. The oxygenation goal is _____.

$SpO_2 \geq 94\%$

The blood pressure goal is _____.

15 years and older: SBP ≥ 100 mm Hg

Less than 15 years: SBP ≥ 70 + (age x 2) mm Hg

This, therefore, precludes the practice of _____.

permissive hypotension

Critical _____ is rapid deterioration of neurologic status that warrants emergent evaluation and treatment.

neuroworsening

The clinical signs are:

spontaneous decrease in the GCS motor score
new decrease in pupillary reactivity
new pupillary asymmetry
bilateral dilated pupils
new focal motor deficit
Cushing's triad (widened pulse pressure, bradycardia, and irregular respiration)

Management may include:

endotracheal intubation (to protect the airway)
mechanical ventilation (transient hyperventilation to $PaCO_2$ or $ETCO_2$ of 30-35 mm Hg) (prolonged hyperventilation is not recommended and may increase ischemic events)
head elevated 30° to 45°, while maintaining neutral cervical spine position (to ensure adequate venous return from the brain)
analgesia and sedation are optimized
IV bolus of hypertonic saline 5% (250 mL) or mannitol 20% (250 mL)
normothermia is maintained with a core temperature of 36°C–37.4°C
surgical evaluation for potential evacuation of mass lesions or decompressive craniectomy

Reasons for a discharged patient with mild traumatic brain injury to return to the hospital include:

drowsiness or increasing difficulty in waking patient,
nausea or vomiting,
convulsions,
severe headaches,
weakness or loss of feeling in the arm or leg,
confusion or strange behavior,
one pupil much larger than the other,
peculiar movements of the eyes, double vision, or other visual disturbances,
very slow or very rapid pulse,
unusual breathing pattern, and
bleeding or watery drainage from the nose or ear.

Spine Trauma

What are the possible mechanisms that can result in spine injuries?

Penetrating and blunt trauma, axial loading, flexion, extension, rotation, lateral bending, and distraction.

Can you clear the C-spine without imaging?

Yes, the C-spine can be cleared clinically if the patient:
is awake, alert, and sober;
has no focal neurological deficits referable to the cervical spine;
has no painful distracting injuries;
has no midline neck pain or tenderness on palpation; and
can *actively* flex, extend, and laterally rotate his head to both sides without pain (never do this passively).

What are the indications for C-spine radiographs in a trauma patient?

Midline neck pain or tenderness, neurological deficits related to C-spine injury, altered LOC, or intoxication.

Which views should be obtained?

Lateral, AP, and open-mouth odontoid views.

With the proper views of the C-spine, and a qualified radiologist, what is the sensitivity for finding an unstable cervical spine injury?

97% (CT with 3 mm slices > 99%).

Approximately _____% of patients with a cervical spine fracture have a second, noncontiguous vertebral column fracture.

10%

Cervical spine injury requires immobilization of the entire patient with:

Semirigid cervical collar, head immobilization, full-length backboard, and straps.

Attempts to align the spine for the purpose of immobilization on the backboard are not recommended if they ___ _.

cause pain

What is the most common type of C1 fracture?

Burst fracture (Jefferson fracture)

As long as the patient's spine is _____, evaluation of the spine and exclusion of spinal injury may be safely deferred, especially in the presence of _____, such as hypotension and respiratory inadequacy.

protected; systemic instability

In the presence of neurologic deficits, _____ or _____ is recommended to detect any soft tissue compressive lesion, such as a spinal epidural hematoma or a traumatized herniated disk.

MRI; CT myelography

A paralyzed patient who is allowed to lie on a hard board for more than _____ hours is at high risk for _____.

two; pressure ulcers

Can a patient breathe on his own after complete cervical cord transection?

Yes, if the phrenic nerves (C3-C5) are spared ("C3, 4, 5 keep the diaphragm alive"). This will result in "abdominal" breathing. The intercostal muscles will be paralyzed though.

Describe the pathophysiology of neurogenic shock.

Spinal cord injury (SCI) → loss of sympathetic tone → vasodilation of blood vessels → hypotension.
Plus:
SCI → interruption of sympathetic chain → unopposed vagal tone on heart → bradycardia → hypotension.

Neurogenic shock is rare in spinal cord injury below the level of _____.

T6

What is a major difference in a physical finding between hypovolemic shock and neurogenic shock?

Hypovolemic shock: usually tachycardia.
Neurogenic shock: usually bradycardia.

How do you treat neurogenic shock?

Judicious use of vasopressors and moderate fluid resuscitation. Too much fluid may result in fluid overload and pulmonary edema.

_____ shock refers to the transient loss of muscle tone and reflexes after a spinal cord injury.

Spinal
Note: it is not really "shock" in that there is no hemodynamic instability.

_____ syndrome is characterized by a greater loss of strength in the upper extremities than in the lower extremities, with varying degrees of sensory loss.

Central cord

_____ syndrome is characterized by paraplegia and a dissociated sensory loss with a loss of pain and temperature sensation. Dorsal column function (position, vibration, and deep pressure sense) is preserved.

Anterior cord

_____ syndrome results from hemisection of the cord, usually as a result of a penetrating trauma. In its pure form, the syndrome consists of ipsilateral loss of motor function (corticospinal tract) and position sense (dorsal column), associated with contralateral loss of pain and temperature sensation (spinothalamic tract) beginning one to two levels below the level of the injury.

Brown-Séquard (accounts for 4% of SCI)

Spinal motion restriction (SMR) may be achieved with a correctly sized _____, backboard (used for brief periods and not long transfers), scoop stretcher, vacuum splint, _____ alignment on a cot or stretcher, or any similar devices.

cervical collar; neutral

SMR is applied to the whole spine due to the high risk of _____ spinal injuries.

noncontiguous injuries

SMR is _____ performed in the sitting position.
not

_____ outcomes of SCI are variable and depend on the level and severity of neurological injury at presentation.
Functional

The _____ score is an accepted standard for assigning the level and grade of SCI.
American Spinal Injury Association (ASIA)

The ASIA score follows a standardized physical examination consisting of _____, _____, and _____ examinations.
myotome; dermatome; anal tone

Hypotension and hypoxia substantially _____ the outcome of both head and spinal cord injuries.
worsen

Permissive hypotension is _____ in SCI and moderate to severe TBI.
avoided

_____ are preferred for volume resuscitation.
Blood products

If blood products are not available, isotonic fluids, such as _____, are safe in maintaining volume status until blood products are available.
normal saline

Chapter 8: Exposure and Environmental Threats in the Primary Survey

The "E" component of the primary survey has two major goals:
1. to fully _____ and inspect the patient for externally visible injuries
2. to identify and begin treatment for any life-threatening _____ emergencies.

expose; environmental

To examine the posterior aspect of a patient who is at risk for spinal injury, _____ the patient while maintaining _____ precautions.

log roll; C-spine

To respect patient privacy and reduce hypothermia, _____.

cover the patient as much as possible during the examination and completely after the exam

Patients with traumatic injuries are at increased risk of hypothermia from _____, _____, and _____.

exposure (prehospital and inhospital); hemorrhage; administration of unheated IV fluids

Hypothermia is defined as a core temperature _____.

