

Chapter 01: Foundations of Clinical Sonography

Hagen-Ansert: Textbook of Diagnostic Sonography, 8th Edition

MULTIPLE CHOICE

1. Historically, the development of ultrasound began shortly after:
 - a. radio communication in World War I.
 - b. sonar in World War II.
 - c. nuclear testing in World War II.
 - d. the launching of Sputnik.

ANS: B

World War II brought sonar equipment to the forefront for defense purposes. Ultrasound was influenced by the success of sonar equipment.

PTS: 1

REF: p. 7

OBJ: Detail a timeline for pioneers in the advancement of medical diagnostic ultrasound.

TOP: Historical overview of sound theory and medical ultrasound

2. The early applications of obstetric ultrasound were initiated by:
 - a. Joseph Holmes.
 - b. Ian Donald.
 - c. John Howry.
 - d. William Fry.

ANS: B

The early obstetric compound scanner was built by Tom Brown and Dr. Ian Donald in Scotland in 1957.

PTS: 1

REF: p. 7

OBJ: Detail a timeline for pioneers in the advancement of medical diagnostic ultrasound.

TOP: Historical overview of sound theory and medical ultrasound

3. Visualization of the cardiac structures in the heart was discovered by:
 - a. Joseph Holmes.
 - b. Ian Donald.
 - c. Hertz and Edler.
 - d. George Ludwig.

ANS: C

In 1954, echocardiographic techniques were developed in Sweden by Drs. C.H. Hertz and I. Edler.

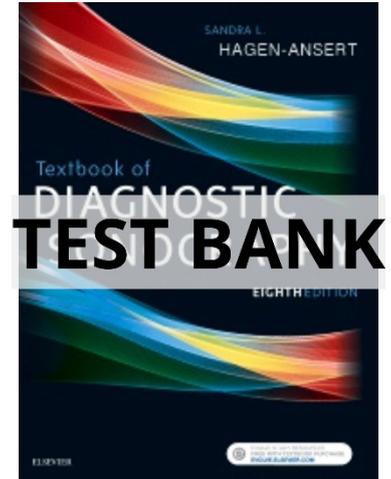
PTS: 1

REF: p. 7

OBJ: Detail a timeline for pioneers in the advancement of medical diagnostic ultrasound.

TOP: Historical overview of sound theory and medical ultrasound

4. Which one of the following statements about the role of sonographers is *false*?



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- a. Sonographers perform ultrasound studies and gather diagnostic data independent of the physician.
- b. Sonographers must possess intellectual curiosity and perseverance.
- c. Sonographers must have a technical aptitude.
- d. Sonographers must be able to communicate on different levels.

ANS: A

A sonographer performs ultrasound studies gathering diagnostic data under *both* the direct and the indirect supervision of a physician. They also must assess clinical history and symptoms, interpret laboratory values, and understand other diagnostic examinations.

PTS: 1 REF: p. 5 OBJ: Describe a career in ultrasound.
TOP: Role of the sonographer

5. In soft tissues, the assumed propagation velocity is (*in meters per second*):
 - a. 1320.
 - b. 1450.
 - c. 1540.
 - d. 1650.

ANS: C

In soft tissues, the assumed propagation velocity (speed) is 1540 meters per second.

PTS: 1 REF: p. 9
OBJ: Demonstrate an understanding of the basic principles and terminology of ultrasound.
TOP: Introduction to basic ultrasound principles - Acoustics

6. Diagnostic ultrasound uses the frequencies of:
 - a. 10 to 15 kHz.
 - b. 1 to 20 kHz.
 - c. 100 to 1000 Hz.
 - d. 1 to 20 MHz.

ANS: D

Diagnostic application of ultrasound uses frequencies of 1 to 20 million cycles per second (1 to 20 MHz).

PTS: 1 REF: p. 9
OBJ: Demonstrate an understanding of the basic principles and terminology of ultrasound.
TOP: Introduction to basic ultrasound principles - Acoustics

7. The device that converts energy from one form to another is called the:
 - a. digitizer.
 - b. transducer.
 - c. scan converter.
 - d. beam former.

ANS: B

Piezoelectric elements (transducers) convert electric energy into ultrasound energy and vice versa.

PTS: 1 REF: p. 12

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OBJ: Demonstrate an understanding of the basic principles and terminology of ultrasound.

TOP: Introduction to basic ultrasound principles - Acoustics

8. The angle of reflection is equal to the:
- acoustic impedance.
 - angle of incidence.
 - refraction.
 - image resolution.

