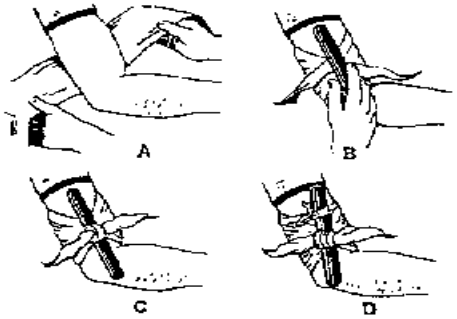
CARDIOVASCULAR

1.A. External hemorrhage is loss of blood to the outside of the body. External hemorrhage is nearly always stopped or slowed when pressure is applied directly to the wound. This should be done with a sterile dressing. If sterile pads are not immediately available, a handkerchief, sanitary napkin, clean cloth or even a bare hand may be used. Frequently hemorrhage; especially the venous type can be lessened by raising the wounded limb to a height above the heart. Elevation may be used before, during, or after application of a pressure dressing, depending mainly on the type and severity of the wound. Serious hemorrhage, especially the arterial type may require simultaneous and continuous compression of the wound. If there is a broken bone in the wounded limb, elevation must be postponed until after the limb is splinted.
Reference: Medical Readiness Training Handbook – p 6-2.

2.D. The purpose of a tourniquet is to stop life threatening hemorrhage. The use of a tourniquet is rarely necessary, and it is not recommended for use as an initial effort to control bleeding. Good technique in the use of pressure dressings, pressure points, and elevation of limbs where possible will assure minimum necessity for use of tourniquets.



Reference: Medical Readiness Training Handbook – p 6-3.

3.B. Current resuscitation strategies for hypovolemia due to severe blood loss typically include the immediate restoration of blood pressure through the use of intravenous fluids. However, results from recent animal studies suggest that rapid, high volume replacement during resuscitation often exacerbates bleeding and may result in increased mortality compared to either low volume or delayed fluid replacement. Clinical trial findings indicate that survival is not worsened, and may be improved, by limiting the initial fluid resuscitation, either by delaying the initiation or by titrating to a low systolic blood pressure, so called permissive hypotensive resuscitation techniques. This term reflects a new trend to keep the blood pressure at a level that prevents any fresh clot from being dislodged, resulting in rebleeding. In large animal "uncontrolled hemorrhage" models, the clot is "popped" at approximately systolic 80/- (*equivalent to a MAP of 60 mm Hg*). This extremely reproducible level of hypotension is identical to the observations made in patients with penetrating or blunt trauma. Thus, both animal researchers and trauma personnel have adopted the term "pop a clot," to be that phenomena which occurs with aggressive resuscitation. "Pop a clot" occurs at a blood pressure of systolic 80/-. An increasingly accepted view holds that

moderate hypotension (systolic blood pressure of *85 to90* mmHg) is sufficient to maintain vital organ perfusion and avoids a hypertensive overshoot with the risk of precipitating further hemorrhage. The concept is still new in the care of the injured and further trials on optimal fluids; levels of permissive hypotension and the effects of delay before surgery are needed before it can be safely assimilated. *The most important message to retain is that the best treatment for ongoing hemorrhage is to turn off the tap and not to continue infusion of fluids, including blood products.*

Ongoing volume replacement is guided by urinary output. Initially 0.5cc/kg/hr is an adequate objective of resuscitation for an adult. This figure should be doubled in cases of crush injury.

The following chart outlines the classes of shock, their presenting signs and symptoms, and the guidelines for resuscitation. These are guidelines only. The amount of blood lost is estimate only as a starting point for resuscitation. Clinical parameters must guide the response to therapy.

Estimated Fluid and Blood Requirements in Shock
(Based on Patient's Initial Presentation)

	Class I	Class II	Class III	Class IV
Blood Loss (ml)	up to 750	750-1500	1500-2000	2000 or more
Blood Loss (%BV)	up to 15%	15-30%	30-40%	40% or more
Pulse Rate	100	100	120	140 or higher
Blood Pressure	**Normal**	**Normal**	**Decreased**	**Decreased**
Pulse Pressure (mm Hg)	Normal or increased	Decreased	Decreased	Decreased
Capillary Blanch Test	Normal	Positive	Positive	Positive
Respiratory Rate	14-20	20-30	30-40	> 3.5
Urine Output (Ml/hr)	30 or more	20-30	5-15	Negligible
CNS-Mental Status	Slightly anxious	Mildly anxious	Anxious & confused	Confused-lethargic
Fluid Replacement (3:1 Rule)	Crystalloid	Crystalloid	Crystalloid & blood	Crystalloid & blood

Reference: Mattox, K. Permissive hypotension,
http://www.trauma.org/resus/permhypoeditorial.html;
http://www.vnh.org/EWSurg/ch09/09ReplacementTherapy.html;
http://www.vnh.org/EWSurg/ch09/09ReplacementTherapy.html

4.D. Prior to the administration of blood or colloid solutions, an isotonic crystalloid solution should be administered. Ringer's lactate is the solution of choice and normal saline is the second choice. RL is the most nearly physiologic solution available for infusion of large volumes. Type specific cross-matched blood is indicated in Class III

and Class IV hemorrhage. In life-threatening situations, type specific blood can be given without proper cross match. If type specific blood is not available, then type O blood is used. (O- is considered the universal donor although O+ can be given to males).
Reference: Medical Readiness Training Handbook – p 6B-5.
Reference: http://wwwsam.brooks.af.mil/web/an/fondocs/shockr1.pdf

5.C. Shock can be generally divided into three types: hypovolemic (decrease in circulating blood volume), cardiogenic (impaired ability of the heart to pump blood), and vasogenic or distributive (vasodilation due to neurological or hormonal stimuli). Given this patient's history, the most likely cause is hypovolemic shock due to blood loss.

Types of Shock	
Cardiogenic Shock	Impaired ability of the heart to pump blood due to ineffective cardiac contractility (e.g., myocardial infarction, myocardial contusion), alterations in rate or rhythm.
Neurogenic Shock	A type of distributive shock due to a reduction in vasomotor tone. Causes include spinal anesthesia, spinal cord injury, altered function of the vasomotor center due to hypoglycemia, or drugs (sedatives, barbiturates, narcotics).
Hypovolemic Shock	The most common shock syndrome to affect a trauma patient. Hypovolemic shock may be due to a loss of whole blood (hemorrhage) or a loss of vascular integrity with leakage of plasma and protein into the interstitial space (burn).
Anaphylactic Shock	A type of distributive shock – result of a severe allergic reaction. This reaction leads to vasodilation, increased capillary permeability, and bronchoconstriction.
Obstructive Shock	Cardiac tamponade, tension pneumothorax/hemothorax, air embolism (pulmonary): leads to shock due to an obstruction or compression of the great veins, aorta, pulmonary arteries, or the heart.
Septic Shock	A type of distributive shock – characterized as a high output low resistant state causing microcirculatory shunting with impaired oxygen utilization. The end-stage of septic shock manifests as a combination of cardiogenic shock and Hypovolemic shock.

Reference: TNCC Manual (1995) pp 79-97

6.C. Once a tourniquet has been applied, it should not be loosened or reapplied until the casualty has reached professional medical care.
Reference: Medical Readiness Training Handbook – p 6-4

7.D. The modified Trendelenburg position may be advantageous if spinal cord or head injury is not suspected. In this position, the patient remains supine with the legs elevated. The elevation assists venous return to the right atrium, but abdominal viscera remain in their normal position. As the patient's blood pressure is stabilized, the legs may be lowered gradually while monitoring the blood pressure for changes. Note: This is **not** Trendelenburg (head down) position. The increased blood pressure observed in Trendelenburg is not associated with increased blood flow or tissue oxygenation.
Reference: TNCC

8.C. This individual is manifesting the signs and symptoms of anaphylactic shock. Anaphylactic shock is systemic anaphylaxis (allergic reaction) that produces life-threatening cardiopulmonary effects. Anaphylaxis usually begins within 30 minutes after exposure to a causative factor, although the onset may be delayed. Once the reaction begins, it is explosive. It begins with generalized allergic symptoms (generalized itching or burning, sneezing and coughing, and watering or itching eyes). Symptoms progress to apprehension and flushing (especially around the face), tightness in chest or difficultly breathing, wheezing or SOB, a rapid weak pulse, low blood pressure, and shock. If the patient has progressive or severe symptoms, such as diffuse hives, wheezing, airway obstruction, hypotension (SBP < 90 mm Hg) or shock, begin emergent treatment.

- Assess
- Place in recumbent position if tolerated.
- Place tourniquet above injection/sting site – release tourniquet every 2 minutes
- Establish airway and administer supplemental oxygen
- Epinephrine (1:1000) 0.01 ml/kg (max 0.3 to 0.5 cc) SC q 20 minutes X 3
- Monitor VS, maintain airway, establish IV, cardiac monitor
- Dopamine for BP maintenance
- Other:
    - Benadryl 1.25 mg/kg max (50 mg IV). This is not a substitute for Epi.

Note: Some patients will resolve their anaphylaxis only to have it recur 8 to 24 hours later. These patients require 12 to 14 hours of observation.
Reference: Virtual Naval Hospital: General Medical Officer (GMO) Manual: Clinical Section: Allergy; http://www.vnh.org/GMO/ClinicalSection/01Anaphaxis.html

9.A. Epinephrine (1:1000) - 0.1 to 0.5 ml. See Question #10

Reference: Virtual Naval Hospital: General Medical Officer (GMO) Manual: Clinical Section: Allergy; http://www.vnh.org/GMO/ClinicalSection/01Anaphaxis.html

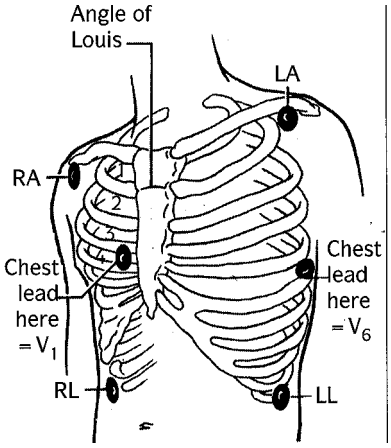
10A. There are several equations to calculate drip rate. An example:

$$\text{Drops/min} = \frac{\text{Total volume infused (ml) X drops/ml}}{\text{Total time for infusion (minutes)}}$$

$$\text{Drops/min.} = \frac{1000 \text{ X } 15 \text{ gtt/ml}}{} = \frac{15{,}000}{} = \textbf{•32 gtt/min}$$

8 X 60 (480) 480

11.A. To perform a 12-lead ECG simply move the V-lead to each of the six chest-lead positions and run and individual strip. To run the augmented leads, change the lead selection dial to record AVR, AVL, and AVF.



