



National Certification Exam Review

Sonography Patient Care *Common Addendum*

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The SDMS has made every effort to ensure that the contributors to this publication are knowledgeable authorities in the specified specialty area(s). The SDMS highly recommends that readers review and study multiple publications on the specialty content areas and on test-taking strategies when preparing for National Certification Examination.

A. Communication/Patient Interactions

1. Maslow's hierarchy of needs

- a. Well recognized theory of motivation; most often diagramed in a pyramidal shape layering the basic needs of humans ranging from the lowest physiological needs (base) to the highest, attainment of personal goals.
- b. Pyramidal levels in order from lowest to highest: Physiologic, Safety and Security, Love and Belonging, Self-Esteem/Respect, and Self-Actualization.
- c. The movement on the pyramid is not always upwards, but life can result in circumstances of moving up and down the pyramid.

2. Accurate communication is essential for both immediate and ongoing patient care.

- a. The SBAR technique
 - (1) Provides a framework for communication between members of the health care team about a patient's condition.
 - (2) Acronym
 - (a) **S**ituation
 - (b) **B**ackground
 - (c) **A**ssessment
 - (d) **R**ecommendation
- b. Various programs are used to facilitate and mentor employees in effective communication. One program widely used is referred to as AIDET.
 - (1) **A**cknowledge the patient
 - (a) Communicate with the patient by name and make eye contact.
 - (2) **I**ntroduction of yourself
 - (3) **D**uration of expected time to complete examination(s)
 - (4) **E**xplanation
 - (a) Provide the patient with details on the examination procedure, inform if other personnel or students are in the room or will be entering into the room, etc.
 - (5) **T**hank you
 - (a) Thank the patient for choosing that particular facility.
- c. Listen carefully and respond thoughtfully.

3. Nonverbal communication

- a. Behaviors to let others know how you "feel" about them or the circumstance.
 - (1) Facial expressions
 - (2) Eye contact
 - (3) Tone of voice
 - (4) Listening skills
 - (5) Touching
 - (6) Body movement and posture
- b. It is important to possess the skills to properly interpret patients' nonverbal cues and communication as well as being cognizant of one's own nonverbal expressions to reflect positive energy.

4. Proper palpation

- a. Appropriate/reassuring touch
- b. Cultural considerations must be observed when employing palpation.

5. Verbal skills

- a. Includes the transmission of words in either written or verbal form.
 - (1) Use clear and distinct speech habits
 - (2) Attitude
 - (3) Validation of communication

6. Avoid assumptions

- a. Verify patient by name, date of birth, address, etc.
- b. Review printed and/or electronic material
- c. If preparation was required, have the patient explain the preparation they followed.

7. Addressing the patient

- a. Greet patient respectfully
- b. Treat a patient as an individual
- c. Allow them to make choices
- d. Use appropriate non-verbal communication

8. Communication factors

- a. Effective traits
 - (1) Listen
 - (a) Maintain silence
 - (2) Observe
 - (3) Respond respectfully
 - (4) Clarify
 - (5) Repeat back to the client to verify accuracy of interpretation
 - (6) Gather necessary information
 - (7) Summarize what has been shared
 - (8) Accept information
- b. Barrier to effective
 - (1) Rapid speaking
 - (2) Using acronyms or abbreviations
 - (3) Use of medical words that may not be understood by the client
 - (4) Broad generalizations
 - (5) Different language
- c. Cutting off communication
 - (1) Listener prevents conversation from starting or continuing

9. Exploring attitudes and feelings

- a. Both sonographers and patients can be affected by:

Notes:

- (1) Physical state (fatigue, cold or increased body temperature, angry)
- (2) Emotional state (sadness, happiness, confidence)

10. Culture and communication

- a. A healthy relationship depends on mutual trust.
- b. Cultural considerations
 - (1) Ethnicity – treatments and cures vary differently from one cultural group to another
 - (2) Religion – may dictate behaviors with wide-ranging impact on patient’s diet, consideration of abortion, use of medication, treatments, or surgery
 - (3) Distance – physical proximity of patient to sonographer
 - (4) Timing – the right time and correct time may differ among cultures
 - (5) Prejudice – culturally derived bias that may be based on race, ethnicity, sexual orientation, or appearance
- c. Cultural bias
 - (1) Tendency to interpret words or actions according to some culturally derived meaning assigned to it.