ANS: B

Angle of reflection is the angle between the reflected sound direction and a line perpendicular to the media boundary.

PTS: 1 REF: p. 6

OBJ: Demonstrate an understanding of the basic principles and terminology of ultrasound.

TOP: Historical overview of sound theory and medical ultrasound

9. The display mode that shows time along the horizontal axis and depth along the vertical axis is:
- A mode.
 - B mode.
 - M-mode.
 - real-time.

ANS: C

Motion mode (M-mode) displays the depth along the vertical axis versus the time along the horizontal axis.

PTS: 1 REF: p. 15

OBJ: Identify ultrasound instruments and discuss their uses.

TOP: Pulse-echo display modes - M-mode

10. Which one of the following statements about the Doppler principle is *false*?
- Doppler refers to a change in frequency in which the motion of laminar or turbulent flow is detected within a vascular structure.
 - The beam should be perpendicular to the flow.
 - The Doppler shift is directly proportional to the velocity of the red blood cell.
 - If the red blood cell moves away from the transducer, then the fall in frequency is directly proportional to the velocity and direction of the red blood cell movement.

ANS: B

The beam should be parallel to the flow to obtain the maximum velocity. The frequency of the Doppler shift is proportional to the cosine of the Doppler angle. At a 90-degree angle (perpendicular to flow), the Doppler shift is zero, regardless of the flow velocity.

PTS: 1 REF: p. 18 |p. 19

OBJ: Discuss three-dimensional and Doppler ultrasound.

TOP: Doppler Ultrasound - Doppler Shift

11. The Fresnel zone is also called the:
- far field.

- b. focal point.
- c. near zone.
- d. Nyquist limit.

ANS: C

The Fresnel or near zone is the field closest to the transducer during the formation of the sound beam.

PTS: 1 REF: p. 18

OBJ: Demonstrate an understanding of the basic principles and terminology of ultrasound.

TOP: System Controls for Image Optimization - Focal Zone

12. The higher the transducer frequency, the:
- a. shorter the wavelength.
 - b. faster the frame rate.
 - c. deeper the penetration depth.
 - d. slower the frame rate.

ANS: A

The higher the frequency, the shorter the wavelength (inversely related).

PTS: 1 REF: p. 18 | p. 22

OBJ: Demonstrate an understanding of the basic principles and terminology of ultrasound.

TOP: Introduction to basic ultrasound principles - Image resolution

Chapter 02: Essentials of Patient Care for the Sonographer

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MULTIPLE CHOICE

1. The most common arrhythmias are:
- a. supraventricular tachycardia.
 - b. tachycardia and bradycardia.
 - c. heart block.
 - d. asystole.

ANS: B

Tachycardia, a heart rate above 100 bpm, and bradycardia, a heart rate below 60 bpm, are the most common cardiac arrhythmias.

PTS: 1 REF: p. 26

OBJ: Defined patient-focused care.

TOP: Basic patient care

2. The normal amount of oxygen in the blood is:
- a. 90%.
 - b. 85%.
 - c. 80%.
 - d. 75%.

ANS: A

A normal reading for a person breathing room air is above 90%.

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PTS: 1 REF: p. 27 OBJ: Define patient-focused care.
TOP: Basic patient care

3. A shortness of breath or the feeling of not getting enough air, which may leave a person gasping, is called:
- apnea.
 - wheezing.
 - hyperventilation.
 - dyspnea.

ANS: D

Dyspnea is defined as a shortness of breath or the feeling of not getting enough air, which may leave a person gasping.

PTS: 1 REF: p. 28
OBJ: Discuss the basic patient care techniques covered in this chapter.
TOP: Basic patient care

4. Which one of the following statements is *false* regarding the protocol for taking a blood pressure?
- If the patient is sitting, be sure he or she has both feet in the air.
 - The brachial artery in the upper arm is the usual site for manually taking a blood pressure.
 - Move any clothing out of the way to place the blood pressure cuff properly.
 - Place the cuff above the elbow, making sure it is approximately an inch above the elbow.

ANS: A

When taking a blood pressure with the patient sitting, ensure that he or she has both feet on the floor.

PTS: 1 REF: p. 28 | p. 29
OBJ: Discuss the basic patient care techniques covered in this chapter.
TOP: Basic patient care

5. Which one of the following statements is *false* regarding the nasogastric (NG) tube?
- Never pull on the tube when moving the patient.
 - Check for leaks in both the NG tube and suction equipment. If found, report them immediately.
 - Raise or open the drainage bottle as necessary.
 - Never disconnect the tubing.