12.A. Exact lead placement is extremely important when performing a diagnostic ECG.
V1 = 4th ICS at right sternal border
V2 = 4th ICS at left sternal border
V3 = Halfway between V2 and V4 in a straight line
V4 = 5th ICS at midclavicular line
V5 = Same level as V4 at anterior axillary line
V6 = Same level as V4 at midaxillary line

13.D. As specified by basic life support, the initial action is to **check a pulse**. If the pulse is absent, begin CPR. The probable cause of this patient's collapse is heat stroke. However, the treatment of the hyperthermia is secondary to treatment of the cardiac arrest.
Reference:

14.C Most blood components are infused within two hours, although the time limit can extend up to four hours. If extended time periods are anticipated, the blood bank can divide the component into aliquots as needed.
Reference: Medical Wing Instruction 44-29 (16Oct02); Section 9.7.1.

15. D Cardiac or pericardial tamponade is a collection of blood in the pericardial sac. This life-threatening injury occurs most often with penetrating trauma, but can also occur with closed injury. As blood accumulates in the pericardial sac, it compresses the heart, inhibiting ventricular filling. Decreased filling leads to decreased stroke volume and cardiac output. Signs and symptoms include: Dyspnea, penetrating chest wound, cyanosis, Beck's Triad (distended neck veins – may be absent if shock is present; hypotension, muffled heart sounds), signs of shock.
TNCC

16.B. The ability to use of palpation of a pulse to estimate systolic blood pressure is imperative in the field as monitoring equipment may not be available.
If you can palpate a radial pulse the SBP is at least **80 mm Hg**
If you can palpate a brachial pulse the SBP is at least **70 mm Hg**
If you can palpate the carotid or femoral pulse the SBP is at least **60 mm Hg**

Maintenance of a MAP of at least 60 mm Hg is necessary to maintain perfusion to vital organs (brain, heart, kidneys); however in cases of uncontrolled hemorrhage where surgical repair is not immediately available, an excessive increase in BP (> 60 mm Hg) should be avoided.
Reference: Mattox, K. Permissive hypotension, http://www.trauma.org/resus/permhypoeditorial.html

17.C. The capillary refill test is performed by depressing the fingernail or tip of the finger. A normal response is refill of the capillary bed as manifested by the return of color within two seconds (long enough to say "capillary refill").

Humans have evolved two physiologic mechanisms to maintain core temperature during cold exposure: 1) reducing skin temperature, which reduces the differential between the skin temperature and the environment and slows heat loss and 2) increasing heat production by shivering.

When the body is exposed to cold, blood is diverted away from skin and extremities to the trunk by vasoconstriction. Consequently, a layer of relatively hypoperfused tissue is formed between the environment and the viscera. Deprived of the heat from the metabolically active core, this "shell" of tissue cools, thereby reducing the gradients for heat loss from the skin surface by radiation, conduction and evaporation. The diversion of blood away from the skin and extremities is caused by arteriolar and venous vasoconstriction mediated by both cutaneous and central temperature responsive reflexes. Direct cooling of the skin or the core causes generalized cutaneous vasoconstriction. Central and peripheral receptors act synergistically, so, the degree of vasoconstriction depends on both skin and core body temperature. The lower the core temperature, the more intense and generalized the vasoconstriction.

In this case, the prolonged capillary refill may reflect thermoregulatory vasoconstriction. Thus it is prolonged but inconclusive.

Reference: http://www.vnh.org/EWSurg/ch09/09InitialHospEval.html, http://www.vnh.org/MACWO/1.html#2

18.C. Based on the history of events leading up to the collapse (c/o left arm pain) and the patient's medical risk factors (2ppd smoker) the most likely cause of the collapse is cardiac dysrhythmia (sudden cardiac arrest). A possible head injury may complicate the therapy. If the airway has been managed, hypoxemia would be the result of impaired cardiac function, not the cause.
Reference: Lippincott Manual Chapter 35 Emergent Conditions
http://pco.ovid.com/lrppco/

19.C. Heat exhaustion occurs when the cardiac output is insufficient to meet the competing demands of thermoregulatory skin blood flow, skeletal muscle, and vital organs. Heat exhaustion is usually due to the combination of increased circulatory load due to thermoregulatory and muscular demand and reduced "effective" plasma volume and venous return due to vasodilation in skin and muscle and sweating-induced depletion of salt and water. Presenting signs/symptoms include thirst, syncope, profound physical fatigue, nausea, vomiting, symptomatic hyperventilation with acroparesthesia (numbness, tingling, prickling in extremities) and carpopedal spasm, dyspnea, muscle cramps, confusion, anxiety and agitation, mood change, orthostatic dizziness, ataxia, hyperthermia and frontal headache.
Treatment: Directed toward (1) reduction of excessive cardiovascular demand, rest and cooling and (2) water-electrolyte depletion: oral or parenteral volume resuscitation (NS 200 to 250 ml fluid boluses to restore circulatory function. Do not exceed 2L without lab evaluation). Heat exhausted patients DO NOT require active cooling measures: removal of heavy clothing and rest in a shaded and ventilated space provides adequate opportunity for spontaneous cooling. However, if available, cool water can be used to cool the skin.
NOTE: It may be difficult to differentiate heat exhaustion from heat stroke; therefore if there is a suspicion of heat stroke – active cooling measures should be initiated immediately.
Reference: Virtual Naval Hospital: Heat Illness;
http://www.vnh.org/HeatIllness/manageht.html

20.C. This patient's clinical presentation and history suggest pericardial tamponade (See Question # 15). Pulmonary trauma is ruled-out by the presence of bilateral breath sounds. Pericardiocentesis is an emergency procedure to relieve cardiac tamponade. The patient is placed at a 45° angle. A 16- or 18-gauge, 6-inch over the catheter needle is inserted into the pericardial space. Blood is aspirated during introduction of the needle until as much non-clotted pericardial blood is withdrawn as possible.
TNCC

RESPIRATORY

21.D. The optimal pulse oximetry probe placement is the Fingers or the Earlobe in most situations. However, with special probes, the bridge of the nose, or the forehead may be used, but the results are not always accurate.

Reference: RESPIRATORY CARE (Respir Care 1991;36:1406-1409)

22. D Oropharyngeal airways are used during resuscitation to prevent upper airway obstruction during bag-valve-mask ventilation or sometimes as a 'bite-block' in intubated patients who are heavily sedated or unconscious. They are contraindicated in conscious patients.

Insertion:

1. Select the correct size airway by measuring from the corner of the mouth to the ear lobe. Sizing is important to prevent obstruction due to the airway.
2. Insert with tip pointing up or from the side.
3. Once the end of the airway is past the base of the tongue, rotate the airway into place so that it holds the tongue away from the back of the throat.

Troubleshooting:

1. If airway obstruction due to the tongue is not relieved:
   a. Remove the airway and reinsert, making sure it extends past the base of the tongue and is not pressing the tongue into the airway.
   b. Recheck the size of the airway. An oropharyngeal airway that is too long will block the airway itself, while one that is too short will force the tongue over the airway.
2. If the patient gags or otherwise does not tolerate the airway, remove it immediately to avoid vomiting. Maintain the airway by positioning the head.

Reference: Modified from Blazer, C: *Quick reference to respiratory therapy equipment assembly and troubleshooting*, St. Louis, Mosby, 1994.

23. C When the endotracheal tube is properly in place in the trachea, and the cuff is properly inflated, air cannot pass by the vocal cords, therefore, the patient should not be able to speak. Immediately consult of an adequately trained provider about the patients' condition.
Reference: Textbook of ACLS. 1987, Chapter 3, pp. 27-39,
http://www.vnh.org/EWSurg/ch13/13SpecialConsiderations.html

24. D A chest radiograph is performed immediately after completion of the procedure to verify that there is no pneumothorax.
Reference: Lippincott Manual Chapter 10 *Respiratory Function and Therapy,* Procedure Guidelines 10-3: Assisting the Patient Undergoing Thoracentesis
http://pco.ovid.com/lrppco/

25. A **Checking for tube placement:** Once the endotracheal tube has been inserted between the vocal cords, inflate the cuff, remove the stylet, attach positive pressure ventilation source (BVM) to the endotracheal tube and check for bilateral breath sounds. Check for esophageal intubation by listening for gurgling over the epigastrium. If breath sounds are heard on one side, slowly withdraw the tube until bilateral breath sounds are present. Proper positioning is usually achieved with an endotracheal tube taped at the 21 cm mark at the teeth in females and 23 cm at the teeth in males. Don't forget to obtain a CXR to check for tube placement.
Reference: http://www.vnh.org/GMO/ClinicalSection/89AirwayManagement1.html

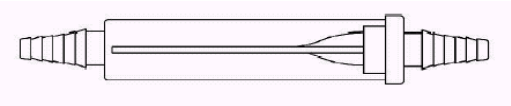
26. C Growing evidence suggests that **tracheal tube dislodgments** after a successful tracheal tube insertion may be occurring at much higher rates than previously suspected. Emphasis should be placed on securing the tube carefully with a tie or tape. With little evidence to directly support any specific commercial device, tracheal tube holders are a Class IIb recommendation. During long transport efforts in the out-of-hospital setting, restless intubated patients can be fitted with a cervical collar and immobilized with sandbags (or some other validated technique) to prevent accidental tube dislodgment. Care should be taken to have alternative ventilation equipment (bag/mask), and re-intubation equipment available during transport. The best technique, however, to prevent, detect, and correct tube dislodgment is the constant vigilance of care providers.
Reference: Textbook of Advance Cardiac Life Support; American Heart Association

27. C The full "H" oxygen tank carries a volume that reads 2200 psi on the tank gauge. O_2 cylinder appears empty, after initially being full (valve open, inter-valve area pressurized, gauge now reading full, then valve re-closed). With 200 psi reading on the tank gauge, the tank has approximately 11% of the oxygen left, and should be changed out for a new tank. See the O2 Cylinder and Gauge below.
Reference: Fundamentals of Respiratory Care; Egan

28. C The normal SpO2 is greater than 95%. The SpO2 may not be accurate if the patient has inconsistent blood flow, vasoconstriction or altered hemoglobin.
Pulse oximetry is considered a safe procedure, but because of device limitations, false-negative results for hypoxemia and/or false-positive results for normoxemia or hyperoxemia may lead to inappropriate treatment of the patient. Factors, agents, or situations that may affect readings, limit precision, or limit the performance or application of a pulse oximeter reading reliability include: low perfusion states, skin pigmentation, nail polish or nail coverings with finger probe, motion artifact, abnormal hemoglobin (primarily carboxyhemoglobin [COHb] and met-hemoglobin [metHb]), intravascular dyes, exposure of measuring probe to ambient light during measurement.
Reference: RESPIRATORY CARE (Respir Care 1991; 36:1406-1409); TNCC (5^{th} Cd. 47)

29. D Carbon monoxide (CO) is a colorless, odorless, tasteless, nonirritating gas produced from incomplete combustion of carbon-containing materials. CO has affinity of hemoglobin for CO is 200 times greater than for oxygen. The pulse oximeter senses hemoglobin saturation. In the presence of CO poisoning, the SaO2 is not initially a good indicator of oxygenation. Clinical signs and symptoms of CO poisoning should be assessed for: (1) A carboxyhemoglobin level of less than 10ppm is not a cause for alarm. (2) From 10 to 20 ppm bears watching and should be correlated with the spirometry results. (Smokers have been known to have carboxyhemoglobin levels of 15 to 18 ppm.), (3) Levels of 20 to 50 ppm can produce fatigue, irritability, cardiac dysrhythmias, ataxia, vomiting, syncope, possible coma, increased blood pressure, tinnitus, dystopia, ventricular dysrhythmias, severe alterations of consciousness, neurologic compromise, loss of consciousness, deep coma, hypertension, convulsions, paralysis, and areflexia. This is considered a severe to lethal exposure.