11. Special circumstances and communication

- a. Non-English speaking
 - (1) Follow institutional policy for arrangements of interpreter, if required.
- b. Hearing impaired – if patient uses sign language, an interpreter may be employed. If patient has hearing aids or does not use sign language; face the person, use facial expressions, body gestures, or appropriate touch. May desire to reduce background noise if hearing aids are present.
- c. Vision impaired – assess degree of impairment, encourage independence. If needed, offer your arm to lead the way. Use spoken word to communicate. Tell the patient what you are doing, when you must leave, etc.
- d. Speech impaired – speak slowly and clearly in normal tone, give directions in simple manner. Do not hurry, provide ample time for the patient to respond. Watch for non-verbal clues. Offer a paper and pencil, if requested or needed to ensure accurate communication.
- e. Confused or disoriented – use simple and direct language; allow ample time for a response; keep environment calm.
- f. Patients with mental challenges: consistent patience, humor, caring. Communicate in area without distractions, speak to patient’s mental (not physical) age. Avoid talking too fast; use low tone of voice.

12. Communication across the age continuum

- a. Children and adolescent interaction
 - (1) Infants (Birth to 1 year)
 - (a) Respond to facial expressions (you should smile)
 - (b) Use gentle body movements (no rapid movements)
 - (c) Use soothing voice when talking
 - (d) To gain cooperation, watch how the care giver holds the infant and mimic that behavior.
 - (2) Toddler (1–3 years)

- (a) Ask the caregiver how to address the child (if name is Alexander, maybe they prefer Alex)
 - (b) Maintain eye contact by “getting-down” to their level
 - (c) Respond well to a friendly smile
 - (d) Be calm cheerful and unhurried
 - (e) Use simple words
 - (f) Use gentle reassuring touch
 - (g) Allow the child to take favorite toy, blanket, etc (be careful that it does not get into the field of view)
- (3) Ages 3–5
- (a) Are capable of sharing information
 - (b) Keep the conversation simple, direct and honest
 - (c) Demonstration often more helpful than verbal instruction
- (4) School age (5–10 years)
- (a) At the age of 7, children begin to think logically and analyze the situation.
 - (b) This age group will want to know ‘Why?’.
 - (c) Provide honest answers (i.e. hold still so that we get a good image).
- (5) Adolescents (10–25 years)
- (a) Modesty and privacy are very important.
 - (b) Use a professional approach with warm assurances.
 - (c) Promote positive “attitude”.
- b. Young adults (25–45 years)
- (1) This group may be juggling many responsibilities, so time is critical.
 - (2) The fact that they are taking time to care for themselves is important.
 - (3) Use a professional approach with warm assurances.
- c. Middle-aged (45–65 years)
- (1) Most individuals in this age range have found their place in life.
 - (2) When their health is a threat, they may respond abruptly.
 - (3) Use a professional approach with warm assurances.
- d. Geriatric interaction (65 and older)
- (1) Often this age population does not consider themselves as “old”.
 - (2) They may require special attention because of the physical problems that come along with aging.
 - (3) Most do not respond well to feeling pushed or hurried.
 - (4) Assure good lighting and that patient has accessories (hearing aid, glasses) when appropriate.
 - (5) Some patients may become disoriented in unfamiliar surroundings, use patient’s full name.

13. Communication under stress

- a. Don’t cope alone, reach out to and review the situation with peer(s), and/or supervisor.
- b. If a patient is uncooperative, be pleasantly firm with your instructions.

Notes:

- c. When preparing for an exam with a potentially combative patient, never let a combative person between you and the door.

14. Telephone communication

- a. Answer calls promptly
- b. Identify yourself and your department
- c. Ask for same information from caller
- d. Validate the message
- e. Take and relay messages promptly

15. Dealing with death and loss

- a. Important to be understanding when dealing with patients who are experiencing a loss.
- b. Five steps of the grieving process
 - (1) Denial
 - (2) Anger
 - (3) Bargaining
 - (4) Depression
 - (5) Acceptance

B. Medical Record and History Taking

1. Patient management

- a. Requisition process
 - (1) Receipt of order
 - (2) Verification of order
- b. Patient identification
 - (1) Double identifier as per department or institutional policy
- c. Clinical indication by physician order and patient history
 - (1) Appropriateness of indication for procedure
 - (2) Correlation with history
 - (a) Previous diagnostic imaging reports, images, lab test results, and/or prior surgical procedures.
 - (b) If patient shares results from outside correlating exam, document where exams were performed in the event final reports are needed to be requested.
 - (c) View images and/or reports from correlating exams and lab values. Document on worksheet results that are relevant to the sonographic examination being requested.
 - (3) Review previous sonographic examination images for technical factors, such as Doppler angles or measurements.
 - (4) Assess for contraindications.
 - (5) Contact departmental or patient physician if discrepancy or error is suspected.
- d. Explanation of procedure
- e. Assessment and respond to patient needs (related to procedure)

2. Medical records

- a. Purpose
 - (1) File of documentation on patient information and management.
 - (2) Provides a chronological record of interactions with a healthcare provider(s).
- b. Content and organization
 - (1) Variation in how information may be organized, but often there are federal, state and/or medical organizations that have minimum standards for maintenance of medical records.
- c. Electronic Medical Record (EMR)
 - (1) Documentation of the individual's health information for use by the provider providing care within that healthcare setting.
 - (2) Less portable than an electronic health record.
- d. Electronic Health Record (EHR)
 - (1) Comprehensive record that can be assessed between between healthcare institutions and authorized providers.
 - (2) Provides for greater portability.
- e. Sonographer or technologist's responsibilities
 - (1) Documentation of procedure
 - (2) Tracking of procedure, if applicable
 - (3) Confidentiality in accordance with HIPAA

3. Patient interview

- a. Purpose – to extract as much information as possible during clinical history regarding patient signs, symptoms, or information relating to requested examination.
- b. Role of the sonographer – acquire clinical information that can contribute to diagnostic process.
 - (1) Desirable qualities
 - (a) Show respect
 - (b) Be sincere
 - (c) Empathy
 - (d) Polite
 - (e) Professional

4. Data collection process

- a. Questioning skills
 - (1) Avoid using leading questions
 - (2) Use open-ended questions
 - (3) Facilitation
 - (4) Listen in silence
 - (5) Probing questions
 - (6) Repetition
 - (7) Summarization

Notes:

5. Elements of clinical history

- a. Determine chief complaint
- b. Determine
 - (1) Localization
 - (2) Chronology
 - (3) Quality
 - (4) Onset
 - (5) Aggravating factors
 - (6) Severity
 - (7) Associated manifestations

6. Chart

- a. Legal document
- b. Validates information
- c. Charting refers to records or information you are expected to add to the patient's medical record.

7. Written records

- a. Must be:
 - (1) Accurate
 - (2) Pertinent
 - (3) Legible
 - (4) Complete
 - (5) Objective
 - (6) Consistent
 - (7) Comments in phrases vs. sentences
 - (8) Frequently used words are abbreviated

8. Responsibilities for record keeping

- a. To inform other health team members
- b. Medico-legal purposes

9. Rules for avoiding charting mistakes

- a. Never use a pencil
- b. Use blue or black ink
- c. To delete an entry: draw a line through it
- d. Sign and date your corrections
- e. Never leave blanks on forms

C. Medico-Legal Considerations

1. Hospital organizational chart

- a. Board of Directors
- b. CEO

- c. Medical Staff
 - d. Departments
 - e. Human Resources Department
- 2. Defining laws**
- a. Rules of conduct enforced by a controlling authority
 - b. All law is ultimately based on “natural law” (the inherent human desire to do good and avoid evil).
- 3. Underpinnings of the law**
- a. Concern for justice and fairness
 - b. Need for laws to be pliable
 - c. Similar standards of performance
 - d. Individual rights and responsibilities
- 4. Medical law**
- a. Goal of medical law
 - (1) To protect people, correct injustice, and compensate for injury.
 - (2) Lays foundation for relationship between patients and healthcare practitioners.
- 5. Forms of law**
- a. The Constitution – the system of beliefs and laws by which a country, state, or organization is governed.
 - b. Statutory law – laws created and passed by the legislature and is written down for use; enforces rules and prohibitions set by the letter of the law.
 - c. Administrative law encompasses laws and legal principles governing the administration and regulation of government agencies (both Federal and state).
 - d. Common law – derives from uses and customs of the people, which have been handed down through generations; also include the decisions of the judges through the courts and tribunals. Can also be referred to as Case law.
- 6. Informed consent**
- a. Guidelines established to obtain consent.
 - b. The patient must fully understand the procedure, risks and benefits.
 - c. Permission obtained from the patient to have a test or procedure performed.
 - (1) Permission may be written, oral, or implied.
- 7. Causes of action**
- a. Civil wrongs involving individual or private property (Torts).
- 8. Torts**
- a. Wrongful **civil acts** resulting in injury to another’s person, property, or reputation, independent of contract, for which the injured party is entitled to seek compensation.
 - (1) Intentional misconduct
 - (a) Includes but not limited to:
 - Assault
 - Battery

Notes:

- False imprisonment
 - Invasion of privacy
 - Libel & slander (defamation)
- (2) Unintentional torts (misconduct)
- (a) Includes but not limited to:
- Negligence
 - Duty of Care
 - Breach
 - Causation

9. Medical malpractice – when a negligent act or omission by a medical professional results in harm to the patient.

10. Negligence (failure to use reasonable care)

- a. Doctrines of Liability
- (1) Respondeat Superior (Master-Servant Doctrine or let the master answer) – A sonographer’s employer can be held liable for sonographer’s negligence.
 - (2) Ostensible Agency Doctrine – hospital or health care facility can be held responsible for sonographer’s negligence, even if not a direct employee.
 - (3) Res Ipsa Loquitar (the thing speaks for itself) – the burden of proof shifts to defendants to prove they were not negligent.

11. Seven ‘C’s’ of malpractice prevention.

- a. Competence
- b. Compliance
- c. Charting
- d. Communication
- e. Confidentiality
- f. Courtesy
- g. Carefulness

12. Do not resuscitate (DNR) or No Code

- a. A legal order written either in the hospital or on a legal form to respect the wishes of a patient to not undergo CPR or advanced cardiac life support if their heart was to stop or they were to stop breathing.
- b. Request usually made by the patient or health care power of attorney and allows the medical teams taking care of them to respect their wishes.

13. Advance Health Care Directive (living will, personal directive, advance directive, or advance decision)

- a. Document providing instructions given by the individual specifying what actions should be taken for their health in the event that they are no longer able to make decisions due to illness or incapacity and appoints a person to make such decisions on their behalf.
- b. A living will is one form of advance directive, leaving instructions for treatment. Another form authorizes a specific type of power of attorney or health care proxy, where someone is appointed by the individual to make decisions on their behalf when they are incapacitated.

- c. Often encouraged that people complete both documents to provide the most comprehensive guidance regarding their care.

14. Power of attorney (POA) or letter of attorney – written authorization to represent or act on another’s behalf in private affairs, business, or some other legal matter.

D. Ethical Considerations

1. Morals

- a. Actions based on religious teachings.
- b. Generally accepted customs of right living and conduct and an individual’s practice in relation to these customs.

2. Values

- a. Concepts, goals and ideals.
- b. Derived from numerous sources to include one’s family, friends, culture, environment, education and life experiences.

3. Ethics

- a. Systems of valued behaviors and beliefs that govern proper conduct and character to ensure protection of individuals’ rights.
- b. Standard of conduct

4. Medical ethics

- a. Developed out of the patient-physician relationship
- b. Mandated that physicians know what is in the best interest of their patients and, above all, that they do no harm.
- c. Sonographers, acting under the direction of physicians, share these ethical obligations.

5. Ethical theories

- a. Deontology – study of duty, moral obligation and taking right action
- b. Teleology – study of evidence of the design and purpose of nature

6. Ethical decision making

- a. Identify the problem
- b. Gather pertinent data and information
- c. Identify the options and solutions
- d. Think the problem through and evaluate short and long-term consequences for each solution.
- e. Make a decision
 - (1) Consult with superiors or physicians to assist in the decision, if applicable.
- f. Act
- g. Review and evaluate results

7. Professional ethics

- a. Principles reduced to a written code
- b. Distinguish a profession from other occupations or trades

Notes:

- c. Sonographers have an ethical obligation to perform competent examination and provide physicians and patients with accurate and reliable information.

8. Professionalism

- a. Defined as being involved in and worthy of high standards of a profession.
- b. Based on integrity, honesty, and compassion.
- c. Abide by the profession's Code of Ethics and within the professional Scope of Practice.

9. The Health Insurance and Portability and Accountability Act (HIPAA)

- a. To protect privacy of patients.
- b. In April 2003, hospitals were required to provide protection of release of individual financial and medical information.
- c. Diagnostic information can be justifiably disclosed to outside parties only with the patient's approval and explicit permission.

E. Infection Control and Infectious Disease Precautions

1. Body's defenses against disease

- a. Healthy, unbroken skin
- b. Nose and bronchial tree
- c. Acidic condition of gastric and vaginal secretions
- d. Lymph nodes
- e. White blood cells

2. The microbial world

- a. Pathogenic microorganisms
 - (1) Pathogenic – anything that causes infection
 - (2) Pathogen – disease causing microorganisms

3. Illness due to pathogens depends on:

- a. Environmental state
- b. Number and strength of invading pathogens
- c. Ability of host to resist infection

4. Main types of pathogens

- a. Fungi – exist as yeast or molds
 - (1) Yeasts are single-celled organisms
 - (2) Molds are multi-celled pathogenic organisms
- b. Viruses
 - (1) Smallest type of microorganisms known to produce disease
 - (2) Must invade the cell of the host in order to exist
 - (3) Invades only a specific type of cell
 - (4) Multiplication of the virus may rely on the health of the host
 - (5) May have dormant stages

- (6) Factors such as stress and poor health may allow the virus to manifest, multiply and cause acute infection.
- c. Bacteria
 - (1) Single-celled microorganisms
 - (2) Classification of bacteria depends on the shape, dividing characteristics, and the bacterial reaction to laboratory staining tests.
 - (3) To protect themselves, they have spores (a protective coating that forms around the nucleus of the bacteria).
 - (4) Bacteria are adaptable which makes them resistant to many types of drugs.
- d. Parasites (Include protozoa and helminths)
 - (1) Protozoa
 - (a) Form cysts to protect themselves.
 - (b) Cause abnormalities in the GI, GU, and hematopoietic systems.
 - (2) Helminths
 - (a) Are worms that can be round or flat.
 - (b) Can survive undetected for long periods of time.
 - (c) Usually found in the GI tract.

5. Four stages of infection

- a. Incubation period – interval between entrance of pathogen into body and appearance of first symptoms (e.g., chickenpox, 2–3 weeks; common cold, 1–2 days; influenza, 1–3 days; mumps, 15–18 days)
- b. Prodromal stage – interval from onset of nonspecific signs and symptoms (malaise, low-grade fever, fatigue) to more specific symptoms. During this time, microorganisms grow and multiply, and client may be more capable of spreading disease to others.
- c. Illness stage – interval when client manifests signs and symptoms specific to type of infection (e.g., common cold manifested by sore throat, sinus congestion, rhinitis; mumps manifested by earache, high fever, parotid and salivary gland swelling)
- d. Convalescence – interval when acute symptoms of infection disappear. Length of recovery depends on severity of infection and client's general state of health; recovery may take several days to months.

6. Cycle of infection

- a. Entrance portal – the manner in which a pathogen enters a susceptible host.
- b. Host – the place where the microorganism resides, thrives, and reproduces, i.e., food, water, toilet seat, elevator buttons, human feces, respiratory secretions.
- c. Causative agent (pathogenic organism) – disease causing microorganism.
- d. Reservoir of infection – the habitat in which the agent normally lives, grows, and multiplies.
- e. Exit portal – the path by which a pathogen leaves its host.
- f. Method of transfer (transmission) – the means by which an organism transfers from one carrier to another by either direct transmission (direct contact between infectious host and susceptible host) or indirect transmission (which involves an intermediate carrier like an environmental surface or piece of medical equipment).

7. Modes of transmission

- a. Airborne (from sneezing or coughing)
- b. Droplet (from sneezing or coughing)
- c. Contact
 - (1) Direct contact with infected area
 - (2) Indirect contact with an object that has been in contact with infected area
- d. Vehicle (results from food, water or medical devices)
- e. Vector (results from insect or animal contact)

8. Aseptic practices

a. Medical asepsis

- (1) Can also be referred to as clean technique.
- (2) Includes, but not limited to general hand hygiene, proper cleaning, transducer care, dusting, linen handling, and changing of sheets and pillowcases.
- (3) If hands are visibly soiled, wash with soap; otherwise, an alcohol based wash is recommended.

b. Surgical asepsis

- (1) Also referred to as sterile technique.
- (2) Sterile hand scrub
 - (a) Remove hand and wrist jewelry
 - Plain wedding band may be worn
 - Wristwatch can be worn, but pushed up for proper hand cleaning
 - (b) Inspect hands for cuts or skin openings that could create a risk for the medical professional if exposed to contaminant.
 - (c) Scrub hands using an antimicrobial soap or an alcohol-based antimicrobial activity.
 - (d) Disposable nail cleaner to scrub underneath nails.
 - (e) Lather hands and scrub to ensure all areas have been cleaned
 - (f) Time of scrub varies according to institutional protocol and manufacturer's recommendation for the cleanser being used. Times can vary between 2 – 6 minutes.
- (3) Sterile field principles
 - (a) All materials are sterile within the field.
 - (b) Correct techniques required to add equipment/supplies to field.
 - (c) Movement around sterile field is limited to prevent contamination.
 - (d) Never reach over or turn back on field.
 - (e) All tables should be brought to waist level to avoid bending over field.
 - (f) After procedure is completed, don gloves and clean all reusable items before returning for cleaning.
 - (g) Discard all disposable items appropriately.
 - (h) Place needles in sharps containers.

9. CDC isolation guidelines

- a. Two level approach
 - (1) Standard precautions
 - (a) Set of practices for use with ALL patients to prevent the spread of disease. Hand washing with soap and water or alcohol-based solution, if not visible soiling of hand, and wearing gloves.
 - (b) Incorporate features of both body fluid precautions and body substance isolation.
 - (c) Required when procedures may require contact with:
 - Blood
 - Body fluid secretions and excretions
 - Mucous membranes
 - Non-intact skin
 - (2) Transmission-based precautions
 - (a) Applies to hospital patients – precautions and isolation requirements
 - (b) Based on the three main routes of infection transmission
 - Airborne
 - Droplet
 - Contact

10. Healthcare-associated infections

- a. Nosocomial infection is defined as a hospital acquired infection.
 - (1) Infections include, but not limited to central line-associated bloodstream infections, catheter-associated urinary tract infections, and ventilator-associated pneumonia.
 - (2) Infections may also occur at surgery sites, known as surgical site infections.
 - (3) Clostridium difficile can cause gastrointestinal infection; patients can be exposed to this bacterium through contaminated surfaces or the spores can be transferred on unclean hands of others.
- b. Iatrogenic infections – infections that are the direct result of diagnostic or therapeutic procedures.
 - (1) Examples – a surgeon leaves a sponge inside the body and an infection develops or pneumonia following a lung biopsy.
- c. Methicillin-resistant Staphylococcus aureus (MRSA)
 - (1) Methicillin – antibiotic of the penicillin class
 - (2) MRSA is resistant to many antibiotics and thus hard to treat.
 - (3) Staphylococcus aureus (“staph”) is a bacteria.
 - (4) Infection occurs when bacteria moves inside the body.
 - (a) Mode of transmission
 - Direct contact – person to person in direct contact via hands.
 - Transmitted through direct contact with colonized or infected skin.
 - Indirect contact
 - Person-fomite-person transmitted from one patient to another by contaminated medical equipment.

- (b) Diagnosis: Nasal Swab, Swab of Wound, Blood Specimen
- (c) Imaging professional precautions
 - Standard precautions
 - Contact precautions
 - Disinfecting all equipment

F. Patient Transfer/Safety

1. Sonographer responsibilities

- a. Carefully monitor unconscious or sedated patients
- b. Siderails up, wheelchairs and stretchers locked
- c. Use proper body mechanics; instruct patient of their role
- d. Restraints (for patient protection) require physician's or charge nurse order

2. National Patient Safety Goals (NPSG)

- a. To promote improvements in patient safety
- b. Identify patients correctly
- c. Improve staff communication
- d. Use medications safely – label medications used in ultrasound area
- e. Infection control – hand cleansing and gloving guidelines of CDC
- f. Emergency management – know locations of crash cart and extinguishers

3. Body mechanics

- a. The principles of proper body alignment, movement and balance.
- b. Three concepts for understanding body mechanics
 - (1) Base of support – part of body in contact with a horizontal surface.
 - (2) Center of gravity – point at which the body is balanced.
 - (3) Line of gravity – divides the body into equal parts anterior-posterior and right to left.

4. Patient positions

- a. Supine – recumbent, face up
- b. Prone – recumbent, face down
- c. Lateral – lying on right or left side
- d. Upright/Erect – seated or standing
- e. Trendelenburg – head of bed/table tilted downward 30–40 degrees (head lower than abdomen)
- f. Reverse Trendelenburg – head of the bed elevated upwards 30–40 degrees
- g. Modified Fowler – head of bed/table elevated 18–20 inches, and knees elevated (head elevated above abdomen)

5. Support and padding

- a. Keeps patient comfortable
- b. Helps maintain position

6. Patient transfers

- a. Wheelchair transfer (assisted pivot)
 - (1) Patient sits on the edge of the wheelchair seat.
 - (2) Patient pushes down on the arms of the wheelchair to assist in rising.
 - (3) Sonographer bends at the knees, keeping back straight.
 - (4) As the patient rises to standing, rise also by straightening your knees and pivot toward the table until the patient can feel the table against the back of the thighs.
- b. Two person lift (from wheelchair)
 - (1) The patient to cross his or her arms over the chest.
 - (2) The person making the transfer stands behind the patient, reaches under the patient's axillae, and grasps the patient's crossed forearms.
 - (3) The second person moves to front of the patient and cradles the patient's thighs in one hand and the patient's calves in the other.
- c. Hydraulic lift transfer
 - (1) The chains have a short segment for attachment to the sling back and a longer segment for attachment to the sling seat.
 - (2) Adjust the chain length according to the patient's size.
 - (3) Hook the chains to the sling from the inside out.
- d. Cart to table transfer
 - (1) The preferred method of moving a patient from a cart to a table is with a moving device.
 - (2) The patient is rolled away from the table while the device is placed halfway underneath both the patient and the draw sheet.
 - (3) The patient is returned to a supine position, and the draw sheet is gently pulled to move the patient onto the table.

7. Additional safety issues

- a. Fire: Chemistry of a fire
 - (1) Fuel, heat, oxygen
 - (2) Causes of hospital fires
 - (a) Spontaneous combustion
 - (b) Open flames
 - (c) Smoking
 - (d) Electrical
 - (3) In fire emergency remember to:
 - (a) **R** Remove and **R**escue all individuals in immediate danger
 - (b) **A** Alert the proper authorities by **A**ctivating the pull station **A**larm and **A**nnouncing fire
 - (c) **C** Contain the fire by **C**losing doors
 - (d) **E** Extinguish the fire with the proper type of **E**xtinguisher
 - (4) Types of extinguishers
 - (a) Type A – for solid combustibles (paper and rubbish fires)
 - (b) Type B – for grease and anesthetic gas (flammable liquids and gases)

Notes:

- (c) Type C – for Electrical Fires (electrical/mechanical equipment and wiring)
- (5) To use fire extinguishers correctly:
 - (a) **P** Pull the Pin
 - (b) **A** Aim the nozzle
 - (c) **S** Squeeze the handle
 - (d) **S** Use a Sweeping motion from Side to Side
- b. Electrical shock
- c. Falls/collisions
- d. Spills
- 8. Radiation/MR safety**
 - a. Be aware of in-use radiation
 - b. Shortest time for radiation exposure, distance and shielding
 - c. Magnets are always on in MR imaging
 - d. Avoid entering MR scanning room without appropriate screening

G. Patient Support

1. Patient assistance

- a. Dressing and undressing
- b. Comfort and modesty
- c. Security of property
- d. Bedpans
 - (1) Female – voiding and evacuation
 - (2) Male – evacuation only; follow medical aseptic technique
- e. Urinals – male – voiding; follow medical aseptic technique
- f. Diapers – adult or infant
- g. Emesis basin – used to collect fluid due to vomiting

2. Support equipment

- a. