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Practice Test

Practice Questions

1. Which of the following extends from a wound under normal tissue and connects two structures, such as the wound and an organ?
   a. Undermining
   b. Fistula
   c. Tunneling
   d. Abscess

2. A patient has a wound on the right hip with tunneling and fistulae. Which of the following is MOST indicative of an abscess formation?
   a. Increased purulent discharge
   b. Increased wound pain
   c. Increased erythema and swelling at wound perimeter
   d. Erythematous, painful, swollen area 3 cm from wound perimeter

3. Which of the following laboratory tests is the most effective to monitor acute changes in nutritional status?
   a. Total protein
   b. Albumin
   c. Prealbumin
   d. Transferrin

4. On the eighth day of wound care, granulation tissue is evident about the wound perimeter, and the wound is beginning to contract. The wound is in which of the following phases of healing?
   a. Proliferation
   b. Inflammation
   c. Hemostasis
   d. Maturation

5. Which of the following is the correct procedure for applying Eutectic Mixture of Local Anesthetics (EMLA Cream) to a wound prior to debridement?
   a. Apply a thin layer (1/8 inch thick) to the wound for 15 minutes, leaving the wound open
   b. Apply a thick layer (1/4 inch thick) to the wound, extending 1/2 inch past the wound onto surrounding tissue, and cover with plastic wrap for 20 to 60 minutes
   c. Apply a thick layer (1/4 inch thick) to the wound surface only and cover with plastic wrap for 15 minutes
   d. Apply a thin layer (1/8 inch thick) to the wound surface only and cover with a loose dry dressing for 20 to 60 minutes
6. When doing a routine dressing change for a healing decubitus ulcer on the right hip, which is the most appropriate cleaning solution?
   a. Povidone-iodine solution  
   b. Hydrogen peroxide  
   c. Alcohol  
   d. Normal saline

7. Which of the following wound irrigation devices will provide approximately 8 psi in irrigant pressure to the wound surface?
   a. 35-mL syringe with 19-gauge Angiocath  
   b. 250-mL squeeze bottle  
   c. Bulb syringe  
   d. 6-mL syringe with 19-gauge Angiocath

8. Which of the following is the most important criterion when assessing a patient’s level of wound pain?
   a. Patient’s behavior  
   b. Type of wound  
   c. Patient’s report of pain  
   d. Patient’s facial expression

9. Which of the following is likely to have the MOST negative effect on wound healing for a 65-year-old woman?
   a. Hypoalbuminemia  
   b. BMI of 20.2  
   c. BMI of 28  
   d. Vegan diet

10. Which of the following is the most definitive method for obtaining a wound specimen for culture and sensitivities?
    a. Tissue biopsy  
    b. Sterile swab of wound  
    c. Needle biopsy  
    d. Sterile swab of discharge

11. A patient with an infected abdominal wound is taking a number of drugs. Which of the following is most likely to impair healing?
    a. Phenytoin  
    b. Corticosteroid  
    c. Prostaglandin  
    d. Estrogen

12. A burn extending through the dermis with obvious blistering would be classified as:
    a. First degree  
    b. Second degree  
    c. Third degree  
    d. Full thickness
13. Which of the following results from smoking cigarettes?
   a. Vasodilation
   b. Vasoconstriction
   c. Increased oxygen transport
   d. Increased oxygen tension

14. When calculating the ankle-brachial index (ABI), if the ankle systolic pressure is 90 and the brachial systolic pressure is 120, what is the ABI?
   a. 1.33
   b. 13.3
   c. 7.5
   d. 0.75

15. Using transcutaneous oxygen pressure measurement (TCPO$_2$), which of the following values indicates that oxygenation is adequate for healing?
   a. 18 mm Hg
   b. 20 mm Hg
   c. 30 mm Hg
   d. 42 mm Hg

16. The method of closure that involves leaving the wound open and allowing it to close naturally through granulation and epithelialization is healing by:
   a. Primary or first intention
   b. Secondary or second intention
   c. Tertiary or third intention
   d. Quaternary prevention

17. A patient's laboratory results show increased serum sodium and serum osmolality. The most likely cause is:
   a. Infection
   b. Overhydration
   c. Dehydration
   d. Malnutrition

18. Autolytic debridement is most effective for:
   a. Chronic wounds
   b. Large burns
   c. Small wounds without infection
   d. Necrotic wounds

19. Enzymatic debridement requires application of enzymes:
   a. 1 to 2 times daily
   b. 3 to 4 times daily
   c. 1 to 2 times weekly
   d. 3 to 4 times weekly
20. Which of the following indicates that sharp instrument debridement must be discontinued?
   a. Purulent discharge occurs
   b. Black eschar is removed
   c. Pain and bleeding occur
   d. Patient complains of fatigue

21. A patient has second and third degree burns on 30% of the body and is in severe pain. Which method of debridement is most indicated?
   a. Autolytic debridement
   b. Enzymatic debridement
   c. Sharp instrument debridement
   d. Surgical debridement

22. Which method of mechanical debridement may cause damage to granulation tissue and is generally contraindicated?
   a. Wet to dry dressings
   b. Whirlpool bath
   c. Irrigation under pressure
   d. Ultrasound treatment

23. Which of the following topical antimicrobials is most appropriate to treat nasal colonization of *Staphylococcus aureus* in a patient with an open wound?
   a. Cadexomer iodine
   b. Metronidazole
   c. Mupirocin (Bactroban®)
   d. Silver sulfadiazine

24. Which of the following is a contraindication to negative pressure wound therapy?
   a. Chronic Stage IV pressure ulcer
   b. Wound malignancy
   c. Unresponsive arterial ulcer
   d. Dehiscent surgical wound

25. Which of the following is the primary goal in referring a patient for multidisciplinary consultation?
   a. Prevention of complications
   b. Treatment of complications
   c. Education
   d. Identification of outcomes

26. Becaplermin (Regranex®) gel, a growth factor, is indicated for which type of wound?
   a. Venous stasis ulcer
   b. Pressure ulcer
   c. Sutured/stapled wound
   d. Diabetic ulcer
27. Which of the following types of dressing is indicated for treatment of a full-thickness infected wound with large amount of exudate?
   a. Alginate
   b. Hydrocolloid
   c. Hydrogel
   d. Semipermeable film

28. What hyperbaric oxygen therapy (HBOT) treatment regimen is usually recommended for chronic wounds and lower extremity diabetic ulcers?
   a. Compression at 2 ATA 3 times 60 minutes daily for 48 hours
   b. Compression at 2 to 2.4 ATA for 90 minutes daily for at least 30 treatments
   c. Compression at 3 ATA for 2 to 4 hour periods 3 to 4 times daily
   d. Compression at 2 to 2.5 ATA for 60 to 90 minutes 2 times daily for 2 to 3 days and then decreasing frequency over 4 to 6 days

29. Which NPUAP stage is a pressure ulcer characterized by deep full-thickness ulceration that exposes subcutaneous tissue with possible presence of slough, tunneling, and undermining, but without visibility of underlying muscle, tendon, or bone?
   a. Stage I
   b. Stage II
   c. Stage III
   d. Stage IV

30. What is the most common cause of shear?
   a. “Sheet burn”
   b. Elevating the head of the bed >30°
   c. Lifting the patient with a pull sheet
   d. Turning the patient side to side

31. What is the minimal thickness of a support surface for a chair?
   a. One inch
   b. Two inches
   c. Three inches
   d. Four inches

32. When turning and repositioning patients, what is the preferred position for the patient to reduce pressure?
   a. Prone
   b. Supine
   c. 30° lateral
   d. 90° side lying
33. On the Braden scale for predicting risk of developing pressure scores, a patient scores 2 (1 to 4 or 1 to 3 scale) on each of 6 parameters (total score 12). What is the patient’s risk of developing a pressure sore?
   a. Very minimal risk
   b. Breakpoint for risk
   c. High risk
   d. Extremely high risk (worst score)

34. Which type of overlay support surface is best for moisture control?
   a. Rubber
   b. Plastic
   c. Gel
   d. Foam

35. Which of the following characteristics indicates venous insufficiency?
   a. Pain ranges from intermittent to severe constant.
   b. Pulses are absent or weak.
   c. Brownish discoloration is evident about ankles and anterior tibial area
   d. Rubor occurs on dependency and pallor on foot elevation.

36. Which of the following is a typical example of a peripheral ulcer caused by arterial insufficiency?
   a. Deep, circular, necrotic ulcer on toe tips
   b. Irregular ulcer on medial malleolus
   c. Round ulcer on anterior tibial area
   d. Irregular ulcer on lateral malleolus

37. When assessing for capillary refill, arterial occlusion is indicated with refill time of:
   a. 15 seconds
   b. <2 seconds
   c. >20 seconds
   d. >2 to 3 seconds

38. A pulse graded as 1 on a 0 to 4 scale of intensity could be described as:
   a. Strong and bounding
   b. Weak, difficult to palpate
   c. Absent
   d. Normal, as expected

39. Which of the following off-loading measures is usually the MOST effective for treatment of neuropathic ulcers?
   a. Total contact cast
   b. Removable cast walkers
   c. Wheelchairs
   d. Half-shoes
40. Which of the following is characteristic of Charcot’s arthropathy (Charcot’s foot)?
   a. Severe pain and inflammation
   b. High arch and hypersensitivity
   c. Muscle spasms, increased pain, and inflammation
   d. Weak muscles, reduced sensation, inflammation, and collapsed arch

41. Which of the following is necessary to manage peripheral lymphedema of the legs?
   a. Daily diuretics
   b. Static compression bandaging
   c. Off-loading
   d. Bed rest

42. Which measurement must be used to evaluate the safety of static compression therapy to manage edema?
   a. Capillary refill time
   b. Venous refill time
   c. Ankle-brachial index
   d. Blood pressure

43. Which of the following pharmacological measures is used to maximize perfusion with intermittent claudication?
   a. Antiplatelet agents, such as Plavix®
   b. Vasodilators, such as cilostazol (Pletal®)
   c. Thrombolytics
   d. Anticoagulants, such as warfarin (Coumadin®)

44. Which of the following may be a subtle indication of infection with arterial insufficiency?
   a. Fever and chills:
   b. Decrease in necrotic area
   c. Decreased pain or edema
   d. Fluctuance of periwound tissue

45. A patient with venous insufficiency requires compression therapy and has Unna’s boot applied but must be on bed rest for four weeks. Which action is correct?
   a. Continue Unna’s boot therapy during bed rest, but change 2 times weekly
   b. Continue Unna’s boot therapy, but keep leg elevated
   c. Discontinue Unna’s boot therapy during the bed rest period
   d. Continue Unna’s boot therapy, but change only every 2 weeks

46. When doing the nylon monofilament test, how many test sites should be used?
   a. 2
   b. 4
   c. 8
   d. 10
47. The NEXT step in wound care for a traumatic wound, such as a dog bite, after stabilizing the patient’s condition and stopping bleeding is
   a. Administer antibiotics
   b. Administer tetanus toxoid/immune globulin as indicated
   c. Flush wound with copious amounts of normal saline under pressure
   d. Scrub wound with povidone-iodine

48. A patient with pemphigus vulgaris has generalized lesions with ulcerations and crusting, causing the patient’s skin to adhere to the bed sheets. How can the patient manage this?
   a. Apply talcum powder liberally to the sheets
   b. Set an alarm to turn frequently during the night
   c. Place a piece of soft plastic over the sheets
   d. Use an alternating pressure mattress

49. What is the most effective treatment for a fungating neoplastic wound of the breast that is oozing blood from eroded vasculature?
   a. Charcoal dressing
   b. Hemostatic dressing and cauterization with silver nitrate
   c. Cleansing with ionic solution
   d. Surgical debridement

50. One of the primary treatments for contact dermatitis with an itching, blistering rash is
   a. Nonadherent dressings
   b. Topical corticosteroid
   c. Antibiotics
   d. Cleansing with povidone-iodine
Answers and Explanations

1. B: A fistula extends under normal tissue away from the wound and connects two structures, such as the wound and an organ or the wound and the skin. Undermining occurs when damaged tissue lies underneath intact skin about the wound perimeter. Tunneling is damaged tissue extending from the wound under normal tissue, but not opening to the skin or other structures. An abscess is a collection of purulent material in a localized area, often occurring with a fistula.

2. D: Abscesses often form in conjunction with fistulae. Typical indications include erythema, pain, and swelling above the localized area of the abscess. If the abscess is deep within the tissue or within an internal organ, however, obvious signs of abscess formation may not be evident, and symptoms may be less specific, including general malaise, abdominal pain, chills, fever, lethargy, diarrhea, and anorexia. Additional symptoms may be specific to the site of the abscess, for example a perirenal abscess may cause flank pain.

3. C: Prealbumin is most commonly monitored for acute changes in nutritional status because it has a half-life of only 2 to 3 days. Prealbumin decreases quickly when nutrition is inadequate and rises quickly in response to increased protein intake. Protein intake must be adequate to maintain normal levels of prealbumin.
   - Normal value: 16 to 40 mg/dL
   - Mild deficiency: 10 to 15 mg/dL
   - Moderate deficiency: 5 to 9 mg/dL
   - Severe deficiency: <5 mg/dL.

Total protein levels and transferrin levels may be influenced by many factors, so they are not reliable measures of nutritional status. Albumin has a half-life of 18 to 20 days, so it is more sensitive to long-term protein deficiencies than to short-term deficiencies.

4. A: Proliferation (days 5 to 20) is characterized by granulation tissue starting to form at wound perimeter, contracting the wound, and epithelialization, resulting in scar formation. Hemostasis (within minutes) occurs as platelets seal off the vessels and the clotting mechanism begins. Inflammation (days 1 to days 4 to 6) is characterized by erythema and edema as phagocytosis removes debris. During maturation or remodeling (days 21 plus), scar tissue continues to form until the scar has about 80% of original tissue strength, and the wound closes; the underlying tissue continues to remodel for up to 18 months.

5. B: Eutectic Mixture of Local Anesthetics (EMLA Cream) is applied thickly (1/4 inch) to both the surface of the wound and surrounding tissue, extending about 1/2 inch past the wound. After application, the wound must be covered with plastic wrap for 20 to 60 minutes to numb the tissue. EMLA cream is effective for about an hour after the wrapping is removed. EMLA can interact with a number of different medications, such as antiarrhythmics, anticonvulsants, and acetaminophen, so medications should be carefully reviewed prior to administration.

6. D: Normal saline is the most appropriate wound-cleansing solution. Antiseptic solutions should be avoided, as they may damage granulation tissue and retard healing, because they interfere with fibroblast cells necessary for healing of the wound, cause increased pain, and do not significantly reduce overall bacterial load. In heavily-contaminated or necrotic wounds, topical antiseptic
solutions, such as dilute povidone-iodine or hydrogen peroxide, may be used for a short period of time to reduce surface bacteria and foul odor.

7. A: A 35-mL syringe with 19-gauge needle provides irrigation pressure at about 8 psi. A squeeze bottle (250 mL) provides about 4.5 psi, but a bulb syringe usually only ≤2 psi. Both syringe/catheter and needle size affect irrigant pressure. Pressures <4 psi do not provide adequate wound cleansing, but pressures >15 psi can result in wound trauma.
   - 6 mL/19 gauge = 30 psi
   - 12 mL/19 gauge = 20 psi
   - 12 mL/22 gauge = 13 psi
   - 35 mL/21 gauge = 6 psi
   - 35 mL/25 gauge = 4 psi

8. C: Perceptions and expressions of pain vary widely from one individual to another, so the most important criterion for evaluating pain is the patient’s own report of pain. Cultural differences have a role in how people express pain, with some cultures typically appearing more stoic than others. Using a 1 to 10 pain scale is an effective tool for people who are cognitively alert. If people are not able to report their pain level, then observation of behavior and facial expressions may give clues to their need for pain medication.

9. A: Hypoalbuminemia is likely to have the most negative effect on wound healing. Hypoalbuminemia is an indication of protein malnutrition (kwashiorkor) and may cause delayed wound healing because of inadequate nutrition. A BMI of 20.2 is within normal range (18.5 to 24.9) and indicates normal weight. A person with a BMI of 29 is overweight, but not obese. Both being underweight (BMI <18.5) and obese (BMI ≥30) can interfere with the body’s ability to heal. BMI alone is not adequate to assess nutritional status or healing ability and vegan diets can provide adequate nutrition.

10. A: The most definitive method of obtaining a wound specimen for culture and sensitivities is with a tissue biopsy. A needle biopsy can also provide an adequate sample in many cases. Swabbing a wound with a sterile applicator often does not provide an adequate sample, because this method obtains material only from the wound surface, which may include both pathogenic agents from the wound and contamination from skin bacteria. The tissue itself must be cultured, not just the discharge.

11. B: Corticosteroids may impair wound healing by interfering with vascular proliferation and epithelialization. The anti-inflammatory effect may interfere with the inflammatory phase of healing by decreasing migration of macrophages and polymorphonuclear leukocytes to the wound, interfering with angiogenesis, and increasing susceptibility to wound infection. Other drugs that may impair healing include vasoconstrictors, NSAIDs, aspirin, colchicine, immunosuppressant’s, DMARDS (antirheumatoid arthritis drugs), and anticoagulants. Some drugs appear to promote wound healing, including phenytoin, prostaglandin, and estrogen.

12. B: A burn extending through the dermis with obvious blistering would be classified as a second-degree burn. A first-degree burn is superficial and involves only the epidermis. First and second-degree burns, like other wounds, may also be classified as partial-thickness injuries, because the vessels and glands necessary for healing remain intact. A third-degree burn, also classified as a full-
thickness injury, extends through the dermis and into the underlying subcutaneous tissue and may extend through vessels, nerves, muscles and even to the bone.

13. B: The nicotine in cigarettes is a powerful vasoconstrictor and interferes with oxygen transport. The carbon monoxide from smoking displaces oxygen on hemoglobin, decreasing the level of oxygen in the blood. Vasoconstriction reduces delivery of nutrients needed for healing. Peripheral blood flow can be reduced by 50% for up to 60 minutes after smoking a cigarette, and oxygen tension may be reduced for 120 minutes. Additionally, nicotine increases the heart rate and blood pressure, so the heart requires more oxygen to function adequately, while receiving less.

14. D: The ankle-brachial index (ABI) examination evaluates peripheral arterial disease of the lower extremities. The ankle and brachial systolic pressures are obtained, and then the ankle systolic pressure is divided by the brachial systolic pressure to obtain the ABI. If the ankle systolic pressure is 90 and the brachial systolic pressure is 120: 90 divided by 120 = 0.75. Normal value is 1 to 1.1 with lower values indicating decreasing perfusion. A value of 0.75 indicates severe disease and ischemia.

15. D: Transcutaneous oxygen pressure measurement (TCPO₂) is a noninvasive test that measures dermal oxygen, to show the effectiveness of oxygen in the skin and tissues. A value of >40 mm Hg indicates adequate oxygenation for healing. Values of 20 to 40 mm Hg are equivocal findings, and values < 20 mm Hg indicate marked ischemia, affecting healing. Two or three different sites on the lower extremities should be tested to give a more accurate demonstration of oxygenation. TCPO₂ is often used to determine if oxygen transport is sufficient for hyperbaric therapy.

16. B: Secondary healing (healing by second intention) involves leaving the wound open and allowing it to close through granulation and epithelialization. Primary healing (healing by first intention) involves surgically closing a wound by suturing, flaps, or split or full-thickness grafts to completely cover the wound. Tertiary healing (healing by third intention) is also sometimes called delayed primary closure because it involves first debriding the wound and allowing it to begin healing while open and then later closing the wound through suturing or grafts. Quaternary prevention includes activities to prevent iatrogenic disorders/effects.

17. C: Increased serum sodium and serum osmolality indicate dehydration. Serum sodium measures the sodium level in the blood.
   - Normal values: 135 to 150 mEq/L
   - Dehydration: >150 mEq/L

   Serum osmolality measures the concentration of ions, such as sodium, chloride, potassium, glucose, and urea in the blood. Levels increase with dehydration, which stimulates the antidiuretic hormone, resulting in increased water reabsorption and more concentrated urine in an effort to compensate.
   - Normal levels: 285 to 295 mill-osmoles per kilogram/ H₂O
   - Dehydration: >295 mOsm/kg/ H₂O

18. C: Autolytic debridement is effective for small wounds without infection, but it is slower than other types of debridement. Autolytic debridement requires an occlusive or semiocclusive dressing to create a warm moist wound environment. Any moisture-retentive dressing, such as hydrocolloids, alginate, and hydrogels, and transparent film, can promote some degree of autolytic
debridement, but because of drainage and odor, surrounding tissue must be protected with some type of skin barrier to prevent tissue maceration.

19. A: Enzymatic (chemical) debridement requires application of enzymes 1 to 2 times daily and is most effective for a wound with necrosis and eschar, which must be crosshatched if it is dry. Enzymes include the following:  
- Collagenase, applied 1 time daily. Wound pH must remain at 6 to 8 or the enzyme deactivates. Deactivated by Burrows solutions, hexachlorophene, and heavy metals.  
- Papain/urea combinations, applied 1 to 2 times daily. Wound pH must remain at 3 to 12. Deactivated by hydrogen peroxide and heavy metals.

20. C: Pain and bleeding indicate that viable tissue is being débrided, so debridement must be discontinued. Only necrotic tissue/eschar should be removed by sharp debridement, removing small layers at a time to prevent injury to viable tissue. Purulent discharge often occurs with an infected wound. While patient fatigue is a concern, positioning the patient for comfort, explaining the procedure, and reassuring the patient may help the patient tolerate continuing the procedure until the wound is adequately débrided.

21. D: Surgical debridement is most commonly used when very large amounts of tissue must be débrided, such as with extensive burns or when there is immediate debridement is needed in order to effectively treat a serious wound infection. General anesthesia allows extensive debridement to be done without the patient suffering associated pain and trauma, although postoperative pain is common. One advantage is that most debridement can be done in one procedure. Lasers may also be used for surgical debridement, with pulsed lasers posing less risk to adjacent tissue than continuous lasers.

22. A: In the past, wet-to-dry gauze dressings were frequently used for wound care; but wet-to-dry dressings have little use in current wound care unless the wound is very small, because the gauze adheres to the wound and can disrupt granulation or epithelization. While a whirlpool bath may effectively cleanse debris from a wound, concerns about cross infection have resulted in less frequent use of the whirlpool. Ultrasound may effectively débride wounds. Irrigating a wound with pressurized solution can be effective if the pressure remains in the optimal range, usually 8 to 12 psi.

23. C: Mupirocin is effective against Gram-positive organisms, such as *Staphylococcus aureus* and MRSA, and is used for treating nasal colonization to decrease risk of wound infection. Cadexomer iodine is effective against a wide range of bacteria (staph, MRSA, strep, and pseudomonas), viruses, and fungi and is placed in the wound where beads of iodine swell in contact with exudate, releasing the iodine into the wound. Metronidazole is effective against bacterial infections, such as MRSA: Silver sulfadiazine is often used to treat burns and is effective against Gram-positive organisms, including Staph, MRSA, Strep, and Pseudomonas.

24. B: Contraindications to negative pressure wound therapy include wound malignancy, untreated osteomyelitis, exposed blood vessels or organs, and nonenteric, unexplored fistulas. Negative pressure therapy uses subatmospheric (negative) pressure with a suction unit and a semi occlusion vapor-permeable dressing. The suction reduces periwound and interstitial edema, decompressing vessels, improving circulation, stimulating production of new cells, increasing the rate of granulation and reepithelialization and decreasing colonization of bacteria NPWT is used for a
variety of difficult-to-heal wounds, especially those that show less than 30% healing in 4 weeks of postdebridement treatment or those with excessive exudate.

25. A: The primary goal in referring a patient for multidisciplinary consultation is to prevent complications. A multidisciplinary team is composed of experts in a number of different fields, collaborating to address the complex problems associated with wound care and underlying pathology. Instead of the serial approach to problem solving involved in the traditional model of care, where referrals are made in response to problems that arise with little communication among specialists, the multidisciplinary approach attempts to identify potential problems and institute preventive measures at the onset, with all members communicating and sharing information.

26. D: Becaplermin (Regranex®) gel is indicated for treatment of peripheral diabetic ulcers extending into subcutaneous tissue or deeper with adequate perfusion. Application follows debridement and usually about 3 weeks offloading if healing is not adequate. Becaplermin is a growth factor derived from human platelets. It is not approved for use with pressure ulcers and stasis ulcers and should not be used with closed (sutured/stapled) wounds. Becaplermin is associated with increased risk of developing malignancy and increased risk of death from existing malignancy.

27. A: Alginates are effective for infected full-thickness wounds with undermining, tunneling, and large amounts of exudate. They are made from brown seaweed and absorb exudate, forming a hydrophilic gel that conforms to the shape of the wound. Hydrocolloids are effective for clean wounds with granulation and minimal to moderate exudate, but they increase the risk of anaerobic infection and hypergranulation. Hydrogels are effective for partial- or full-thickness wounds that are dry or have a small amount of exudate. Hydrogels can be used with necrotic and infected wounds. Semipermeable film is effective over intravenous sites or dry, shallow, partial-thickness wounds.

28. B: The usual hyperbaric oxygen therapy (HBOT) for chronic wounds and lower extremity diabetic ulcers is compression at 2 to 2.4 ATA for 90 minutes daily, with at least 30 treatments. Oxygen toxicity may occur with treatment over 90 minutes. Hyperbaric oxygen therapy (HBOT) is treatment in a high-pressure chamber while breathing 100% oxygen, which increases available oxygen to tissues by 10 to 20 times, improving perfusion. HBOT results in
- Hyperoxygenation of blood and tissue
- Vasoconstriction, reducing capillary leakage
- Angiogenesis, because of increased fibroblasts and collagen
- Increased effectiveness of antibiotics needing active transport across cell walls (fluoroquinolone, amphotericin B, aminoglycosides)

29. C: This is a Stage III ulcer. NPUAP stages include
- Suspected deep tissue injury: purple/reddish discoloration and boggy, mushy, or firm tissue
- Stage I: skin intact with localized nonblanching reddened area, often over bony prominences
- Stage II: abrasion, blister, or slightly depressed area with red/pink wound bed, partial-thickness skin loss, but no slough
- Stage III: deep, full-thickness ulceration that exposes subcutaneous tissue with possible presence of slough, tunneling and undermining without visibility of underlying muscle, tendon, or bone
- Stage IV: deep, full-thickness ulceration with extensive damage, necrosis of tissue extending to muscle, bone, tendons, or joints
- Unstageable: cannot be staged before debridement because of the extent of slough/eschar

30. B: The most common cause of shear is elevation of the bed >30°. Shear occurs when the skin stays in place and the underlying tissue in the deep fascia over the bony prominences stretches and slides, damaging tissue and vessels, which become thrombosed, often resulting in undermining and deep ulceration. Friction against the sheets holds the skin in place while the body slides down the bed, causing pressure and damage in the sacrococcygeal area. The head of the bed should be maintained <30° except for the brief periods when the patient is lifted with a pull sheet or lifting device and turned, at least every 2 hours.

31. A: Support surface material should provide at least one inch of support under areas to be protected when in use to prevent “bottoming out.” (Check by placing a hand palm up under the overlay, below the pressure point.). Static support surfaces are appropriate for patients who can change position without increasing pressure to an ulcer. Those needing assistance to move require dynamic support surfaces. Dynamic support surfaces are also needed when static pressure devices provide less than an inch of support.

32. C: The 30° lateral position is better than the 90° side-lying or supine positions because it prevents pressure over bony prominences. Prone (face down) is not comfortable for most patients and requires careful positioning. Devices such as pillows or foam should be used to correctly position patients so that bony prominences are protected and not in direct contact with each other. Patients should not be positioned on ulcers. Goals for repositioning and a turning schedule of at least every 2 hours should be established for each individual and documented.

33. C: A Braden score of 12 indicates high risk. The Braden scale rates 5 areas (sensory perception, moisture, activity, mobility, and usual nutrition pattern) with a 1 to 4 scale and one area (friction and shear) with a 1 to 3 scale. Lower scores correlate with increased risk. The scores for all six items are totaled, and a risk is assigned according to the number.
   - 23 (best score): excellent prognosis with very minimal risk
   - ≤ 16: breakpoint for risk of pressure ulcer (will vary somewhat for different populations)
   - 12 to 14: high risk
   - 6 (worst score): prognosis is very poor with strong likelihood of developing pressure ulcer

34. D: Foam overlays provide the best moisture control for preventing moisture damage to skin. Some materials, such as rubber, plastic, or gel, may increase perspiration and moisture, while some porous materials, including some types of foam, may reduce perspiration. Foam varies considerably in density and indentation load definition (ILD). ILD is the number of pounds of pressure needed to make an indentation in a 4-inch foam of 25% of its thickness, using an indentation of 50 square inches. Foam can be closed-cell (resistant) or open cell (visco-elastic). Open-cell foam is temperature sensitive, helping it to mold to the body as it reaches the patient’s body temperature.

35. C: Venous insufficiency is characterized by hemosiderin staining (brownish discoloration) about the ankles and anterior tibial area. Pain is usually aching and cramping, and peripheral pulses are present. Lipodermatosclerosis occurs in the lower leg area as the tissue becomes fibrotic from fibrin and protein (collagen) deposits, causing the skin to feel waxy and the tissue to harden, with
narrowing of the tissue around the ankle compared to proximal tissue above. Venous (stasis) dermatitis is inflammation of the epidermis and dermis, resulting in scaly, erythematous, crusty, weepy, itchy skin, usually in the lower leg (ankle and tibia).

36. A: Arterial ulcers are characterized by painful, deep, circular, often necrotic ulcers on toe tips, toe webs, heels or other pressure areas, with little edema of extremity. Because circulation is impaired, peripheral pulses are weak or absent and skin is pale, shiny, and cool with loss of hair on toes and feet and little edema. Nails are thick, with ridges. Rubor occurs on dependency and pallor on foot elevation. Venous ulcers, by contrast, are typically superficial, irregular ulcers on the medial or lateral malleolus and sometimes on the anterior tibial area, with varying pain and moderate to severe edema of extremity.

37. D: Capillary refill time >2 to 3 seconds indicates arterial occlusion. To assess capillary refill, grasp the toenail bed between the thumb and index finger and apply pressure for several seconds to cause blanching. Release the nail and count the seconds until the nail regains normal color. Check both feet and more than one nail bed. Assess venous refill time with the patient lying supine for a few moments and then have the patient sit with the feet dependent. Observe the veins on the dorsum of the foot and count the seconds before normal filling. Venous occlusion is indicated with times >20 seconds.

38. B: A pulse graded 1 would be weak and difficult to palpate. Pulses should first be evaluated with the patient in a supine position and then again with the legs dependent, checking bilaterally and proximally to distally to determine if the intensity of pulse decreases distally. Pedal pulses should be examined at both the posterior tibialis and the dorsalis pedis. The pulse should be evaluated for rate, rhythm, and intensity, which is usually graded on a 0 to 4 scale.
   - 0 – pulse absent
   - 1 – weak, difficult to palpate
   - 2 – normal, as expected
   - 3 – full
   - 4 – strong and bounding

39. A: Total contact casts (TCC) encase the lower extremity in a walking cast that equalizes pressure of the plantar surface. The casts may have windows over pressure ulcers to allow observation and treatment. TCC is more successful than other off-loading measures, possibly because people restrict activity more. Removable cast walkers allow patients to remove the casts, but studies show that people only use them 28% of the time, decreasing effectiveness. Wheelchairs allow dependency of using a limb but prevent pressure. Half shoes may have a high walking heel with the front of the foot elevated off of the ground.

40. D: Charcot’s arthropathy results from neuropathy that weakens the muscles of the foot and reduces sensation. As muscles supporting the bones weaken, the bones become weak and fracture easily. Because of the lack of sensation, the patient may be unaware of the fracture and continue to walk, causing further deformity. It causes inflammation, swelling, and increased temperature in the foot, and but usually no pain. In time, the joint dislocation causes the arch to collapse. Treatment includes
   - Compression bandages for 2 to 3 weeks
   - Total contact or non–weight-bearing cast for up to 9 months
   - Gradual weight-bearing after skin has resumed its normal temperature
41. B: Lymphedema is managed with static compression bandaging during the day, providing 40 to 60 mmHg pressure. Bandaging maybe removed at night if the limb is elevated. Dynamic compression may be used, but it can displace fluid or further damage lymphatics if not monitored carefully. Diuretics do not help. Lymphedema is a dysfunction of the lymphatic system, resulting in a debilitating, progressive disease. Proteins, lipids, and fluids accumulate in interstitial spaces, causing pronounced induration, edema, and fibrosis of tissues, resulting in distention and thick fibrotic skin with orange discoloration (peau d’orange). Scaly keratotic debris collects, and the skin develops cracks and leaks of lymphatic fluid.

42. C: Static compression is contraindicated if the ankle brachial index (ABI) is <0.5. Compression therapy serves as a preventive and therapeutic treatment to eliminate edema. It is contraindicated in those with heart failure or peripheral arterial disease, because it may further impair compromised arterial circulation.

- High level compression provides therapeutic compression at 30 to 40 mmHg at the ankle. Some may provide pressure at 40 to 50 mmHg. ABI should be >0.8.
- Low level compression provides modified pressure up to 23 mmHg at the ankle. ABI must be >0.5 and <0.8. While this level is less than therapeutic, even low levels of pressure may provide some therapeutic benefit.

43. B: While vasodilators may divert blood from ischemic areas, some, such as cilostazol (Pletal®) or pentoxifylline (Trental®), may be indicated. Vasodilators dilate arteries and decrease clotting and are used for control of intermittent claudication. If medications do not relieve symptoms, surgical intervention, such as bypass grafts, angioplasty, and even amputation (if ischemia is irreversible) may be necessary. Surgery is indicated with ABI <0.5 or >0.5 if the patient fails to respond to medication and lifestyle changes, or with intolerable, incapacitating pain.

44. D: Subtle indications of infection with arterial insufficiency include fluctuance (soft, wavelike texture) of periwound tissue on palpation, increased pain in the ischemic limb, or ulcer and/or increased edema, increased area of necrosis, and slight erythema about wound perimeter. Because of the lack of circulation, the normal signs of inflammation and infection may not be evident with arterial insufficiency, so observing for subtle signs of infection is critically important. Prompt identification and treatment is necessary to prevent cellulitis and/or osteomyelitis, which might necessitate amputation.

45. C: Unna’s boot (ViscoPaste®) is a gauze wrap impregnated with zinc oxide, glycerin, or gelatin to provide a supporting compression “boot” to support the calf muscle pump during ambulation, so it is not suitable for nonambulatory patients and should be discontinued during the bed rest period. The bandage must be applied carefully, without tension. It may either be left open to dry or covered with an elastic or self-adherent wrap. The dressings are changed according to individual needs, determined by a decrease in edema, the amount of exudate, and hygiene, with dressing changes ranging from twice weekly to once every other week.

46. D: The nylon monofilament test is evaluated according to how many of 10 test sites the patient is able to detect, with <4 indicative of decreased sensation. To test, use this procedure:
- Ask the patient to indicate when the monofilament pressure is felt.
- Grasp a length of #10 monofilament in the instrument provided.
- Touch the monofilament against the bottom of the foot and then press the monofilament into the foot until the line buckles.
- Test the great, 3rd, and 5th toes.
- Test the left, medial, and right areas of the ball of the foot
- Test the right and left of the arch.
- Test the middle of the heel.

47. C: Traumatic injuries are usually contaminated, and once the patient is stable and the bleeding is controlled, the wound should be flushed with copious amounts of isotonic normal saline under pressure (8 to 12 psi), usually 100 to 200 mL of irrigant per inch of wound. Prophylactic antibiotics may be given for 3 to 7 days for superficial wounds and up to 14 days with evidence of infection. Tetanus toxoid or tetanus immune globulin may be necessary if vaccination is not current. Animal bites may also require rabies postexposure prophylaxis (PEP).

48. A: Applying talcum powder liberally to the sheets may help keep the patient’s skin from sticking to them. Pemphigus vulgaris (PV), an autoimmune disorder causing blistering of both the skin and the mucus membranes (presenting symptom in 50 to 70% of patients), creates burn-like wounds, which may heal slowly or not at all, often starting in the mouth and genital areas. Untreated, the disorder can lead to death. Blisters on skin rupture, causing ulcerations, and those in folds may develop hypergranulation and crusting. Treatment includes corticosteroids, immunosuppressive drugs, and plasmapheresis to remove antibodies.

49. B: The ulcers of fungating neoplastic wounds bleed as the vasculature erodes so hemostatic dressings (gel foam, alginates) and cauterization with silver nitrate may be necessary. Using nonadherent dressings or long-term dressing reduces trauma. Charcoal dressings control odor, and ionic cleansers or antiseptics may be used to cleanse the wound. A foam, alginate, or hydrofiber dressing or wound pouch is used to manage exudate. Skin sealants, barrier ointments, and hydrocolloid wafers to anchor tape protect periwound tissue.

50. B: With contact dermatitis, topical corticosteroid is used to control inflammation and itching. Skin should be gently cleansed with water or oatmeal bath and left open without dressings. Antibiotics are needed only if a secondary infection occurs. Caladryl® lotion may relieve itching, and antihistamines may reduce allergic response. Contact dermatitis is a localized response to contact with an allergen, resulting in a rash that may blister and itch. Common allergens include poison oak, poison ivy, latex, benzocaine, nickel, and preservatives, but people may react to a wide range of items, preparations, and products.