< 35°C

Hypothermia can lead to _____. Worsening hypothermia can lead to _____ and even _____.

coagulopathy; dysrhythmias; cardiac arrest

Hypothermic patients are not pronounced dead until they are _____ and dead.

warm

An injury to skin or other tissue that is allowed to freeze is called _____.

frostbite

For frostbite, rewarm the affected extremity by _____ and evaluate for possible _____ therapy.

immediate immersion in a 40°C circulating water bath until pink color and perfusion return (usually within 20 to 30 minutes). Do not use dry heat since there is a significant risk of burning the skin;
thrombolytic

An early form of freezing injury less severe than frostbite and characterized by cold, red, numb, or tingling skin is called _____.

frostnip

A cold injury from prolonged exposure to damp, cold (not freezing) conditions, leading to skin breakdown, nerve damage, and poor circulation is called _____.

trench foot

Chapter 9 Thermal Injuries

After removal of a heat source from a burn wound, the next step should be:

Cool the burn wound with room-temperature running tap water for 20 minutes. Do not use ice.

Cooling can be effective if initiated within _____ hours following injury.

3

Inhalation injury nessecitates _____ and transfer to a _____.

intubation; burn center

A high index of suspicion for inhalation injury must be maintained, because patients may not display clinical evidence for up to _____ hours. By this time, edema may prevent non-surgical intubation.

24

Immediate intubation is indicated in the following:

Signs of airway obstruction (hoarseness, stridor, accessory respiratory muscle use, sternal retraction)
Signs of respiratory compromise (inability to clear secretions, respiratory fatigue, poor oxygenation or ventilation)
Decreased level of consciousness
Very large total body surface area (TBSA) flame burns (typically > 40%–50%)
Extensive and deep facial burns
Burns inside the mouth

Circumferential burns of the neck can lead to swelling of the tissues around the airway; therefore, _____ is also indicated for these injuries.

early intubation

Carbon monoxide has _____ times the affinity for hemoglobin as does oxygen.

> 200

For patients with CO poisoning, the half-life of CO is _____ when breathing room air, and _____ when breathing 100% oxygen.

4 hours; 40-50 minutes

Patients with carboxyhemoglobin (COHb) levels less than _____% usually don't have any physical symptoms.

20%

COHb 20% - 30% may cause _____

headache and nausea

COHb 30% - 40% may cause _____

confusion

COHb 40% - 60% may cause _____
coma

COHb > 60% may cause _____
death

Is there any role for hyperbaric oxygen therapy in the primary resuscitation of a patient with a critical burn injury?
No

In a burn patient with persistent hypotension and profound metabolic acidosis unexplained by other causes, _____ should be suspected.
cyanide toxicity

Antidote treatment of this consists of the administration of _____.
hydroxycobalamin

A practical guide for determining the body surface area (BSA) of burns is _____.
the rule of nines

In the rule of nines only _____ and _____ burns are included.
partial-thickness (second-degree); full-thickness (third-degree)

Any patient with burns over more than _____% of the body surface (TBSA) requires fluid resuscitation.
20%

The palmar surface of a patient's hand represents approximately _____ % of TBSA.
1%

Adult head body surface area (BSA) is _____%.
9% (i.e. entire head, front and back is 9%) of TBSA.

Infant's head BSA is _____%
18% (9% front, 9% back) of TBSA.

What is the main difference between adult and infant BSA determination for burns?
Entire head BSA for infant is 18%, whereas it is 9% for adults.

Chest BSA is _____% of TBSA
18%

Back BSA is _____% of TBSA
18%

Each arm BSA is _____ % of TBSA

9% (total, front and back)

Each leg BSA for an adult is _____% of TBSA
18% (total: 9% front, 9% back)

Infant front or back of each leg BSA is _____%.
7% (total of each leg is 14%)

If you add up the BSAs of the head, chest, back, arms, and legs in the adult you get 99% of total BSA. What does the remaining 1% represent?
The perineum.

Partial-thickness or 2nd degree burns extend into the _____, whereas full-thickness or 3rd degree burns extend _____.
dermis; all the way through the dermis into and even beyond the subcutaneous tissue.

In the prehospital setting and during the primary survey, lactated Ringer's (LR) is administered as follows:

≤ 5 years old:	125 mL/hr
6–12 years old:	250 mL/hr
≥ 13 years old:	500 mL/hr

In the absence of shock, bolusing of fluids is generally avoided because _____.
it promotes "third spacing" (accumulation of fluid in interstitial spaces) rather than simply increasing intravascular volume.

Case: An 80 kg adult with 70% TBSA burns has been receiving LR at 500 mL/hr for the past 30 minutes since the injury. The primary survey has just been completed. The infusion rate should now be adjusted to:
2 x kg x % TBSA /16 = 2 x 80 x 70 / 16 = 700 mL/hr;
and then, if necessary, readjust the rate to achieve a urine output of 0.5 mL/ kg/hr or 0.5 x 80 = 40 mL/hr
Note: These calculations are different for younger patients and those with electrical injuries.

Are prophylactic antibiotics advisable?
No, there is no indication for prophylactic antibiotics in the post-burn period. Antibiotics should be reserved for the treatment of actual infections.
Tetanus immunization, however, should be up-to-date.

Compartment syndrome results from the combination of decreased skin _____ in deep burns and _____ in soft tissue, resulting in increased _____ and, consequently, reduced _____ to tissues within the affected space.
elasticity; edema; pressure; perfusion

Symptoms of compartment syndrome are:
increasing pain out of proportion to the stimulus
pain on passive stretch of the affected muscle

palpable tenseness of the compartment
asymmetry of the muscle compartments
altered sensation (e.g. paresthesia)
absence of a palpable distal pulse

True or false: The absence of a palpable distal pulse may be relied upon to diagnose compartment syndrome.

False. The absence of a pulse is usually a late finding in compartment syndrome.

The end results of untreated compartment syndrome are:

Muscle necrosis, neurologic deficit, ischemic contracture, infection, delayed healing of a fracture, and possible amputation.