30. B Heimlich valve is a one-way valve that will prevent air from entering the chest. All patients in aero medical evacuation require a Heimlich valve on their chest tube.
In the event of a hemothorax the Heimlich valve must be monitored for potential valve occlusion.



Reference: AACN's Clinical reference for critical care nursing; Kinney, M.

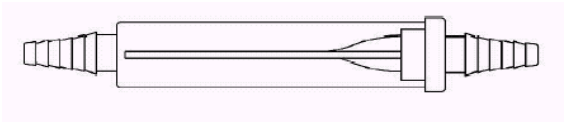
31. B **Tension pneumothorax:** Air under pressure in the pleural space. Decreased breath sounds, shifted heart sounds, dyspnea, trachea shift from midline, hyperresonance on percussion, distended neck veins, chest pain, and hypotension. Since a tension pneumothorax may produce cardiovascular collapse and cardiac arrest, emergency relief of pressure must be accomplished as soon as the clinical diagnosis is apparent. This may allow little of no time for x-ray film confirmation.

Treatment: Needle thoracostomy in the second intercostal space, mid-clavicular line, followed by a chest tube.

Reference: http://www.vnh.org/EWSurg/ch28/28Treatment.html

32. D In caring for the patient with chest tubes connected to underwater seal drainage, one golden rule should be observed: chest tubes should NEVER be clamped. The effects of tension pneumothorax from pressure build-up are far more damaging than the effects of an open pneumothorax from disconnection of the underwater seal. In the event of a bottle break or crack, the chest tube may be submerged in a bottle of sterile water until new equipment is available.

Heimlich valve is a one-way valve that will prevent air from entering the chest. All patients in aero medical evacuation require a Heimlich valve on their chest tube.



Reference: AACN's Clinical reference for critical care nursing; Kinney, M.

33.C. Intermittent or continuous bubbling in the water seal bottle or chamber indicates an air leak in the system. To assess for the location of the leak, **intermittently** occlude the chest tube or drainage tubing, beginning at the insertion site and progressing to the chest drainage unit. If the bubbling in the water-seal chamber stops when the chest tube is occluded at the dressing site, the air leak is inside the patient's chest or under the dressing; reinforce the dressing. If the bubbling stops when the drainage tubing is occluded along its length, the air leak is between the occlusion and the patient's chest; check to make sure all connections are airtight. If the bubbling does not stop with occlusion, replace the chest-drainage unit.
Reference: AACN Procedure Manual – p 139

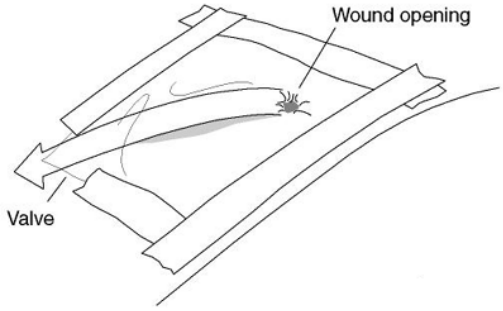
34.B. Research was conducted here at Wilford Hall Medical Center to answer this question.
Purpose: to determine the effect of different chest drainage tubing positions on the volume of fluid drained and pressure within the chest tubing. Three positions were evaluated: straight, coiled and dependent loop. In addition, the dependent loop was also evaluated with periodic lifting and draining.

- 500 ml NS infused into pleural space over 45 min.
- Measurements: amount of fluid drained over 1 hour; pressure at 2 locations within the drainage tubing; 8 subjects

Results: Significantly less fluid drained (P=.03) with Dependent Loop than other three.
Lift/Drain=250ml; Coiled=301ml; Straight=337ml (NS). Pressure at proximal site significantly higher (P=.003) with Dependent Loop with and without lift and drain.
Conclusion: Straight and coiled tube positions are optimal for draining fluid from the pleural space. If a dependent loop cannot be avoided, lifting and draining it every 15 minutes will maintain adequate drainage.
Military Relevance: Military nurses may care for patients with chest tubes in austere conditions (e.g., aero medical evacuation aircraft, field hospitals) where it may be difficult to maintain chest drainage tubing in the straight or coiled positions. In cases where a dependent loop is unavoidable, periodic lifting and draining the tubing will improve drainage.
Reference: Schmelz, J., Johnson, A.D., Norton, J., Andrews, M. & Gordon, P., American Journal of Critical Care, 1999, 8:319-323

35.D. Tidaling, or fluctuations in the water-seal chamber with each breath, indicates effective communication between the pleural space and drainage system and provides an indication of lung expansion. Fluctuations or tidaling will stop when the lung is re-expanded or when the tubing is obstructed by a kink, a fluid-filled loop, the patient lying on the tubing, or a clot or tissue at the distal end.
AACN Procedure Manual – p 139

36.D. A flutter dressing is recommended for an open chest wound to decrease the risk of developing a tension pneumothorax. A flutter valve, seals the chest wound by negative pressure during inspiration and is forced open by positive pressure during expiration. An occlusive dressing is firmly taped into place around the wound leaving one corner unsealed to act as the valve.



Reference: http://www.vnh.org/FirstAidAnatomy/ChestWound.html; TNCC (p 157)

37.D. In a tension pneumothorax, air leaks into the pleural space and has no means of escape. As air accumulates the pleural pressure increases leading to collapse of the lung. The collapsed lung and increased pleural pressure compresses the mediastinal structures (heart, great vessels, trachea) causing them to shift. Venous return, cardiac output, and pulmonary status are all impaired. Signs and symptoms of a pneumothorax include dyspnea, tachypnea, hyper resonance on the injured side, decreased or absent breath sounds on the injured side, and chest pain. A tension pneumothorax is further confirmed by worsening of the above symptoms, hypotension, distended neck veins, and tracheal deviation – shift toward the uninjured side. With a pulmonary contusion signs and symptoms include: dyspnea, ineffective cough, hemoptysis, hypoxia, chest pain and possible chest wall contusion or abrasion. Flail chest is defined as a fracture at two or more sites on two or more adjacent ribs or when rib fractures produce a free-floating sternum. Signs and symptoms of flail chest include dyspnea, chest wall pain, and paradoxical chest wall movement.

Reference: TNCC (p 155 – 158); http://info.med.yale.edu/intmed/cardio/imaging

38. C **Checking for tube placement:** Once the endotracheal tube has been inserted between the vocal cords, inflate the cuff, remove the stylet, attach positive pressure ventilation source (BVM) to the endotracheal tube and check for bilateral breath sounds. Check for esophageal intubation by listening for gurgling over the epigastrium. If breath sounds are heard on one side, slowly withdraw the tube until bilateral breath sounds are present. Proper positioning is usually achieved with an endotracheal tube taped at the 21 cm mark at the teeth in females and 23 cm at the teeth in males. Don't forget to obtain a CXR to check for tube placement.
Reference: http://www.vnh.org/GMO/ClinicalSection/89AirwayManagement1.html

39. B The oropharyngeal airway should be used only in the unconscious patient because it may stimulate vomiting and laryngospasm in the conscious or semi-conscious patient.
Reference: Textbook of Advance Cardiac Life Support; American Heart Association

40. A Endotracheal intubation (in this case orotracheal intubation) is indicated because the patient is unconscious, potential compromise of the airway due to facial trauma. Nasopharyngeal airways are indicated when the insertion of an oropharyngeal airway is technically difficult or impossible (because of trismus, massive trauma around the mouth, mandibulo-maxillary wiring, etc.) The nasopharyngeal airway is also of value in the semi-conscious patient who does not tolerate an oropharyngeal airway. Oralpharyngeal airways should be reserved for obtunded unconscious patients who are not intubation.
Crichothyroidectomy is only indicated if unable to intubate the trachea in light of maxillofacial trauma or neck injury.
Reference: Textbook of Advance Cardiac Life Support; American Heart Association; ATLS

41. D The most serious complication of suctioning is the sudden onset of severe hypoxemia secondary to a decrease in lung volume and interrupting ventilation. Therefore, it is optimal to hyperinflate, hyperventilate and hyper oxygenate immediately prior to suctioning.
Reference: Endotracheal Suctioning and Death; NY State Journal of Medicine; Marx, G.F.

42. B The maximum allowable time for continuous suction is 15 seconds. Should suctioning continue for a longer time the risk of complications increases significantly.
Reference: Respiratory Care; Burton

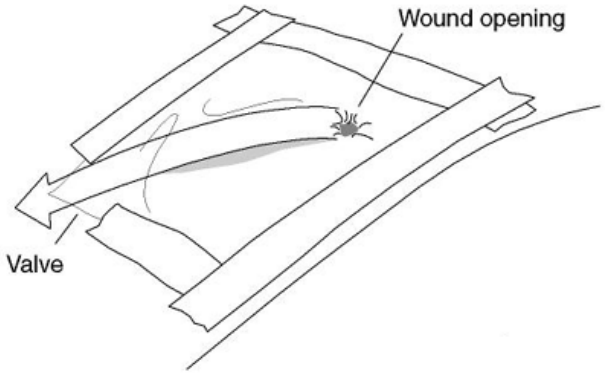
43. B During acute airway obstruction of any cause, attempts to open the airway have the highest priority. Upper airway obstruction in the unconscious person most commonly is the result of the loss of tonicity of the submandibular muscles, which provide direct support to the tongue and indirect support to the epiglottis. Posterior displacement of the tongue occludes the airway at the level of the larynx. The basic technique for opening the airway is head tilt with anterior displacement of the mandible (chin lift and, if necessary jaw thrust).
Reference: Textbook of Advance Cardiac Life Support; American Heart Association

44.C. In a tension pneumothorax, air leaks into the pleural space and has no means of escape. As air accumulates the pleural pressure increases leading to collapse of the lung. The collapsed lung and increased pleural pressure compresses the mediastinal structures (heart, great vessels, trachea) causing them to shift. Venous return, cardiac output, and pulmonary status are all impaired. Signs and symptoms of a pneumothorax include dyspnea, tachypnea, hyper resonance on the injured side, decreased or absent breath sounds on the injured side, and chest pain. A tension pneumothorax is further confirmed by worsening of the above symptoms,

hypotension, distended neck veins, and tracheal deviation – shift toward the uninjured side.

Reference: TNCC pp 156-157; http://info.med.yale.edu/intmed/cardio/imaging

45.D. The patient may be demonstrating the signs of a tension pneumothorax, exacerbated by the presence of an occlusive dressing. The definitive treatment in this case is to relieve the pneumothorax by replacing the occlusive dressing with a flutter dressing. See question #36.



Reference: http://www.vnh.org/FirstAidAnatomy/ChestWound.html; TNCC (p 157)

BURNS AND WOUND MANAGEMENT

46.D. External hemorrhage is loss of blood to the outside of the body. External hemorrhage is nearly always stopped or slowed when pressure is applied directly to the wound. This should be done with a sterile dressing. If sterile pads are not immediately available, a handkerchief, sanitary napkin, clean cloth or even a bare hand may be used. Frequently hemorrhage; especially the venous type can be lessened by raising the wounded limb to a height above the heart. Elevation may be used before, during, or after application of a pressure dressing, depending mainly on the type and severity of the wound. Serious hemorrhage, especially the arterial type may require simultaneous and continuous compression of the wound. If there is a broken bone in the wounded limb, elevation must be postponed until after the limb is splinted.
Reference: Medical Readiness Training Handbook – p 6-2.

47.D. Intravenous administration of small doses (e.g., MSO4 – 2 mg IV). Subcutaneous or intramuscular injections of analgesics will not be mobilized during the period of edema formation and will be ineffective in pain control. A patient who has received multiple subcutaneous or intramuscular doses of an analgesic may later mobilize them simultaneously and develop severe respiratory depression, which must be treated promptly.
Reference: http://wwwsam.brooks.af.mil/web/an/fondocs/burns.pdf,
http://www.vnh.org/EWSurg/ch03/03FirstAid.html;
http://www.vnh.org/FSHandbook/10burn_mgmt.html

48.A After the wound has been debrided, irrigated, and appropriately dressed, it is not inspected for 4-10 days unless the clinical course dictates an earlier appraisal. Note that the wound is allowed to heal by secondary intent. Intervening dressing changes are not indicated unless the clinical course indicates that there is continued hemorrhage, vascular changes, or infection. This inspection of the wound should be performed in the operating room.
Reference: http://www.vnh.org/EWSurg/ch19/19RedebrideAndWndClosure.html

49D. Skin interface pressure is high on the NATO litter. Use of a double-folded blanket does not have any pressure reducing effect. Lateral positioning may reduce pressure on the sacrum, but it is associated with increased pressure on the trochanter, heels, and shoulder. The optimal pressure reducing solution is the application of an aerovac mattress; however, pressure reduction on this surface is not a great as a hospital mattress.

50.A. Flush area immediately with large quantities of fresh water, using an installed deluge shower or hose, if available. Avoid excessive water pressure. Continue to flush the area for at least 15 minutes while removing the clothes, including shoes, socks, and jewelry. Dry lime powder (alkali burns) creates a corrosive substance when mixed with water; keep the powder dry and remove it by brushing it from the skin.
Reference: http://www.vnh.org/FSHandbook/10burn_mgmt.html

51.D. Irrigate gently and copiously with isotonic sterile saline solution or sterile water to remove dirt and debris. A catheter tip syringe may be used to create a steady constant flow.

Wound Irrigation
1.Shave the area surrounding area of the wound, but only shave what is necessary. Eyebrows are never shaved. 2.Irrigate gently and copiously with isotonic sterile saline solution or sterile water to remove dirt and debris. a. A catheter-tip syringe may be used to create a hydraulic action. b.General rule - irrigate 50 mL per inch of wound hour of age of wound. Use more irrigant for grossly contaminated wounds. c. If the wound is grossly contaminated, the wound may need to be cleaned with a surgical scrub sponge and then irrigated. d.The wound may be anesthetized first if the patient cannot tolerate the wound irrigation and cleaning. 3.The wound is infiltrated with local anesthetic intradermally through the wound margins or by regional nerve block. 4.Devitalized tissue and foreign matter are removed - Devitalized tissue inhibits wound healing and enhances chance of bacterial infection.

Reference: http://pco.ovid.com//rpcco (search wound irrigation, Ch35, "Injuries to Soft Tissues, Bones and Joints)

52.D. With electrical burns, the size of the cutaneous lesion may be misleading, as there may be severe underlying tissue damage. Myoglobinuria due to muscle destruction may lead to renal failure. The shock may cause titanic contractions leading to fractures of the vertebrae
Reference: Medical Readiness Training Handbook – p6D-5

53.C. The pilot has signs and symptoms of smoke inhalation and upper airway thermal injury. For individuals who have a history of being trapped in a closed space fire, evaluate for signs and symptoms of inhalation injury: facial burns, singed nasal hair or eyebrows, oropharyngeal burns, carbonaceous sputum, hoarseness and stridor. Intubate early for inhalation injuries. Evaluate for carbon monoxide and toxic gas inhalation.

If the burn patient is to be evacuated and the adequacy of the airway is at all questionable, the caregiver should perform endotracheal intubation or tracheostomy before movement rather than risk the possibility of acute airway obstruction in transit. Three categories of patients are most apt to require endotracheal intubation on the basis of the indications listed: (1) patients with severe head and neck burns, (2) patients with steam burns of the face, and (3) patients burned in a closed space who have inhaled smoke or other noxious products of incomplete combustion.
Reference: Medical Readiness Training Handbook – p6D-5,
http://www.vnh.org/FSHandbook/10burn_mgmt.html;
http://www.vnh.org/EWSurg/ch03/03EndoIntubation.html

54.C. Each leg is 18%. Note: If the burn does not involve an entire extremity, use a partial percentage (e.g., palm of patient's hand ~ 1%).

Reference: http://wwwsam.brooks.af.mil/web/an/fondocs/burns.pdf

55.A. To avoid potential vascular occlusion, a dressing should be started from the most distal aspect and move toward the proximal aspect.
Reference: ATLS

56.C Initial treatment of burn patients will be resuscitative. When such patients are first seen, a simple plan of treatment must include: maintenance of airway with ventilating support, as needed, adequate fluid therapy, and careful records of input and output.
Reference: http://www.vnh.org/MedAspNBCDef/1ch6.htm

57.C To calculate the fluid replacement: 2-4 ml/kg/%BSA burned. Administer ½ this amount within the first 8 hours (time starts at time of injury not admission to medical facility). Adjust IVF rate (change 10%/hr) to maintain a UOP of 30-50 ml/hr
4ml X 60kg X 50% = 12,000 ml. Administer 6,000 ml in the first 8 hours since the injury.
Reference: http://wwwsam.brooks.af.mil/web/an/fondocs/burns.pdf; http://www.vnh.org/FSHandbook/10burn_mgmt.html

58.D. The initial fluid of choice is Lactated Ringers. Normal saline is the second choice.
Reference: http://wwwsam.brooks.af.mil/web/an/fondocs/burns.pdf; http://www.vnh.org/FSHandbook/10burn_mgmt.html

59.D. Hemorrhage from a neck wound, unless attended immediately at onset may become fatal. Major concern in the emergency care of patients surviving neck wounds other than those involving the spinal column lies in maintenance of an open airway. Dressings to the neck must be tied upward over the head or downward under the opposite armpit, NEVER completely around the neck, to avoid pressure on the trachea. Shock is managed by general measures, except that morphine, which depresses the cough reflex, is not given.
Reference: Medical Readiness Training: Student Handbook. p 6-15 – 6-16

60.A. Complete amputations will have less active bleeding than partial amputations because of retraction of the severed arteries. An exception is an avulsive type of complete amputation, which can result in extensive bleeding.
Reference: TNCC Manual, p196

61.C. Corneal abrasion:

(a) Dx - History of minor trauma, prominent foreign body (FB) sensation, irregular corneal surface, positive fluorescein staining under blue light.

(b) Rx - cycloplegia (Cyclogyl 1%, 1 gtt, q12 hours, Homatropine 5%, 1 gtt, QD, or Scopolamine 0.25%, 1 drop (gtt), TID), antibiotic ointment, systemic pain medications as needed, reevaluate every 24 hours until healed. Application of a tight patch to insure immobility of the eyelid. The patch can usually be discontinued in 24-36 hours, but repatching for another 24-36 hours may be necessary for larger abrasions. Lack of progressive improvement necessitates referral to an ophthalmologist. The use of topical anesthesia for other than facilitating vision testing, examination, or instrumentation is contraindicated. Repeated installation inhibits healing. Topical steroids or steroid antibiotic combinations are likewise contraindicated. Steroids are unnecessary and will cause rapid progression of a dendritic ulcer, including corneal perforation, should this lesion exist or supervene. Fungal superinfection and glaucoma may also result from injudicious use of topical steroids.

Reference: http://www.vnh.org/GMO/ClinicalSection/52OphthalmologyTrauma.html, http://www.vnh.org/EWSurg/ch24/24MgtMinorInjuries.html

62.C. As a dressing, dry sterile gauze should be laid lightly in the wound. This should be no more than a wick. In no case should gauze be "packed" into the wound since this additional pressure can cause necrosis of any tissue that already has its blood supply partially compromised.

The single most important principle in the management of battle wounds is their nonclosure following debridement. The surgeon must not give in to the temptation to primarily close certain "very clean appearing" war wounds. Such closure is ill advised and inappropriate and can only be condemned. All wounds must be left widely open with the following exceptions:

1. Sucking chest wounds
2. Joint capsules
3. Wounds of the dura
4. Some head and neck wounds; however, with severe contamination it may be safer to leave these open.

The delayed primary wound closure is usually performed in a communication zone hospital 4-10 days after debridement, but occasionally may be performed at the forward hospital when evacuation has had to be delayed. The indication for delayed primary closure is the clinically clean appearance of the wound. Whereas most wounds are closed in the operating room utilizing the interrupted wire technique and local or general anesthesia, some may be very amenable to tape closure. This technique can be initiated 4-6 days post debridement. Approximation of the skin edges is accomplished with micropore paper tape or wide "butterflies" applied in overlapping diagonal "basket weave" fashion after the skin has been degreased with acetone, and tincture of benzoin has been applied and allowed to dry thoroughly. Edges of the wound may not come completely together with the first tape application. This is not a problem, as they will come progressively closer together with each reapplication of tape, done at 48 hour intervals. Tape closure offers some advantages over suture closure Even compression of wound edges decreases skin edema, and the problem of cutting needles causing additional tissue damage is avoided. The wound edges are very vascular and needle passage can cause hematomas. Since tape closure is, in reality, a gradual "encouragement" of the skin toward closure rather than a total closure from the beginning, a great margin for error is added and the potential complication of wound breakdown, sometimes seen after suture closure, is almost completely avoided. No anesthesia is needed for this procedure and it can be performed by supervised ward nursing personnel.
Reference: Emergency War Surgery NATO Handbook: Part III: General Considerations of Wound Management: Chapter XVI: Wounds and Injuries of the Soft Tissues: Treatment Recommendations; http://www.vnh.org/EWSurg/ch16/16TreatmentRecs.html

63.C. For major wounds - major soft tissue damage, bone or joint involvement, major nerve injury, vascular injury, or development of compartment syndrome

(1) Control hemorrhage by direct pressure: use a tourniquet only as a last resort to control high-grade bleeding.
(2) Dress wounds. Do not remove impaled, embedded foreign bodies.
(3) Splint in position of function (a sling is adequate for most upper extremity injuries).
(4) Administer tetanus prophylaxis, if not current
(5) Consider antibiotics in contaminated wounds, or if a delay in definitive care is anticipated. Consult with a specialist first.
(6) Evacuate to a facility with surgical capability, as a litter patient if appropriate. Plan for emergent transport and definitive care within two hours.

Reference: http://www.vnh.org/GMO/ClinicalSection/100PenetratingExtremity.html

GI/GU FLUID AND ELECTROLYTES

64.B. Urethral trauma should be ruled out before insertion of a urethral catheter. If an anterior pelvic is suspected urethral injury (particularly in a male) needs to be ruled-out. In females, urethral trauma is almost always associated with pelvic fractures. Indications of possible urethral trauma include suprapubic pain, urge but inability to urinate, hematuria (may be microscopic) blood at the urethral meatus, blood in the scrotum, rebound tenderness, abdominal wall muscle rigidity, spasm or involuntary guarding, and a high-riding prostate in males.
References: TNCC (p 192); University of Iowa Family Practice Handbook, 3rd Edition, Chapter 1 Emergency Medicine: Urologic Trauma; http://www.vh.org/Providers/ClinRef/FPHandbook/Chapter01/15-1.html

65.B. Input and Output Records. It is extremely important to accurately follow the input and output of fluids in burn patients. It would be impossible to modify fluid therapy according to individual needs without accurate records. Combat medical records, however, must be simple and should be attached to the patient so that they accompany him during evacuation. Medical planners must consider how to modify and improve combat medical records so that accurate input and output data on burn patients can be recorded. Most burn patients will require urinary catheterization, and this can aid considerably in recording urinary output rates accurately.
Reference: http://www.vnh.org/MedAspNBCDef/1ch6.htm

66.A. Aspiration of fluid and confirmation of a pH < 5.5. Intestinal placement will show a pH > 6.0. Pulmonary secretions also have an alkaline pH. "Common practice for many years has been to evaluate tube placement by placing a stethoscope over the stomach and instilling 20 to 50 ml of air via syringe. There are numerous reports in the literature of false-positive results using this method, including reports of serious pulmonary complications because of tracheal tube placement. The ability to simply aspirate fluid from the tube is often interpreted as confirmation of gastric intubation.

Several reports have shown that fluid can also be aspirated after endotracheal intubation. As well, some authors have suggested placing the tip of the NG tube under water and observing for bubbles to confirm placement. Bubbles would indicate endotracheal intubation. Although logical, this method is also unreliable. If a tube were lodged in the mucosal wall of either the esophagus or the lung, no bubbles would result, yet placement would be incorrect."
Reference: AACN Procedure Manual (2001) p 684

67.C. Measure the tube from the bridge of the nose to the earlobe to the tip of the xiphoid process. This ensures adequate length for placement of the tube into the stomach.
Reference: AACN Procedure Manual (2001) p 682

68.B. In this case the bullet may have traveled from the entry wound in the leg into the abdomen. "Pain, rigidity, guarding or spasm of the abdominal musculature are classic signs of intra-abdominal pathology. Sudden movement of irritated peritoneal membranes against the abdominal wall causes rebound tenderness and guarding of the abdominal muscles. Irritation may be due to the presence of free blood or gastric contents in the peritoneal cavity."
Reference: TNCC p 179

69.A Laboratory findings reveal an elevated hematocrit reflecting the state of hemoconcentration. Serum potassium and uric acid levels are elevated. The blood area nitrogen levels are unchanged. Free myoglobin may be detected. The serum creatinine phosphokinase (CPK) is markedly elevated to at least five times normal. The first urine specimen, because it was collected in the bladder before injury, may be normal. Later, urine becomes dark due to the presence of myoglobin. It will have an acid Ph

Because of the crush injury, potassium may be released fro the cells. Additionally hypovolemia and myoglobin may precipitate renal failure, which reduces potassium excretion.

Reference: Emergency War Surgery NATO Handbook: Part III; General Considerations of Wound Management; Chapter XVII, Crush Injury;
http://www.vnh.org/EWSurg/ch17/17CrushInjury.html

ORTHO / NEURO

70.B. RICE therapy: A highly successful sports medicine approach to accelerate the healing of any injury is to first decrease the inflammatory process (swelling, pain, and warmth), then increase the range of motion at the joint.

RICE THERAPY	
Approaches to achieving this goal are: (a) Rest, Ice, Compression and Elevation (RICE). (b) Range of motion (ROM) at the joint is achieved through the continued use of ice, stretching of the injured ligament or tendon, and weight bearing exercises. (c) Ice, stretching, and exercise (ISE) reduces inflammation. (d) RICE (rest, ice, compression, and elevation) is appropriate for all strains and sprains. In general, if a patient cannot bear weight on the extremity, rest is indicated and x-rays to rule out a fracture should be completed as soon as practical.	
Rest	Means applying no weight or only partial weight to the extremity. Crutches should be used for locomotion. Relative rest means decreasing activities that cause pain and replacing them with other activities that are pain-free.
Ice	Means applying ice to the injured area, in 20 min on 20 min off cycles. This will prevent a hypothermic injury. This should continue until swelling has stabilized.
Compression	Means applying an Ace wrap or similar compression wrap to the injured part for periods of 2 to 4 hours. Never sleep with a compression wrap applied unless medically advised.
Elevation	Means placing the injured part above the level of the heart; this allows gravity to help reduce the swelling and fluid accumulation.

Reference: General Medical Officer (GMO) Manual: Clinical Section: Orthopedics Sports Related Injury Management; http://www.vnh.org/GMO/ClinicalSection/57SportsRelatedInjuryMan.html

71.C. These symptoms are consistent with excessive pressure from the cast or compartment syndrome. When plaster casts or splints are used, particularly in the patient with impaired sensation, vigilance must be maintained to prevent skin breakdown from excessive cast pressure. Complaints of pain under the cast must not and cannot be ignored. Once a plaster cast has been applied it must be immediately bi-valved to avoid excessive pressure on the skin. A monovalved cast has no place in the early treatment of a combat casualty. Bivalving the cast for transportation and evacuation is mandatory.

Patients in plaster of paris casts should be escorted since limbs may swell in flight necessitating bivalving of the cast. Casts applied less than 72 hours prior to the flight are to be of the GYPSONA type and are split (including all dressings) down to the

skin level. Patients with lower limb plasters are normally to be stretcher cases unless the cast has been on for more than 7 days and there is no residual tissue swelling. Plaster casts should be marked with identifying information pertinent to the underlying injury and the date of cast application for use during transit and by receiving personnel. In general, plaster splinting is inadequate for anything other than temporary field immobilization.
Reference: Emergency War Surgery NATO Handbook: Part III: General Considerations of Wound Management: Chapter XIX: Wounds and Injuries of Bones and Joints;
http://www.vnh.org/EWSurg/ch19/19Fractures.html

72.B. Capillary refill provides an estimate of the rate of peripheral blood flow. Normal refill is almost instantaneous (normal less than 2 seconds). In the presence of suspected vascular injury, a prolonged capillary refill, pulse deficit and abnormal ankle-brachial or wrist-brachial index (< 1) correlate highly with arterial injury. Prolonged capillary refill is not diagnostic of chronic ischemia. Additionally, capillary refill is not diagnostic of hypovolemia due to blood loss. Other indicators of inadequate perfusion (e.g., tachycardia, blood pressure, postural blood pressure, labs) are required for a diagnosis.
Reference: Medical Readiness Training Handbook – p 6G1- 6G5.

73.C. The dressing is appropriate for stabilization of a humerus fracture. Sternal fracture or an ulnar fracture should be immobilized with the elbow in an approximate 90-degree flexion and the wrist and forearm in a neutral position.

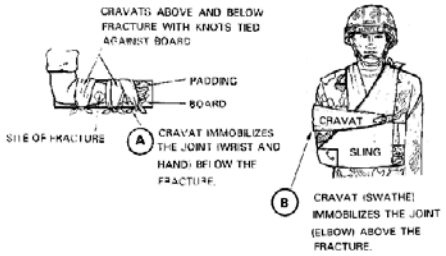


Figure 4-14. Board splint applied to fractured forearm (Illustrated A and B).

Reference: http://www.vnh.org/FirstAidForSoldiers/Fm211_4.html#REF66h4;
http://www.vnh.org/StandardFirstAid/chapter6.html

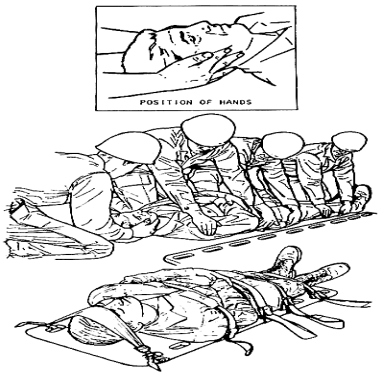
74.D. Casts should be clearly marked with the date of application and the nature of the fracture or surgical procedure performed. All casts, including the underlying web rolling and padding, should be bi-valved to allow for soft tissue swelling at altitude. The air splints commonly used for initial stabilization pose a similar potential problem and must be constantly monitored during flight and adjusted to prevent any tourniquet effect. It is preferable to use wire-ladder splints; wood splints or plaster splints to stabilize fractures and severe sprains.
References: http://www.vnh.org/EWSurg/ch19/19Fractures.html;
http://www.vnh.org/FSManual/16/04MedicalConditions.html

75.B. Intermittent or persistent burning under a cast is an indicator of possible pressure ulcer formation. This pain may diminish as the pressure ulcer develops.
Reference: AACN (1993) p 653

76.C. The patient's history and presentation are consistent with a fat embolism. Following open or closed fractures, especially pelvic and long bone fractures, fat globules from the bone marrow can be released and travel to the pulmonary vasculature. The fat globules obstruct the pulmonary vasculature and lead to alveolar damage. Clinically the patient presents with dyspnea/tachypnea, rales, wheezes, tachycardia, increased temperature, decreasing PaO2 or SaO2, and petechia (on the upper thorax and axillary region).
Reference: TNCC (p 250); Medical Readiness Training Handbook – p 6C-5

77.C. These clinical findings are consistent with neurogenic shock. Neurogenic shock, which is a form of distributive shock, is associated with spinal cord injuries at or above T6. The injury impairs descending sympathetic pathways leading to loss of vasomotor tone and sympathetic innervation of the heart. The loss of sympathetic innervation is manifested by vasodilation (hypotension) and cardiac deceleration (bradycardia). Treatment includes the judicious administration of IV fluids and vasopressors.
Reference: TNCC (p 210/222)

78.B. Padding is essential to keep the patient in a neutral position.
Add padding to eliminate pressure, ensuring that it doesn't alter alignment.
Padding may be improvised from such items as a jacket, blanket, poncho, shelter half, or leafy vegetation. Use padding as needed to keep neck in a neutral position, or behind knees to support a neutral axis under small of back, neck and knees. Suspected pelvic injury can be immobilized by the use of the long board with padding secured over the pelvis.



Spinal immobilization using a long board. The bearers should assemble the required items: long spine board, four 6-foot patient securing straps, cravat, and four pieces of padding. If an item is not available, the bearers should improvise it from available materials.
Reference: http://www.vnh.org/EWSurg/Figures/Fig42.html, http://www.gov.mb.ca/health/ems/guidelines/A3.pdf

79.C. The hallmark of a head injury is an alteration in level of consciousness. All other options (papillary changes, motor function, vital signs) are late findings. The level of consciousness can be described using the Glasgow Coma Scale or the acronym AVPU.

Glasgow Coma Scale

Best Motor Response		Eye Opening		Best Verbal Response	
Obeys	6				
Localized to Pain	5			Oriented, Conversing	5
Withdraws	4	Spontaneous	4	Disoriented, Conversing	4
Abnormal Flexion	3	To Verbal Command	3	Inappropriate Words	3
Extension	2	To Pain	2	Incomprehensible Sounds	2
None	1	No Response	1	No Response	1

Add the scores for each category. A total score of 7 or less indicates a severe injury.

The most common patterns for comatose patients are Motor $\leq$ 5, Eyes = 1, Verbal = 1

Responsiveness

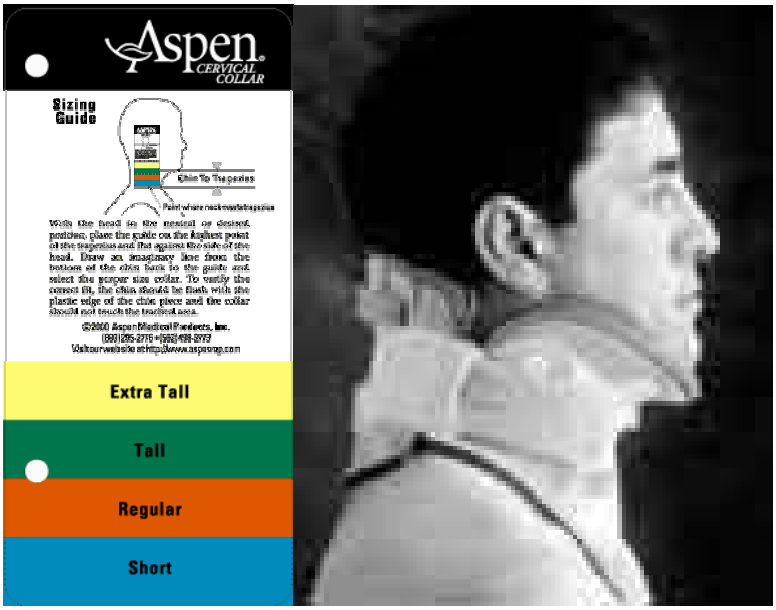
A = **A**lert	V = Responds to **V**erbal stimuli	P = Responds to **P**ainful stimuli	U = **U**nresponsive

Reference: http://www.vnh.org/EWSurg/ch22/22CraniocerebralInjury.html, http://www.vnh.org/GMO/ClinicalSection/47CentralNervousSystemEm.html

80.B. With facial trauma the first priority is to maintain the patient's airway. Suctioning may be required. Because skull injuries often involve the spine, the patient should be immobilized on a spine board after the application of a rigid collar.
Reference: http://www.vnh.org/FirstAidAnatomy/JawFracture.html

81.C Placement of a nasogastric tube is not recommended in the setting of severe midface trauma because of the potential for introducing the tube into the anterior or middle cranial fossa. An orogastic tube should be inserted if a basilar skull fracture or severe midface fracture is suspected. The cause of nausea and vomiting should be investigated (manifestation of head trauma or swallowing blood).
Reference: Medical Readiness Training Handbook – Section 6F; TNCC p 121 (TNCC manual 159-183)

82.C. Each brand of cervical collar may require a slightly different sizing method. Sizing for the Aspen Collar®, which is in our EMEDs is sized by measuring from the patient's chin (not the angle of the jaw) to the highest aspect of the shoulder (where the collar will rest). A correctly sized collar will have the patients chin centered in the chin piece.



Note: Do not replicate this sizing guide – use guide supplied in package for correct measurement.
Reference: TNCC p 447; http://www.aspencollar.com/sizing.html

83.A. A cervical collar does not immobilize the cervical spine. The head and torso must also be immobilized to prevent flexion, extension, rotation, and lateral movement. Logrolling is required to minimize cervical movement.
Reference: TNCC (443-449)

84.D. The timing and the method of wound closure require as great a measure of surgical judgment as did the original decision to amputate. Delayed primary closure is not indicated in open circular amputations. Continued traction will often result in the skin eventually closing over the end of the stump. If it does not, small split-thickness skin grafts can be used. A definitive revision may be necessary later, but it can be performed at higher echelons, which permit immediate fitting techniques, thereby allowing more rapid prosthetic application. Delayed primary closure too often results in a chronically inflamed, edematous, indurated, and sometimes draining stump that is unreceptive to prosthetic application.

Reference: Emergency War Surgery NATO handbook,
http://www.vnh.org/EWSurg/ch21/21StumpWoundClosure.html

NBC/TRIAGE/MEDICATIONS/PAIN MANAGEMENT

85.B. 500 mg q8 hrs = 1500 mg/24 hours X days = 3000 mg (3 gm)
Require three 1-gram vials.

86.C. Bivalving and spreading the cast results in significant reduction in skin pressure.
Reference: http://www.vnh.org/EWSurg/ch19/19Fractures.html

87.A. The treatment of combat stress requires minimal medication, as medication reinforces the patient role. For battle fatigue cases that are unable to sleep, a short acting benzodiazepine (i.e., temazepam) may be indicated. The use of neuroleptics (i.e., haldol, thorazine, etc.) is only indicated in extremely agitated personnel who do not respond to routine treatment.
Reference: Medical Readiness Training Handbook – p 7-5.

88.A. See #87
Reference: Medical Readiness Training Handbook – p 7-5.

89.B. See the following table for the treatment of all animal bites:

TREATMENT OF ANIMAL BITE

(1) Get history including what first-aid was given before arrival.
(2) Administer appropriate tetanus prophylaxis.
(3) Anesthetize the wound appropriately.
(4) Wash all lacerations and puncture wounds for at least 15 minutes with a 20% soap solution, benzalkonium chloride, or betadine.
(5) Debride meticulously and aseptically all nonviable tissue. Remove all foreign particles.
(6) Irrigate wounds thoroughly with at least 1000 cc normal saline. Consider using pressure lavage.
(7) Administer prophylactic antibiotics if the wound was on the hand or arm or if the animal's teeth penetrated to the bone or tendon sheath, or if wound is more than 8 hours old.
(8) Splint extensively lacerated arms or legs.
(9) Elevate...Lack of elevation is most common cause of treatment failure.
(10) Call animal control (or bioenvironmental engineering).

Reference: http://lib-sh.lsumc.edu/fammed/grounds/bites.html

90.B. Possible side effects (% of people vaccinated):

Mild local reactions, about 30% of men and 60% of women (less than 1" of redness, swelling, tenderness at the site of injection -- not unlike other vaccine shots).
Moderate local reaction (1" to 5"), 1% to 5% (redness, minor swelling, tenderness at the site of injection).
Large local reactions, about 1% (redness greater than 5", swelling at the site of injection and forearm) Beyond the injection site, from 5% up to 35% of people will notice muscle aches, joint aches, headaches, rash, chills, fever, nausea, loss of appetite, malaise, or related symptoms. Again, these symptoms usually go away after a few days. Over-the-counter medications before or after the anthrax vaccine may help reduce bothersome symptoms.
Serious events, such as those requiring hospitalization, are rare. They happen about once per 200,000 doses. Severe allergic reactions can occur after any vaccination, less than once per 100,000 doses. There have been no patterns of long-term side effects from the vaccine, neither persistent side effects, nor

delayed side effects.

Reference: Anthrax Vaccine Immunization Program (AVIP)
http://www.anthrax.osd.mil/HTML_interface/default.html

91.C. **Guide to contraindications and precautions to commonly used vaccines**

Precautions: -Moderate or severe acute illness with or without fever

Contraindications:

a. Serious allergic reaction (e.g., anaphylaxis) after a previous vaccine dose
b. Serious allergic reaction (e.g., anaphylaxis) to a vaccine component

Reference: http://www.cdc.gov/nip/recs/contraindications.htm#Guide

92.A Tetanus: caused by Clostridium tetanus (a bacteria that produces a neurotoxin).

Tetanus		
Symptoms	**History**	**Vaccine**
a. Spasms of jaw muscles (lockjaw) b. Stiffness of neck, back, and abdominal muscles c. Muscle contractions	**History** of skin wounds is common. 2/3 of all US cases come from puncture wounds of the hands and feet.	a. Dose is 0.5 cc IM b. Basic series given as part of DPT as child, but in an unimmunized person: one shot followed in 4-6 weeks by second shot, followed in 6-12 months by third shot. c. Booster is every 10 years d. May be given if medically indicated for injury. e. Increased wounds for risk are - old, dirty wounds, puncture wounds, animal bites, wounds with jagged edges. f. Reactions are rare, usually limited to injection site soreness

Reference: http://www.vnh.org/SickcallScreeners/Immunizations.html

93. D The mainstay of pain management is as needed (PRN) dosing. However, there are two reasons why PRN dosing regimens for acute pain may fail. First, patients usually expect pain relief to be delivered immediately upon request. PRN dosing can frequently contribute to a failure in this process. This occurs because either the patient waits too long to request more pain medication or, the staff cannot immediately administer the drug. Second, blood concentrations fluctuate between 4 hour dosing intervals such that the minimum effective analgesic concentration (MEAC) is maintained only 35 percent of the time, or patients are in pain 65 percent of the time. Drugs used in the treatment of acute pain must be viewed as

agents that need to be titrated on a frequent basis rather than being administered on a set-dosing regimen determined by the average patient.
Reference: http://www.vnh.org/GMO/ClinicalSection/03AcutePainMngt.html

94. C Drugs used in the treatment of acute pain must be viewed as agents that need to be titrated on a frequent basis rather than being administered on a set-dosing regimen determined by the average patient.
Reference: http://www.vnh.org/GMO/ClinicalSection/03AcutePainMngt.html

95.C. Frostbite injury is classified as superficial and deep. Note the degree of injury may not be determined for several weeks. Initial treatment involves removing all constricting items from the injured extremity and ensuring the overall warmth of the patient. If the injured parts are still frozen when first seen, they should be rewarmed rapidly by immersion in water at 100° to 104°F (37.5° to 40°C) with added antiseptic soap, such as pHisoHex, and with agitation of the bath water to hasten the warming. A whirlpool apparatus is most satisfactory for this.
References: (1) McAdams, TR. Am J Orthopedics. Jan 1999;
(2) Medical Readiness Training: Student Handbook (1998);
Overall management of cold injuries:
http://www.vnh.org/EWSurg/ch04/04ColdInjury.html; Management of frostbite:
http://www.vnh.org/EWSurg/ch04/04FirstAid.html

96.C. The successful prevention and control of cold injuries depend, first of all, upon vigorous command interest, the provision of adequate clothing, and a number of individual and group measures. These measures include: The provision of adequate supplies of clothing and footgear and their correct utilization to avoid exposure to cold. The program of supply must provide adequate dry clothing for the daily needs of the soldier who is farthest forward in combat; it must also provide for the correct fitting of clothing and boots. All articles of clothing must be sized and fitted to avoid constriction of the extremities and tightness over the back, buttocks, and thighs. Clothing for cold weather, based on the layering principle, is now designed as an assembly for protection of the head, torso, and extremities. The clothing is worn in loose layers, with air spaces between the layers, under an outer wind-resistant and water-resistant garment. Body heat is thus conserved. The garment is flexible, and inner layers can be removed for comfort and efficiency in higher ambient temperatures or during strenuous physical exertion. Prevention of loss of body heat by the proper protection of the body is as important as the efficient use of appropriate dry footgear and warm dry gloves. Finally, the most efficient clothing is of no value unless a high level of individual and unit clothing discipline are maintained through training.
Reference: Emergency War Surgery NATO Handbook: Part I: Types of Wounds and Injuries: Chapter IV: Cold Injury Prophylaxis
http://www.vnh.org/EWSurg/ch04/04Prophylaxis.html

The following are host factors that may or may not influence the development of cold injury:
Age. There is no convincing evidence that age is a significant epidemiologic factor in cold injury among combat troops. (See website for additional factors)
References: Cold Related Injuries:
http://www.vnh.org/EWSurg/ch04/04ColdInjury.html;
Host Factors: http://www.vnh.org/EWSurg/ch04/04HostFactors.html;
Good review of hypothermia and cold related injuries:
http://www.princeton.edu/~rcurtis/hypocold.html;
Sustaining Health & Performance in The Cold: Environmental Medicine Guidance for Cold Weather Operations:
http://www.vnh.org/ColdWeatherOperations/depcold/toc.html

97.D. Skin: Erythema should be treated with calamine or other soothing lotion or cream (e.g., 0.25% camphor and menthol, calamine) to reduce burning and itching. Small blisters (under 1-2 cm) should be left intact, but because larger ones will eventually break (the blister fluid does not contain mustard), they should be carefully unroofed. Denuded areas should be irrigated three to four times daily with saline, another sterile solution, or soapy water and then liberally covered with a topical antibiotic such as silver sulfadiazine or mafenide acetate to a thickness of 1-2 mm.

Eye: Immediately flush the contaminated eye with water. Antibiotic ointment, with or without steroid, helps minimize infection. In more severe cases, blepharospasm and pain are extreme, requiring local anesthetic drops or ointment (e.g., tetracaine). Irrigation with sterile saline will remove crusted exudate.

The basic principles of eye care are to prevent infection and to prevent scarring. Although it is unlikely that mustard will still be in the eye by the time the casualty is seen, the eye should be irrigated to remove any possible chemical agent that might be on the lashes and to remove any inflammatory debris that might be on the surface of the eye. Mild lesions (e.g., conjunctivitis) can be treated three to four times daily with a soothing eye solution.

Casualties with more-severe eye lesions should be hospitalized.
Care for these patients should consist of at least one daily irrigation, preferably more, to remove inflammatory debris; administration of a topical antibiotic three to four times daily; and administration of a topical mydriatic (atropine or homatropine) as needed to keep the pupil dilated (to prevent later synechiae formation). Vaseline or a similar material should be applied to the lid edges to prevent them from adhering to each other; this reduces later scarring and also keeps a path open for possible infection to drain. (When animals' eyes were kept tightly shut, a small infection could not drain, and a panophthalmitis developed that completely destroyed the eyes.65) Topical analgesics may be used for the initial examination; however, they should not be used routinely as they might cause corneal damage. Pain should be controlled with systemic analgesics. The benefit of topical steroids is unknown; however, some ophthalmologists feel that topical steroids may be helpful if used within the first 48 hours after the exposure (but not after that).

In any case, an ophthalmologist should be consulted as early as possible on this and other questions of care. Keeping the casualty in a dim room or providing sunglasses will reduce the discomfort from photophobia. The transient loss of vision is usually the result of edema of the lids and other structures and not due to corneal damage. Medical personnel should assure the patient that vision will return. Recovery may be within days for milder injuries, while those with severe damage will take approximately a month or longer to recover.

References: Textbook of Military Medicine: Medical Aspects of Chemical and Biological Warfare: Chapter 7, Vesicants:

http://www.vnh.org/MedAspChemBioWar/chapters/chapter_7.htm#PatientManagement;
Office of the Surgeon General, Department of the Army, http://www.vnh.org/MedAspChemBioWar/index.html; http://www.vnh.org/CHEMCASU/04Vesicants.html#2

98.B. Transmission is by direct contact, including respiratory droplets from nose and throat of infected persons. The correct isolation procedure is "droplet precautions". Chemoprophylaxis of persons in **close contact** with an index case-patient is the primary means for prevention of secondary cases of meningococcal disease. Close contacts at high risk for secondary disease include household members, day care center contacts, and anyone directly exposed to a patient's oral secretions (e.g., through kissing and endotracheal tube management) (1). The attack rate among household contacts of patients with meningococcal disease is an estimated 500--800 times greater than the general population (4). Because the risk for illness is highest during the first few days after infection, chemoprophylaxis should be administered as soon as possible (ideally within 24 hours) after contact with an index case-patient. Chemoprophylaxis administered >14 days is probably of limited or no value. Systemic antibiotics that effectively eliminate nasopharyngeal carriage of N. meningitides include rifampin, ciprofloxacin, and ceftriaxone (Table 1) (1).

TABLE 1. Schedule for administering chemoprophylaxis against meningococcal disease

Drug	Age group	Dosage	Duration and route of administration*
Rifampin†	Children <1 mo	5 mg/kg every 12 hrs	2 days
	Children ≥1 mo	10 mg/kg every 12 hrs	2 days
	Adults	600 mg every 12 hrs	2 days
Ciprofloxacin§	Adults	500 mg	Single dose
Ceftriaxone	Children <15 yrs	125 mg	Single intramuscular dose
Ceftriaxone	Adults	250 mg	Single intramuscular dose

*Oral administration unless indicated otherwise.
† Rifampin is not recommended for pregnant women because the drug is teratogenic in laboratory animals. Because the reliability of oral contraceptives may be affected by rifampin therapy, consideration should be given to using alternative contraceptive measures while rifampin is being administered.
§ Ciprofloxacin generally is not recommended for persons aged <18 years or for pregnant and lactating women because the drug causes cartilage damage in immature laboratory animals. However, ciprofloxacin can be used for chemoprophylaxis of children when no acceptable alternative is available.

References: CDC MMWR: Exposure to Patients With Meningococcal Disease on Aircraft---United States, 1999—2001; June 15, 2001 / 50(23);485-9 http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5023a2.htm#tab1; Guide to Clinical Preventive Services, Second Edition: Immunizations and Chemoprophylaxis Post exposure Prophylaxis for Selected Infectious Diseases http://www.vnh.org/GCPS2/77.html; World Health Organization (WHO) Fact Sheet No 105 Revised December 1998 EPIDEMIC MENINGOCOCCAL DISEASE http://www.who.int/inf-fs/en/fact105.html; CDC MMWR June 30, 2000 /

49(RR07);1-10 Prevention and Control of Meningococcal Disease Recommendations of the Advisory Committee on Immunization Practices (ACIP)
http://www.cdc.gov/mmwr/preview/mmwrhtml/rr4907a1.htm

99.B. False. Need for vaccine booster doses: Available data show that vaccine-induced antibody levels decline steadily with time and that up to 50% of adult vaccines who respond adequately to vaccine may have low or undetectable antibody levels by 7 years after vaccination. Nevertheless, both adults and children with declining antibody levels are still protected against hepatitis B disease. Current data also suggest excellent protection against disease for 5 years after vaccination among infants born to hepatitis B-carrier mothers. For adults and children with normal immune status, booster doses are not routinely recommended within 7 years after vaccination, nor are routine serologic testing to assess antibody levels necessary for vaccine recipients during this period. For infants born to hepatitis B-carrier mothers, booster doses are not necessary within 5 years after vaccination. The possible need for booster doses after longer intervals will be assessed as additional information becomes available. References: CDC MMWR February 09, 1990 / 39(RR-2);1-26 Protection Against Viral Hepatitis Recommendations of the Immunization Practices Advisory Committee (ACIP)
http://www.cdc.gov/mmwr/preview/mmwrhtml/00041917.htm;
http://wwwsam.brooks.af.mil/web/eh/html/immune.htm

100.A. The correct isolation procedure is contact isolation.

Diarrheal diseases are a major cause of morbidity and mortality among refugee and displaced populations, primarily because of the inadequacy of the water supply (both in terms of quality and quantity), and the insufficient and poorly maintained sanitation facilities.
In eastern Sudan in 1985, between 25%-50% of all deaths in four major camps were attributed to diarrheal diseases. In Somalia (1980), Malawi (1988), and Ethiopia (1989), between 28%-40% of all deaths in refugee camps were attributed to diarrhea. Between March and October 1991, 35% of deaths among Somali refugees in the Liboi camp in Kenya were caused by diarrhea.
Among Central American refugees in Honduras, diarrheal diseases were responsible for 22.3% of mortality among children less than 5 years of age during a 3-year period. In April 1991, in camps for Iraqi refugees on the Turkish border, approximately 70% of all patients arriving at clinics had diarrhea. Of these, approximately 25% complained of bloody diarrhea during the first 2 weeks of April. Although the etiologies of diarrheal illness during refugee emergencies have not been well documented, the responsible pathogens are most likely to be the same agents that cause diarrhea in non-refugee populations in developing countries.
In one study in a camp for famine victims in Ethiopia, of 200 patients with diarrhea, 15.6% had positive cultures for Escherichia coli (pathogenicity not specified by authors), 3.5% for Shigella spp., and 2% for Salmonella spp.

References: Famine-Affected, Refugee, and Displaced Populations: Recommendations for Public Health Issues. MMWR 41. No RR-13. Publication Date 07/24/1992 http://www.cdc.gov/mmwr/preview/mmwrhtml/00019261.htm or http://www.vnh.org/MMWROOTW/

101.C. For babies who are unable to drink but are not in shock, a nasogastric tube can be used to administer ORS solution at the rate of 15 mL/kg body weight/hour. For infants in shock, a nasogastric tube should be used only if IV equipment and fluids are not available.

Oral rehydration therapy (ORT) is the giving of fluid by mouth to prevent and/or correct the dehydration that is a result of diarrhea. As soon as diarrhea begins, treatment using home remedies to prevent dehydration must be started. If adults or children have not been given extra drinks, or if in spite of this dehydration does occur, they must be treated with a special drink made with oral rehydration salts (ORS). The formula for ORS recommended by WHO and UNICEF contains:

- 3.5 gms sodium chloride
- 2.9 gms trisodium citrate dihydrate (or 2.5 gms sodium bicarbonate)
- 1.5 gms potassium chloride
- 20 gms glucose (anhydrous)

The above ingredients are dissolved in one liter of clean water. WHO has recently recommended a change in the complete formula, replacing 2.5 gms of sodium bicarbonate with 2.9 gms of trisodium citrate dihydrate. The new formula gives the packets a longer shelf life and is at least as effective in correcting acidosis and reducing stool volume. Packets containing sodium bicarbonate are still safe and effective.

References: Famine-Affected, Refugee, and Displaced Populations: Recommendations for Public Health Issues. MMWR 41. No RR-13. Publication Date 07/24/1992; http://www.cdc.gov/mmwr/preview/mmwrhtml/00019261.htm or http://www.vnh.org/MMWROOTW/;
The Treatment of Diarrhea: A manual for physicians and other senior health workers From World Health Organization (WHO) Division of Diarrheal and Acute Respiratory Disease Control WHO/CDR/95.3 10/95
http://www.rehydrate.org/diarrhoea/treatment_of_diarrhea.htm
International Conference on Oral Rehydration Therapy (ICORT): Oral Rehydration Therapy - The Four Simple Technologies; http://almashriq.hiof.no/lebanon/600/610/614/solar-water/unesco/02-03.html;
World Health Organization: Reducing deaths from diarrhea through oral rehydration therapy. http://www.who.int/bulletin/pdf/2000/issue10/bu0747.pdf

102.A. BICEPS

BICEPS	
Brevity	Keep the intervention to 3 days or less
Immediacy	Treat as soon as symptoms are recognized
Centrality	Keep victims together for mutual support and consistent treatment plan; treat away from hospital and other patients
Expectancy	Reaffirm that you expect them to get well and return to duty; assign minor military duties
Proximity	Treat near the patient's unit to maintain bonding
Simplicity	Treat only the present stress reaction (provide food, rest, shelter); NO MEDS unless absolutely necessary (e.g., Benadryl for sleep)

References: Medical Readiness Training Handbook – Ch 7; Disaster Psychiatry/Mental Health: http://wwwsam.brooks.af.mil/web/an/fondocs/menvl1re.pdf Combat Stress Control (CSC) http://www.vnh.org/CombatStress/CSCtrl.html;

103.A. Combat stress is not a psychiatric disorder. It is a normal reaction, which happens to normal individuals who are placed in extreme situations. The intensity of the stresses is momentarily outside the individual's ability to cope. Combat stress is defined as a psychological reaction manifested by a variety of symptoms during, or immediately following, combat.

Respiratory: Hyperventilation, choking sensation, dyspnea, paresthesia
Cardiovascular: Palpitations, chest pain, increased heart rate
GI: Dry mouth, nausea and vomiting, diarrhea or constipation
Neurological: Dizziness, trembling, feelings of unreality, jitteriness

The emotion associated with the survival complex is fear.

It is always important to rule-out exposure to a chemical or biological agent.

SIGNS AND SYMPTOMS OF EXPOSURE TO A CHEMICAL OR BIOLOGICAL AGENT.
Cyanide Exposure: (symptoms depend on amount of exposure) **High Concentration**: Increased depth of respiration within a few seconds, violent convulsions after 20-30 seconds, cessation of regular respirations within 1 minute – cardiovascular arrest within a few minutes of exposure **Moderate Concentration**: Vertigo, nausea and headache appear very early and are followed by convulsions and coma. Death will occur if individual is not removed from the exposure.
Blister Agent Exposure: **Skin:** Insidious onset – no pain at time of exposure – erythema and blisters similar to a conventional burn; **Eyes:** hyperemia, lacrimation, pain, lid edema, iritis, edema of cornea; **Respiratory:** sneeze, rhinorrhea, hoarseness, cough, dyspnea, tachypnea; GI: indigestions, N/V, bloody diarrhea; **Cholinergic Effects**: miosis, N/V, fatigue, agitation, depression (difficult to differentiate from nerve exposure)

Nerve Agent Exposure: (Symptoms depend on the type of agent)
General signs/symptoms that should raise an index of suspicion are dimness of vision, runny nose, and tightness in the chest.
Muscarinic: Miosis (abnormal contraction of pupils), pain, blurred vision; increased salivation and mucous secretions, bronchoconstriction causing dyspnea, chest pain, cough, wheeze; increased GI peristalsis, N/V, cramps, diarrhea, flatulence; tachycardia, increased sweating.
Nicotinic: Myo fatigue, fasciculations, cramps, weakness, increased BP, tachycardia
CNS: Chronic Exposure - Difficulty in concentrating, restlessness, anxiety, insomnia, emotional labiality; Acute exposure – LOC, convulsions, coma, depression of respiratory center, death due to respiratory arrest.

References: Medical Readiness Training Handbook – Ch 10, http://www.vnh.org/MedAspChemBioWar/index.html; Medical Readiness Training Handbook – Ch 7

104.B. DoD Directive 6490.5, signed Feb. 23, 1999, attempts to implement combat stress control policies throughout the department. Initial treatment is simple, use the phrase 'three hots and a cot.' It's also important to treat combat stress casualties, as close to the front or to their units as possible and with the understanding they will return to duty. It's been found that if you ship people out of their units, most never go back, and they don't recover as well. One of the things to explain to the commands is that 80 to 90 percent of these people can be returned to duty usually within three days. If you start evacuating large numbers of soldiers, you're going to have an epidemic, especially if you get into a situation where there's real combat. Simple Treatment with Rest and Replenishment. Keep treatment for BF deliberately simple. Provide relative relief from danger but maintain a tactical atmosphere, which is not too comfortable. Provide rehydration, sleep, and hygiene.
References: http://www.dod.mil/news/Feb2000/n02222000_20002221.html; http://www.vnh.org/FM851/chapter1.html#18

105.D. Patient A – delayed Patient B – minimal
Patient C – minimal Patient D - immediate
Triage (sorting) is the evaluation and classification of casualties for the purposes of establishing treatment priorities and evacuation. It must be understood that the ultimate goal of combat medicine is to return the greatest number of soldiers to combat and the preservation of life and limb in those who cannot be returned. There are four triage categories. Reference: Medical Readiness Training Handbook. Ch 3

THE FOUR TRIAGE CATEGORIES
Immediate (Red) – severe, life threatening wounds requiring procedures of moderately short duration. Casualties in the group have a high likelihood of survival. Examples: Unstable chest and abdominal wounds, inaccessible vascular wounds with limb ischemia, incomplete amputations, open fractures of long bones, massive external bleeding; white phosphorus burns, partial/full thickness burns involving 15% - 40% BSA.
Delayed (Yellow) – casualties in this category can tolerate delay prior to operative intervention without unduly compromising the likelihood of a successful outcome. Examples: Stable abdominal wounds with probable visceral injury, but without significant hemorrhage; soft tissue wounds requiring debridement, maxillofacial wounds without airway compromise; vascular injuries with adequate collateral circulation, genitourinary tract disruptions, fractures requiring operative manipulation, debridement and external fixation, most eye and CNS injures.
Minimal (Green) – casualties with wounds that are so superficial that they require no more than cleansing, minimal debridement under local anesthesia, tetanus toxoid, and first-aid type dressings. Examples: Burns < 15% TBSA (with the exception of those involving the face, hands, or genitalia); upper extremity fractures, sprains, abrasions, early phases of symptomatic but unquantified radiation exposure, suspicion of blast injury (perforated tympanic membrane), and behavioral/psychiatric disorders.
Expectant (Blue): - Casualties with wounds so extensive that even if they were the sole casualty and had the benefit of optimal medical resource application, their survival would still be very unlikely. During a mass casualty situation these casualties would require an unjustifiable expenditure of limited resources, which would be more wisely applied to several other more salvageable individuals. (Note: this category is not used during civilian emergencies) Examples: Unresponsive patients with penetrating head wounds, high spinal cord injuries, mutilating explosive wounds involving multiple anatomical sites and organs, partial/full thickness burns in excess of 60% TBSA, convulsions and vomiting within 24 hours of radiation exposure, profound shock with multiple injuries and agonal respirations.

106.C. Immediate – see Question #105
Reference: Medical Readiness Training Handbook – Chapter 3

107.A. Prolonged loss of gastric contents, whether from vomiting or nasogastric suctioning, can lead to hypokalemia. A small part of this potassium loss is direct because these body fluids contain 5 to 8 mEq/liter potassium. More importantly, concomitant alkalosis and intravascular volume depletion contribute to renal potassium loss.

Metabolic alkalosis results in bicarbonaturia, which increases potassium excretion both directly, as a caution to balance the negative charge of bicarbonate ions, and indirectly, through stimulation of urinary sodium excretion, leading to worsening of intravascular volume depletion and stimulation of the renin-angiotensin-aldosterone system. In addition, potassium reabsorption by the collecting duct is affected by acid-base status. Thus metabolic alkalosis increases renal potassium excretion by increasing potassium secretion and probably by direct suppression of potassium reabsorption.
Reference: http://www.trauma.org/resus/permhypoeditorial.html

108.C. (See Question #105)
Patient 1 = minimal; Patient 2 = delayed; Patient 3 = expectant
Reference: Medical Readiness Training Handbook – Chapter 3

109.B. Since the exposure to infectious droplet nuclei usually cannot be eliminated, various environmental control methods can be used in high-risk areas to reduce the concentration of droplet nuclei in the air. Such measures include maximizing natural ventilation and controlling the direction of airflow. The increase of natural ventilation (the use of fans, and to be aware of the direction of airflow) can be implemented. Ventilation should be evaluated regularly to determine if they are effective. The simplest evaluation includes the use of smoke to monitor proper airflow direction.
Reference: http://who.int/gtb/publications/healthcare/PDF/WHO99-269.pdf