ANS: C

When a patient with an NG tube comes to the ultrasound department, the drainage bottle should never be raised or opened.

PTS: 1 REF: p. 32
OBJ: Discuss the basic patient care techniques covered in this chapter.
TOP: Patients with tubes and tubing

6. The basic principles of body mechanics require all of the following *except*:

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- a. maintain a stable center of gravity by keeping your center of gravity low and your back straight and bending your hips and knees.
- b. maintain a strong base of support by keeping your feet apart, placing one foot slightly ahead of the other with the toes pointing in the direction of activity.
- c. when lifting, flex your hips to absorb jolts, and turn with your feet instead of your knees.
- d. maintain a center of gravity by keeping your back straight and any objects being lifted close to your body.

ANS: C

When lifting an object, maintain a strong base of support, flex your knees to absorb jolts, and turn with your feet instead of your hips.

PTS: 1 REF: p. 36 OBJ: Describe patient transfer techniques.
TOP: Patient transfer techniques

7. Which one of the following statements is *incorrect* regarding hand washing?
 - a. Wash your hands after touching blood, body fluids, or contaminated items—*only when gloves are not worn*.
 - b. Wash your hands after removing gloves, between patient contacts, and whenever indicated to avoid the transfer of microorganisms to other patients or the environment.
 - c. Washing your hands between tasks and procedures on the same patient may be necessary to prevent cross-contamination of different body sites.
 - d. Use plain soap for routine hand washing and an antimicrobial agent or waterless agent for specific situations (e.g., to control outbreaks, for hyperendemic infections).

ANS: A

Wash your hands after touching blood, body fluids, or contaminated items—*whether or not gloves are worn*.

PTS: 1 REF: p. 39 TOP: Infection control
OBJ: Discuss infection control and isolation techniques.

8. Examples of airborne transmission include all of the following *except*:
 - a. tuberculosis.
 - b. measles.
 - c. chickenpox.
 - d. mumps.

ANS: D

Mumps is spread via droplet transmission. Some diseases that are spread by airborne transmission include tuberculosis, measles, chickenpox, and shingles.

PTS: 1 REF: p. 40 TOP: Infection control
OBJ: Discuss infection control and isolation techniques.

9. Examples of contact transmission include all of the following *except*:
 - a. flu.
 - b. pertussis.

- c. impetigo.
- d. scabies.

ANS: B

Pertussis is spread via droplet transmission. Flu, impetigo, scabies, methicillin-resistant *Streptococcus aureus* (MRSA), pinkeye, wound infections, and hepatitis A are spread through contact.

PTS: 1 REF: p. 40
OBJ: Discuss infection control and isolation techniques. TOP: Infection control

10. According to the National Institutes of Health, hypertension is defined as a blood pressure greater than (in mm Hg):
- a. 120/80.
 - b. 135/75.
 - c. 140/90.
 - d. 150/100.

ANS: C

According to the National Institutes of Health, hypertension is defined as a blood pressure greater than 140/90 mm Hg.

PTS: 1 REF: p. 29 OBJ: Define patient-focused care.
TOP: Basic patient care

11. Vital signs include all of the following *except*:
- a. blood pressure.
 - b. pulse rate.
 - c. hematuria.
 - d. respiratory rate.

ANS: C

Vital signs include pulse, respiratory rate, blood pressure, and body temperature.

PTS: 1 REF: p. 25 | p. 53 OBJ: Define patient-focused care.
TOP: Basic patient care

12. How many beats per minute (bpm) is the normal adult pulse rate?
- a. 30 to 50
 - b. 50 to 75
 - c. 60 to 100
 - d. 100 to 120

ANS: C

Normal adult pulse rates should be between 60 and 100 bpm with a regular beat.

PTS: 1 REF: p. 25 OBJ: Define patient-focused care.
TOP: Basic patient care

13. Breathing that stops spontaneously for any reason is called:
- a. apnea.
 - b. asthma.

- c. dyspnea.
- d. cyanosis.

ANS: A

Breathing that stops spontaneously for any reason is called *apnea*. It may be temporary, starting and stopping at intervals, or prolonged.

PTS: 1 REF: p. 28 OBJ: Define patient-focused care.
TOP: Basic patient care

14. An intravenous (IV) fluid container should always be _____ cm above the level of the patient's vein.
- a. 5 to 8
 - b. 8 to 12
 - c. 18 to 20
 - d. 25 to 30

ANS: C

An IV fluid container should always be 18 to 20 cm above the level of the patient's vein. An IV container too high may cause too rapid a flow rate, and fluid may infiltrate into the surrounding tissues. An IV container too low may cause blood to flow back in the tubing, causing a clot to form or the fluid to stop flowing.

PTS: 1 REF: p. 31
OBJ: Describe how to assist patients with special needs.
TOP: Intravenous therapy

15. When transferring catheterized patients, the urine-collecting bag must be:
- a. attached to the wheelchair or gurney.
 - b. held below the level of the patient's bladder.
 - c. emptied before starting the ultrasound examination.
 - d. analyzed for bacterial infection.

ANS: B

When transferring catheterized patients, the urine-collecting bag must be held below the level of the patient's bladder. This level will prevent urine in the bag from being siphoned into the bladder.

PTS: 1 REF: p. 32 | p. 33 OBJ: Describe patient transfer techniques.
TOP: Patients with tubes and tubing

16. Which one of the following is a special safety precaution for oxygen therapy?
- a. Smoking where oxygen is used is allowed.
 - b. An oxygen cylinder can be placed next to a patient during transport.
 - c. Electrical equipment may be placed next to an oxygen cylinder.
 - d. The tank is secured in the upright position away from any heat source.

ANS: D

Securing the tank in the upright position away from any heat source, including electrical equipment, is a special safety precaution for oxygen therapy. Not allowing smoking where oxygen is being used and not placing an oxygen cylinder beside a patient when transporting him or her by stretcher are additional special safety precautions.

PTS: 1 REF: p. 33
OBJ: Describe how to assist patients with special needs.
TOP: Patients with tubes and tubing

17. An artificial opening in the abdominal wall surrounded by a ring of mucosal tissue is called a(n):
- ostomy.
 - stoma.
 - catheter.
 - annula.

ANS: B
An artificial opening in the abdominal wall is called a *stoma*. A stoma appears as a round hole surrounded by a ring of mucosal tissue. This opening may be temporary or permanent, depending of the patient's condition.

PTS: 1 REF: p. 35
OBJ: Discuss the basic patient care techniques covered in this chapter.
TOP: Patients with tubes and tubing

18. Lifting an object should be done using the muscles of the:
- back.
 - legs.
 - feet.
 - shoulder.

ANS: B
Lifting a box or patient should be done using the strong muscles of the legs.

PTS: 1 REF: p. 41 OBJ: Describe patient transfer techniques.
TOP: Patient transfer techniques

19. When transferring a patient from a wheelchair to the examination table, you should:
- bend at the knees and lean forward.
 - bend the back and lean backward.
 - bend only the knees.
 - bend the knees and back.

ANS: A
When transferring a patient from a wheelchair to the examination table, you should bend at the knees and lean forward.

PTS: 1 REF: p. 37 | p. 38 OBJ: Describe patient transfer techniques.
TOP: Patient transfer techniques

20. Infectious materials include all of the following *except*:
- blood.
 - intact skin.
 - synovial fluid.
 - cerebrospinal fluid.

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ANS: B

Infectious materials include blood, synovial fluid, cerebrospinal fluid, semen, vaginal secretions, pericardial and pleural fluids, saliva in dental procedures, and unfixed human tissue or organs.

PTS: 1

REF: p. 39

OBJ: Discuss infection control and isolation techniques.

TOP: Infection control

21. The basic infection control guidelines used to reduce the risks of spreading infection are called:
- infection precautions.
 - standard precautions.
 - environmental controls.
 - patient-focused precautions.

ANS: B

Standard precautions are the basic infection-control guidelines used to reduce the risks of infection spread through droplets, air, and contact.

PTS: 1

REF: p. 39

OBJ: Discuss infection control and isolation techniques.

TOP: Infection control

22. Examples of droplet transmission include all of the following *except*:
- mumps.
 - pneumonia.
 - strep throat.
 - chickenpox.

ANS: D

Disease spread through droplet transmission includes mumps, measles, pertussis, pneumonia, strep throat, and specific forms of meningitis. Chickenpox is transferred via the air.

PTS: 1

REF: p. 40

OBJ: Discuss infection control and isolation techniques.

TOP: Infection control

23. Which one of the following personal protective equipment (PPE) is applied last?
- Mask
 - Gown
 - Gloves
 - Shoe covers

ANS: C

Gloves should be the last PPE to be applied. Shoe covers are more commonly used during sterile procedures.

PTS: 1

REF: p. 41

OBJ: Discuss infection control and isolation techniques.

TOP: Infection control

24. The most common nosocomial (hospital-acquired) infection is a(n):
- appendicitis.
 - pneumothorax.