If compartment syndrome is suspected, _____ must be performed before the pulse _____.

escharotomy; disappears

Referral to a burn center is indicated for:

Full-thickness burns of any size in any age group;
Partial-thickness and full-thickness burns on greater than 10% BSA;
Partial-thickness and full-thickness burns involving the face, eyes, ears, hands, feet, genitalia, and perineum, as well as those that involve skin overlying major joints;
Significant electrical burns, including lightning injury (significant volumes of tissue beneath the surface can be injured and result in rhabdomyolysis and acute renal failure and other complications);
Significant chemical burns; Inhalation injury;
Burn injury in patients with pre-existing illness that could complicate treatment, prolong recovery, or affect mortality (e.g. diabetes);
Children with burn injuries who are seen in hospitals without qualified personnel or equipment to manage their care;
Burn injury in patients who will require special social, emotional, or long-term rehabilitative support, including cases involving suspected child maltreatment and neglect.

Alkali burns are generally more serious than acid burns, because alkalies penetrate tissues more _____.

deeply

Chapter 10 Musculoskeletal Trauma

Exsanguinating hemorrhage is discovered and managed in the _____ part of the xABCDE of the primary survey.

x

In the secondary survey, in addition to "AMPLE," what other aspects of the history are significant?

Mechanism of injury, environment, preinjury status, and prehospital observations and treatment.

What are the four essential components of the physical assessment of MSK trauma?

Skin, neuromuscular function, circulatory status, and skeletal and ligamentous integrity.

Extremity injuries that are considered potentially life-threatening include _____ and _____.

major arterial hemorrhage; crush syndrome

A fracture with an intrinsic tendency to displace after reduction is regarded as _____.

unstable

What clinical findings might suggest a pelvic injury?

ecchymosis over the pelvis, perineum, or scrotum
pelvic tenderness
palpable diastasis of the symphysis pubis
hip rotation (usually external rotation)
leg-length discrepancy

The pelvis can accommodate _____ liters of blood.

4 to 6

Any pelvic fracture can produce significant hemorrhage, especially if age > _____.

64

Significant hemorrhage is more likely in the following pelvic fracture patterns:

anterior posterior compression III
vertical shear
open pelvic fracture

The pelvis should be stabilized with a _____ or commercial _____.

sheet; binder

This should be positioned circumferentially around the pelvis at the level of the _____.

greater trochanters (NOT over the iliac crests)

This maneuver should _____ rotate the lower extremities, which can also be secured together at the ankles to further _____ pelvic volume and help tamponade venous bleeding.

internally; decrease

Up to _____ mL of blood loss is commonly associated with femur fractures.
1,500 mL

To immobilize femoral shaft fractures, apply constant inline _____ to straighten the limb, then place an _____ device to maintain alignment. _____ can be used for both these purposes.
traction (not necessary for other long bone fractures); immobilization; Traction splints

Arterial flow may be _____ in a deformed limb. Therefore, immediate _____, _____, and _____ is necessary
compromised; realignment; splinting; reassessment

Definitive signs of arterial injury are:
obvious external arterial bleeding (i.e. pulsatile)
a rapidly expanding pulsatile hematoma
absent distal pulses

Does the presence of a distal Doppler signal alone exclude a significant arterial injury?
No

The appropriate use of _____ significantly decreases the patient's discomfort by controlling the amount of motion that occurs at the injured site.
splints

Should a leg be completely straight when splinting?
No, flexion of 10 degrees at the knee is recommended to lessen pressure on neurovascular structures.

If a fracture and an open wound exist in the same limb segment, the fracture is considered _____ until proven otherwise.
open

Patients with open fractures should be treated with _____ as soon as possible.
hemorrhage control
intravenous antibiotics
thorough debridement
bone stabilization

What characteristics of wounds increase the risk for tetanus?
significant contamination,
contused or abrased,
> 1 cm deep,
due to burns or frostbite,
due to high velocity missiles, and
> 6 hours old.

A doppler ankle-brachial index in a lower extremity less than _____ is indicative of impaired arterial flow.

0.9

What is the procedure to salvage a body part that was traumatically amputated?

The amputated part should be thoroughly washed in an isotonic solution (e.g. Ringer's lactate) and wrapped in sterile gauze that has been soaked in aqueous penicillin (100,000 units in 50 mL of Ringer's lactate). The amputated part is then wrapped in a similarly moistened sterile towel, placed in a plastic bag, and transported with the patient in an insulated cooling chest with crushed ice. Care must be taken not to freeze the amputated part.

In order to discover occult injuries not identified during the initial evaluation, it is imperative to repeatedly _____ the patient.

reevaluate (this cannot be over-repeated)

Crush syndrome is also known as _____.

traumatic rhabdomyolysis

Explain the pathophysiology of crush syndrome?

Crush injury of a significant muscle mass (increase in CK) → release of myoglobin →may cause acute renal failure and disseminated intravascular coagulation (DIC).
Other effects are metabolic acidosis, hyperkalemia, and hypocalcemia.

Myoglobin-induced acute renal failure may be prevented by intravascular fluid expansion and osmotic diuresis to maintain a high tubular volume and urine flow. It is recommended to maintain the patient's urinary output at _____ until the myoglobinuria is cleared.

100 mL/hr

Diagnostically, myoglobin release is indicated by dark amber urine that tests positive for _____, and a serum creatine kinase level exceeding _____ U/L.

hemoglobin; 10,000

After severe injuries, _____ may also occur.

fat embolism

_____ syndrome develops when the pressure within an osteofascial compartment or other confined space causes ischemia and subsequent necrosis.

Compartment

Symptoms of compartment syndrome are:

increasing pain out of proportion to the stimulus
pain on passive stretch of the affected muscle
palpable tenseness of the compartment
asymmetry of the muscle compartments
altered sensation (e.g. paresthesia)
absence of a palpable distal pulse

The absence of a palpable distal pulse may _____ be relied upon to diagnose compartment syndrome.

not - the absence of a pulse is usually a late (often too late) finding in compartment syndrome.

The end results of untreated compartment syndrome are:

Muscle necrosis, neurologic deficit, ischemic contracture, infection, delayed healing of a fracture, and possible amputation.

If compartment syndrome is suspected, _____, must be performed before the pulse _____.

fasciotomy or escharotomy; disappears

In cases where acute compartment syndrome is a concern, the use of peripheral nerve blocks is _____ to avoid masking symptoms.

contraindicated

Chapter 11 Trauma in the Pediatric Patient

Children typically have abundant physiologic _____ and often have few signs of hypovolemia, even after severe volume depletion. When deterioration does occur, it can be _____.

reserve; precipitous and catastrophic

Children are particularly susceptible to hypothermia, which can significantly compromise their response to treatment, prolong _____ times, and adversely affect central nervous system _____.

coagulation; function

Important differences in airway anatomy in infants and young children are:

proportionally larger occiputs, tongues, tonsils, epiglottises;
relatively more cephalad and anterior larynges;
shorter tracheas.

The most common cause of pediatric cardiac arrest is _____.

hypoxia

The size of ET tube for an infant is _____.

The same size as the infant's nostril or little finger (usually size 3 for neonates; 3.5 for infants)

How do you calculate the ET tube size for children?

Internal diameter = (age / 4) + 3.5 mm

How should you insert an OPA (Guedel) in a child?

Use tongue blade and insert gently without turning – otherwise there is great risk for trauma and resultant hemorrhage. Again, avoid the 180° rotation maneuvre.

What heart rate is considered tachycardic for infants, toddlers/preschoolers, and school age/prebuscent children?

Infants: > 160
Toddlers/preschoolers: > 140
School age/prepubescent: > 120

What other injuries are likely present if a child has broken ribs?

Since children's ribs are very pliable, a great amount of force is required to break them. Broken ribs means a massive force and high likelihood of organ damage. There is often underlying organ damage even without broken ribs.

The normal systolic BP in children can be estimated by what formula?

90 mm Hg + (age x 2)

How do you estimate a child's total circulating blood volume?

Infants: 80 mL/kg
1 to 3 years: 75 mL/kg
> 3 years: 70 mL/kg

How do you estimate a child's weight?

Weight (kg) = (2 x age in years) + 10

When shock in a child is suspected, how much fluid bolus do you give?

10 mL/kg packed red blood cells or whole blood.

If this is not immediately available, give 20 mL/kg warm crystalloid, followed by blood products as needed.

What are the urine output goals for children?

Infants: 1–2 mL/kg/hr

Age 1 to adolescence: 1–1.5 mL/kg/hr

Teenagers: 0.5 mL/kg/hr

What would you see in an infant that would make you suspect severe brain injury in spite of normal level of consciousness?

Bulging fontanelles.

Physical examination findings suggestive of child maltreatment include:

Multiple bruises in different stages of healing

Evidence of frequent previous injuries, e.g. old scars or healed fractures on x-rays

Perioral injuries

Injuries to the genital or perianal area

Fractures of long bones in children younger than three years of age

Ruptured internal viscera without antecedent major blunt trauma

Multiple subdural hematomas, especially without a fresh skull fracture

Retinal hemorrhages

Bizarre injuries, such as bites, cigarette burns, and rope marks

Sharply demarcated second- and third-degree burns

Skull fractures

Chapter 12 Trauma in the Older Adult

Aging is associated with a decline in cellular function, resulting in a heightened vulnerability to injury-related stress, a phenomenon referred to as _____.

"reduced physiological reserve"

Five preexisting conditions that are particularly impactful on the outcomes of trauma patients are:

cirrhosis, coagulopathy, chronic obstructive pulmonary disease, ischemic heart disease, and diabetes mellitus.

The _____ enables clinicians to identify patients at greater risk of poor outcomes.

Trauma-Specific Frailty Index (TSFI)

Rapid screening for _____ and subsequent correction of coagulation parameters may improve outcomes.

anticoagulant use

Early and aggressive, but cautious, reversal of anticoagulation may lead to better outcomes. What are the antidotes for common anticoagulants?

Anticoagulant	Antidote
warfarin	Vitamin K: 5-10 mg IV; FFP: 10-15 mL/kg; PCC: 25-50 units/kg
low-molecularweight heparin (e.g. Enoxaparin)	protamine sulfate (partial reversal) 1mg/mg of enoxaparin if within 8 hours; 0.5 mg/ mg if after 8 hours
factor Xa inhibitors (e.g. Rivaroxaban, Apixaban)	andexanet alfa 400-800 mg bolus followed by 4-8 mg/min infusion; PCC: 50 units/kg
antiplatelet agents (e.g. ASA, clopidogrel)	platelet transfusion 1-2 units; DDAVP 0.3 mcg/kg IV

_____are the most common mechanism of injury encountered in older adults seen in trauma centers, and are the most common cause of unintentional injury and death among the elderly.

Falls

Elderly patients have a limited ability to _____ to compensate for blood loss.

increase heart rate

Elderly patients may not exhibit tachycardia in response to hypovolemia because of limited cardiac response to catecholamines. Why else?

They may be on beta-blockers, or have a pacemaker.

What is a possible mistake about a blood pressure of 120/80 in an 87-year-old man?

Assuming that normal blood pressure means euvolemia. Many geriatric patients have uncontrolled hypertension, and if their usual BP is 180/100, then 120/80 is relative HYPOtension for them.

Assessment and management of elderly patients is often complicated by their use of:

beta blockers, anticoagulants, calcium channel blockers, diuretics, NSAIDs, corticosteriods, hypoglycemics, psychotropics, etc.

Why would geriatric patients be more susceptible to intracranial hemorrhage when there is increased space around a shrinking brain to protect them from contusion?

Atrophic brain → stretching of the parasagital bridging veins, making them more prone to rupture upon impact.

In patients with fixed kyphosis, forcefully manipulating the neck to conform to the contour of a cervical collar can result in _____. Instead, these patients should be positioned with sandbags or positioners supporting the _____ and on _____ of the head maintaining the fixed kyphosis.

further injury; occiput; either side

How well do geriatric patients do with non-operative management of abdominal injuries compared to younger people?

Not as well – the risks of non-operative management are often worse than the risks of surgery.

Chapter 13: Trauma in the Pregnant Patient

Plasma volume increases during pregnancy. What happens to the hematocrit?

It decreases due to dilution by plasma (a hematocrit of 31-35% is normal in pregnancy).

What would you think of a WBC of 15,000 in a pregnant woman?

Normal. It can go up to 25,000 during labor.

A $PaCO_2$ of 35 to 40 in a pregnant patient may indicate what?

Impending respiratory failure. PaCO2 is usually around 30 due to hyperventilation due to increased levels of progesterone.

Pregnancy results in a _____ fall in systolic and diastolic blood pressures during the second trimester.

5 to 15 mm Hg. Blood pressure returns to near-normal levels at term.

Given the potential for the gravid uterus to compress the inferior vena cava and pelvic vessels, large-bore IV access should be secured above the _____.

diaphragm

IV fluids and medications administered through access below the diaphragm may not easily reach the central circulation.

What should you always assume about a pregnant patient's stomach?

That it is always full. Gastric emptying time increases during pregnancy. Early NG tube placement is recommended.

Placental abruption is a significant cause of fetal mortality after trauma, and may occur even with minor mechanisms of injury. It is primarily a clinical diagnosis, guided by observation, fetal heart rate monitoring, and tocometry. Most placental abruptions can be detected within _____ hours of trauma, but they have been reported as late as _____ hours after trauma.

6; 24

The classic triad of abruption includes _____, _____, and _____.

contractions; bleeding; abdominal pain

Of these, uterine _____ are the most sensitive predictor of placental abruption.

contractions

What is the time-frame for administering Rhogam?

Within 72 hours of the injury.

True or False: All Rh negative pregnant trauma patients should be administered Rhogam?

False. Rhogam is not necessary if the injury is remote from the uterus (e.g. distal extremity injury only).

When worn correctly by pregnant women, seat belts reduce fatalities by _____.

65-70%, with a 10-fold reduction in serious injury.

An abrupt decrease in maternal intravascular volume can result in a profound increase in uterine vascular _____, reducing fetal _____ despite reasonably normal maternal vital signs.

resistance; oxygenation

Admission to hospital is advisable in the presence of:

vaginal bleeding,
leakage of amniotic fluid,
pain or cramping,
evidence of hypovolemia,
uterine irritability,
changes in fetal heart tones.

In the supine position, vena cava compression can decrease cardiac output by _____% because of decreased venous return.

30%

The uterus should be displaced manually to the _____ side to relieve pressure on the inferior vena cava.

left

If a pregnant patient requires immobilization in a supine position, the patient or spine board can be log rolled _____ degrees to the _____.

15 degrees; left

Indicators that suggest the presence of intimate partner violence include:

Injuries inconsistent with the stated history;
diminished self-image, depression, or suicide attempts;
self-abuse;
frequent ED or office visits;
symptoms suggestive of substance abuse;
self-blame for injuries; and
the partner's insistence on being present for the interview.

Chapter 14: Initial Assessment: Secondary Survey

While the primary survey identifies immediately life-threatening injuries, the _____ ensures that all other injuries are identified.

secondary survey

The secondary survey starts when the _____ survey is completed and the patient is _____ stable or improved.

primary; hemodynamically

What information is in an "AMPLE" patient history?

A = Allergies
M = Medications
P = PMH/Pregnancy
L = Last meal
E = Events/Environment of injury

When is this done?

During the secondary survey.

Injuries may evolve over time, such as: _____.

compartment syndrome, pulmonary contusions, hemothoraces, and pneumothoraces.

As such, the need for _____ cannot be overemphasized.

repeated reassessments

Of paramount importance, _____ are reassessed frequently. Changes may indicate alterations that require immediate intervention.

vital signs

In hemodynamically normal patients with tourniquets, assess the tourniquet's effectiveness and consider conversion to _____ if the timing and situation are appropriate.

Hemostatic or pressure dressings

Provide _____, _____, and _____ as required.

tetanus immunizations, antibiotics, and analgesia

What things are you looking for when you perform a digital rectal exam (DRE) in a trauma patient?

blood
tears
high-riding, non-palpable, or mobile prostate (in males)
sphincter tone

You should assume that any patient with multisystem trauma and altered level of consciousness, or blunt injury above the clavicle, has what type of injury?

Cervical spine injury.

How can you clear the C-spine without imaging?

The C-spine can be cleared clinically if the patient:
is awake, alert, and sober;
has no distracting injuries;
has no neurological deficits referable to the cervical spine; has no midline neck pain or tenderness on palpation; and
can actively flex, extend, and laterally rotate head to both sides without pain.

Otherwise, when would C-spine films be obtained?

During the secondary survey.

When should MOST images be obtained?

During the secondary survey.

What imaging is done during the primary survey?

CXR and pelvis films (both AP views), and FAST scan.

What should you do for every female patient of childbearing age?

Pregnancy test.

What possible injuries would you suspect with a frontal impact automobile collision?
head trauma
whiplash

cervical spine fracture
anterior flail chest
myocardial contusion
pulmonary contusion
pneumothorax
hemothorax
traumatic aortic disruption
fractured spleen and liver
fracture of hip and knee
posterior dislocation of hip and knee

Chapter 15 Transfer to Definitive Care

The patient's _____ should be reviewed before deciding to transfer.
expressed goals of care

Patients whose injuries _____ an institution's capabilities for definitive care should be identified and transferred early.
exceed

The _____ course is designed to train clinicians to be proficient in assessing, stabilizing, and preparing trauma patients for definitive care.
ATLS

Patient outcome is directly related to the _____ elapsed between injury and properly delivered definitive care.
time

_____ studies that delay transfer should not be obtained.
Diagnostic

The referring doctor and receiving doctor should communicate _____.
directly (not through intermediaries)

Communication should be clear, concise, and comprehensive. To this end, a standardized communication tool, such as _____, is recommended.
SBAR (Situation, Background, Assessment, Recommendations)

Under Situation, cover:
- referring clinician and facility
- name, age, gender, etc. of patient
- mechanism of injury
- indication for transfer
- xABCDE:
  - x - emergency hemorrhage interventions
  - Airway: assessment, intervention
  - Breathing: assessment, intervention
  - Circulation: assessment, intervention
  - Disability: assessment, intervention
  - Environment/Exposure: assessment, intervention

Under Background, cover:
- AMPLE history
- fluids/blood administered
- medications (date and time)
- images
- treatments (e.g. chest tubes, fracture reduction/splinting)

Under Assessment, cover:
response to interventions
current status

Under Recommendations, cover:
expected care needs enroute
preferred mode of transport
care capabilities during transport

Transfer personnel should be _____ to administer the required patient care en route.
adequately skilled

When an aircraft ascends, air pressure _____, even in a pressurized cabin.
decreases

Therefore, a pneumothorax will tend to _____, unless a _____ has been placed.
expand; chest tube

Clinical judgment is used to determine if it is safe for a patient with a small pneumothorax to be transported by air without a _____ in place.
chest tube

SECTION II: TRAUMA SYSTEMS and PATIENT-CENTERED CARE

Chapter 16: Trauma Systems

The key benefits to implementing a trauma system are:
Rapid access to prehospital care
Specialized treatment at designated trauma centers
Coordination of care across different clinicians, ensuring appropriate treatment and follow-up
Improvement of outcomes
Overall healthcare cost reduction

Chapter 17: Triage and Disaster Management

A _____ is a situation that generates multiple injured patients who stretch, but do not overwhelm, patient care resources.
mass casualty event (MCE)

A _____ generates a large number of casualties with needs that exceed available healthcare resources.
mass casualty incident (MCI)

A _____ is a situation that disrupts the capabilities of the normal health care system while also generating a large of number of casualties (e.g. a healthcare facility is destroyed).
mass event incident (MEI)

In an MCI or MEI, the focus must shift from _____ to _____.
"greatest good for the individual injured patient;"
"greatest good for the casualty population"

In the initial prehospital and inhospital evaluations, the only triage decisions to be made are the determination of who among the living needs _____ care, and who does not.
immediate

The _____ provides the framework for initial casualty assessment and intervention at the scene and beyond.
primary survey

Secondary survey activities and definitive care are _____ until all critically injured, salvageable casualties are _____.
deferred; stabilized

What are the five mass casualty triage categories?
Immediate (Red)

Delayed (Yellow)
Minimal (Green)
Expectant (Various colors)
Dead (Black)

The “expectant” category is for those who are _____.
alive but expected to die even with treatment

The principle of doing the greatest good for the greatest number necessitates _____ care to individuals in the _____ category.
denying; “expectant”

Chapter 18: Injury Prevention

The “Three Es” of injury prevention interventions are:
Environment/Engineering
Education
Enforcement

A planning tool that deconstructs the injury event into “human,” “agent” (e.g. vehicle), and “environmental” factors along temporal opportunities for intervention (“pre-event,” “event,” and “postevent”) is _____.
Haddon’s Matrix

Chapter 19: Trauma-Informed Care and Social Determinants of Health

Trauma-informed care (also called _____ care) recognizes that patients may present having experienced _____ trauma in their lives (be it physical, emotional, psychological, spiritual, or social).
humanistic, past

The trauma-informed care (TIC) principles promote _____ as opposed to inadvertent retraumatization.
healing

TIC also recognizes that _____ can experience secondary and vicarious trauma from witnessing suffering.
clinicians

Trauma-informed communication demonstrates compassion and empathy for patients, families, and colleagues while avoiding preconceived _____ and inappropriate comments.
judgments

Consistent with TIC, the patient is _____ prior to performing each step of the examination.

informed

Clothing is removed, while protecting _____.
dignity

What are the five domains of the social determinants of health?
Built environment
Economic stability
Education (access and quality)
Healthcare (access and quality)
Social and community context

Chapter 20: Communicating Serious News in the Acute Trauma Setting

When speaking to patients or families about serious news, it is important to be _____: have a _____ message, make sure the _____ is suitable, and make sure all the appropriate _____ are present. During the meeting, do as much _____ as talking. Afterwards, _____ with the team.
prepared; clear; environment; team members; listening; debrief

A suggested "ABCDE" approach to communicating serious news is:
Ask what the family has been told.
Begin with the warning.
Concise summary.
Do allow for silence. Don't speak too much. Listen!
Enourage and validate Emotions. Elicit questions. End Encounter with a plan for next steps.

Concerning pregnancy, you should generally avoid the following terms:
"products of conception," "embryo," "fetus"

Clinicians should be mindful that prognosis is rarely determined by _____ alone and should avoid allowing _____ to influence their clinical decisions
age; ageism

SECTION III: SPECIFIC INJURIES and INJURY PATTERNS – SPECIAL CONSIDERATIONS

Chapter 21: Thoracic, Abdominopelvic, and Genitourinary Trauma

Thoracic Trauma

A patient arrives in the trauma bay intubated and there are absent breath sounds over the left hemithorax. Where should you place your decompression needle?

Trick question. This may not be a pneumothorax. For relatively stable intubated patients always suspect a right main stem bronchus intubation before attempting needle decompression.

Where would you insert a large caliber needle to decompress a tension pnuemothorax?

Through the 2nd intercostal space in the midclavicular line of the affected hemithorax.

For an open pneumothorax (sucking chest wound), air passes preferentially through the chest wall defect (path of least resistance) if the diameter of the defect is at least _____ the diameter of the trachea.

2/3

Flail chest results from multiple rib fractures. By definition, this would be _____ or more ribs, fractured in _____ or more places.

2 or more ribs with each fractured in 2 or more places

Flail chest is invariably accompanied by _____ which can interfere with blood oxygenation.

pulmonary contusion (Note: do not volume-overload these patients.)

Both tension pneumothorax and massive hemothorax are associated with decreased breath sounds on auscultation. You can tell which it is by _____.

percussion (hyperresonant with pnuemothorax; dull with hemothorax)

What is the definition of a "massive hemothorax"?

≥ 1500 mL or ≥ 1/3 of the patient's total blood volume in the pleural space. Some also define it as continued blood loss ≥ 200 mL/hr for at least 4 hours.

If a patient doesn't have JVD, does this mean a tension pneumothorax or pericardial tamponade is not present?

No, the patient may be hypovolemic.

What size chest tube might you use to evacuate a massive hemothorax?

38 French

Where would you insert it?

4th or 5th intercostal space, just anterior to the midaxillary line. The tube should travel just superior to the rib and be directed inferiorly (superiorly if treating a pneumothorax).

What is Kussmaul's sign?

A rise in venous pressure with inspiration while breathing spontaneously. It is a true paradoxical venous pressure abnormality associated with cardiac tamponade.

Size of needle for pericardiocentesis?

18 gauge (spinal needle)

How well do CPR compressions work on someone with a penetrating chest injury and hypovolemia?

"Closed heart massage" for cardiac arrest is ineffective in patients with hypovolemia. Patients with PENETRATING thoracic injuries who arrive pulseless but with myocardial electrial activity (PEA), may be candidates for a thoracotomy in the ED.

Are all patients with PEA who have sustained a thoracic injury candidates for an ED thoracotomy?

No, only those with PEA and PENETRATING thoracic injuries are candidates for an ED thoracotomy.

An ED thoracotomy can allow you to do what?

Evacuate pericardial blood,
cardiac massage,
directly control hemorrhage,
cross-clamp the descending aorta to slow blood loss below the diaphragm and increase perfusion to the heart and brain.

For a patient with a traumatic simple pneumothorax, what should you do BEFORE you start positive pressure ventilation or take them for surgery?

Insert a chest tube - positive pressure ventilation can turn a simple pneumothorax into a tension pneumothorax, so insert a chest tube first.

Should you evacuate a simple hemothorax if it is not causing any respiratory problems?

Yes, a simple hemothorax, if not evacuated, may result in a retained clotted hemothorax with lung entrapment, or possibly develop into an empyema.

A pneumothorax associated with a persistent large air leak after tube thoracostomy suggests a _____ injury.

tracheobronchial (use bronchoscopy to confirm)

A history of rapid-deceleration should alert the clinician to the potential of _____.

blunt aortic injury (BAI)

What radiographic findings are suggestive of BAI?

Widened mediastinum,
obliteration of aortic knob,
abnormal aortic arch contour,

left “apical cap” (opacity at apex of left lung representing blood),
deviation of trachea to the right,
depression of left mainstem bronchus, deviation of esophagus (NG tube) to right, widened left paratracheal stripe,
fracture of 1st or 2nd ribs,
fracture of scapula.

Does a normal chest radiograph exclude BAI?

No

Treatment of Grade I and many Grade II BAI injuries is blood pressure control, maintaining systolic blood pressure below _____ and pulse rate below _____. The initial medication of choice is a titratable short-acting _____.

100 mm Hg; 100 beats per minute; beta blocker (such as esmolol)

A deceleration injury victim with a left pnuemothorax or hemothorax, without rib fractures, and in pain or shock out of proportion to the apparent injury, and has particulate matter in the chest tube, may have _____.

an esophageal rupture - a forceful blow causes expulsion of gastric contents into the esophagus, producing a linear tear in the lower esophagus allowing leakage into the mediastinum

Fractures of the lower ribs (10-12) should increase suspicion for _____ injury.

hepatosplenic

Why are upper torso, facial, and arm plethora with petechiae associated with crush injuries to the chest?

Temporary compression of the superior vena cava

Describe a systematic way to review a chest radiograph?

Trachea and bronchi, pleural spaces and parenchyma, mediastinum, diaphragm, bones, soft tissues, tubes and lines.

What types of penetrating chest wounds should alert the practitioner to the possible need for thoracotomy?

Penetrating anterior chest wounds medial to the nipple line, and posterior wounds medial to the scapula, because of potential damage to the great vessels, hilar structures, and the heart, with the associated potential for cardiac tamponade.

Penetrating injuries that occur within the “_____” should cause concern for cardiac and great vessel injury.

cardiac box (this is the same question, but asked in a different way)

How would you perform pericardiocentesis?

Obtain a 6 inch, 18 gauge needle. Puncture the skin 1-2 cm inferior to the left xiphohondral junction at a 45 degree angle to the skin and aim towards the top of the left scapula.

What is a good way to know if you've advanced your needle too far during pericardiocentesis and have entered ventricular muscle?

ECG Changes - extreme ST-changes, widened QRS, PVCs, etc. Withdraw needle until ECG returns to baseline

What should you do with your needle after you successfully evacuate blood during pericardiocentesis?

If possible, use the Seldinger technique to insert a 14 gauge flexible catheter. Close the stopcock and leave the catheter in place in case re-evacuation is needed. This is not a definitive treatment.

Abdominopelvic Trauma

Early consultation with a _____ is necessary whenever a patient with possible intraabdominal injuries is brought to the ED.

surgeon

What are the indications for prompt laparotomy?

Free air, retroperitoneal air, or rupture of the hemidiaphragm
Peritonitis
Penetrating abdominal wound with hypotension
Blunt abdominal trauma with hypotension and a positive FAST or clinical evidence of intraperitoneal bleeding
Positive DPL
Gunshot wound traversing the peritoneal cavity or visceral/vascular retroperitoneum
Evisceration
Bleeding from the stomach, rectum, or genitourinary tract from penetrating trauma
Contrast-enhanced CT that demonstrates ruptured gastrointestinal tract, intraperitoneal bladder injury, renal pedicle injury, or severe visceral parenchymal injury

What does FAST stand for?

Focused Assessment with Sonography in Trauma

FAST has a sensitivity, specificity, and accuracy in detecting intraabdominal fluid comparable to _____.

diagnostic peritoneal lavage (DPL)

What are the advantages of FAST?

Rapid, noninvasive, accurate, and inexpensive means of detecting intraabdominal fluid that can be repeated frequently.

What are the four places you should look first when doing a FAST scan?

Mediastinum, hepatorenal fossa, splenorenal fossa, pouch of Douglas.

Name two anatomical challenges that can interfere with doing a FAST scan?

Obesity and bowel gas (since fat and gas attenuate sound waves).

What do you need to do BEFORE you do a DPL (other than getting instruments and materials together, etc.)?

Decompress the bladder and decompress the stomach.

For patients with facial fractures or basilar skull fractures, gastric tubes should be inserted _____ before doing a DPL.

orally

What is "adequate" fluid return when getting DPL fluid back?

30%

DPL is considered to be _____% sensitive for detecting intraperitoneal bleeding.

98%

What is the only ABSOLUTE contraindication to DPL?

An existing indication for laparotomy.

What are some RELATIVE contraindications to DPL?

Morbid obesity, advanced cirrhosis, pre-existing coagulopathy, and previous abdominal operations (possible adhesions).

When should you use an open supraumbilical approach for a DPL?

Pelvic fractures (don't want to enter a pelvic hematoma) and advanced pregnancy (don't want to damage uterus or fetus).

When performing a DPL, what INITIAL findings (not from lab) would mandate a laparotomy?

Free blood (>10 mL) or GI contents (vegetable fiber, bile, feces, etc.).

If you don't get gross blood upon initial DPL aspiration, what do you do next for an adult? For a child?

Adult: 1,000 mL warm isotonic crystalloid intraperitoneally.
Child: 10 mL/kg warm isotonic crystalloid intraperitoneally.

What parameters would make a DPL positive?

> 100,000 red blood cells/mm^3,
500 white cells/mm^3, or
bacteria on Gram stain.

Your trauma patient needs an emergent laparotomy, can you take them to the CT scanner first to evaluate injuries?

No, if they need an emergent laparotomy, they are unstable. Unstable patients should go to the OR, not the CT scanner.

CT should only be performed in _____ patients in whom there is no existing indication for an _____.

hemodynamically stable; emergency laparotomy
CT scan is not performed if it delays transfer of a patient.

This is because CT is a _____ procedure.
time-consuming

CT is not performed if it delays _____ of a patient.
transfer

List three methods of hemorrhage control.
Pelvic stabilization, laparotomy, angiographic embolization.

What percentage of stab wounds to the anterior abdomen do not penetrate the peritoneum?
25-33%

Do you need to operate on everyone with an isolated solid organ injury?
No, not if they remain hemodynamically stable (of all patients who are initially thought to have an isolated solid organ injury, <5% will have hollow viscus injury as well).

Does an early, normal serum amylase level exclude major pancreatic trauma?
No.

The major potentially reversible factor contributing to mortality following pelvic fracture is _____.
hemorrhage

Hypotension, a negative FAST, and a pelvic fracture on anteroposterior (AP) x-ray is indicative of _____.
major pelvic hemorrhage

In such a case, a sheet or pelvic binder should be positioned circumferentially around the pelvis at the level of the _____.
greater trochanters (NOT over the iliac crests)

Genitourinary Trauma

You need to do retrograde urethrography PRIOR to foley placement if there is _____.
inability to void,
unstable pelvic fracture,
blood at urethral meatus,
scrotal hematoma,
perineal ecchymoses, or
high-riding or mobile prostate.

Chapter 22: Penetrating Trauma

Concerning penetrating trauma, the leading cause of preventable death is _____.
hemorrhage
_____ is vital to ensure that all wounds are identified.
Complete exposure

Carefully inspect areas that can hide small injuries, like the _____.
scalp, perineum, and all skin folds

Generally, the number of bullet wounds plus bullets identified on imaging should equal an _____ number.
even

This rule may not apply to patients who have been injured by bullets _____.
in the past

Mark injuries with radioopaque markers before _____.
imaging

Bullets identified on imaging remote from where they entered the body may have _____ through vascular channels or have travelled within the _____.
embolized; gastrointestinal tract

Blindly probing wounds should be _____ because doing so provides little helpful information and may _____ bleeding and further _____ the wound.
avoided; exacerbate; contaminate

The ideal place for removal of impaled objects is the _____.
operating room (i.e. a surgeon should do this)

This is because impaled objects may be _____ bleeding or be firmly lodged in place.
tamponading

Bleeding from head wounds may be stopped with _____, _____, or _____.
compression (wound pressure); oversewing; staples

Chest wounds that may involve infradiaphragmatic injury as well are located:
below the nipples anteriorly or the scapula angle posteriorly

Penetrating injuries that occur within the "_____" should cause concern for cardiac and great vessel injury.
cardiac box

Concerning GSWs, you should have a high index of suspicion for cardiac injury in patients with bullet wounds that are within the "_____."

expanded cardiac box.

Indications for exploratory laparotomy include:
Hemodynamic instability
Peritonitis
Bleeding from rectum
Aspiration of blood via nasogastric tube or hematemesis
Hematuria
Evisceration of bowel
Impalement
Positive FAST
Positive DPL
Free air on imaging

If a patient has any of these and is in shock, immediate _____ to achieve hemostasis prior to _____ should be considered if surgical capabilities permit.
surgery; transfer

An Assessment of Blood Consumption (ABC) score ≥ _____ indicates that initiation of massive transfusion protocol is probably necessary.
2

Massive transfusion protocols (MTPs) are generally activated after transfusion of 4-10 units PRBCs. MTPs usually have a predefined ratio of PRBCs, FFP/cryoprecipitate, and platelets of _____.
1:1:1 units

When the _____ is completed and the patient is _____ normal, any tourniquets should be assessed for conversion to _____ dressings.
primary survey; hemodynamically; hemostatic or pressure

Chapter 23: Ocular Trauma

Chemical burns require _____ and _____ irrigation.
immediate; copious

Ideally, normal saline or lactated Ringer's connected to a _____ lens is used.
Morgan

The patient's head should be _____ so the fluid runs out toward the ipsilateral temple and not into the other _____.
tilted; eye

_____ solutions are usually more damaging to the eye and often require more flushing to normalize the pH to _____.
Alkaline; 7.0

Powders consist of small granules that can readily get stuck in the eye's superior and inferior fornices. This situation may require inverting the _____ and directly flushing the _____.
eyelids; fornices

After each _____ of solution or about every 30 minutes, stop the fluid, wait 5 to 10 minutes, and check the pH of the _____.
liter; tears

In any case, continue irrigating at least until the _____ arrives.
ophthalmologist

Perform the complete ocular exam during the _____ survey.
secondary, i.e. after stabilizing life- and limb-threatening injuries.

Orbital compartment syndrome (OCS) is an emergent condition that occurs when intraorbital pressure exceeds _____ pressure, causing compression and ischemic compromise to the _____ and _____.
ophthalmic artery; retina; optic nerve

OCS may present with:
orbital bruising
subconjunctival hemorrhage
proptosis
decreased vision
poorly reactive pupil
relative afferent pupillary defect (RAPD)
limited extraocular movements
firmness to palpation through the eyelids
elevated intraocular pressure

Orbital compartment syndrome may cause vision loss in as little as _____ minutes. This can be prevented by relieving _____ by performing lateral _____ and _____.

90; pressure; canthotomy; cantholysis

If you suspect OCS, do _____ delay treatment with canthotomy and cantholysis by obtaining a CT scan for further proof of hemorrhage.

not

After canthotomy and cantholysis, healing of the incisions is often spontaneous without further _____ necessary.

surgical repair

In a patient with an abnormally shaped eye, a peaked pupil, shallow anterior chamber, corneal or scleral laceration, pigmented tissue pushing through the sclera or cornea, positive Seidel test or a foreign body in or protruding from the eye, you should suspect _____.

an open or ruptured globe

Initial management until surgery consists of:
Covering the affected eye with a rigid shield or disposable cup, ensuring that no dressing, gauze, or other soft material contacts the eye; and _____.

providing IV antibiotic (drug of choice is a fluoroquinolone)

A trauma patient has difficulty with upward eye movement and in attempting it he becomes nauseated. A likely reason for this is:

An orbital floor fracture entrapping the rectus inferior muscle.

Repair of this should occur within _____ hours of onset to avoid muscle _____ and permanent damage.

48; ischemia

For lid lacerations, _____ is the top priority.

excluding an open globe

If there is a tear near the punctum or through the canalicular duct, repair by _____ subspecialist is often required within _____ to prevent chronic _____.

an oculoplastic; 72 hours; tearing

Chapter 24: Injury in Combat Zones and Austere Environments

The OE in ATLS-OE stands for _____.

Operational Environment

ATLS-OE provides an expanded construct for assessment and resuscitation of the trauma patient in the _____ setting.

military

ATLS-OE is a course of instruction that emphasizes the importance of maintaining _____ awareness while providing care in a potentially hostile, resource-constrained, and manpower-limited environment.

situational

In an active shooter event, the most important initial step is _____ by e.g. law enforcement, appropriate military personnel. However, the immediate priorities of rapid extremity hemorrhage control by first responders and expeditious transport of those with potentially _____ internal hemorrhage must be mitigated.

threat suppression; noncompressible

Care Under Fire is the care rendered by fellow soldiers ("buddy aid") or the unit medic or corpsman at the scene of the injury while both the immediate responder and the casualty are still under _____.

hostile fire

In the Care Under Fire stage, the standard of care is _____.

the immediate arrest of exsanguinating hemorrhage with a tourniquet or pressure/hemostatic dressing

Because it is frequently difficult to ascertain the exact location of bleeding on an extremity during Care Under Fire, a tourniquet should be placed _____.

"high and tight" at the shoulder or groin

During later phases of care, these hastily placed tourniquets must be assessed for replacement in a location _____ inches above the wound or conversion to a _____,

2–3; pressure dressing

The Stop the Bleed® campaign empowers the _____ to act.

lay responder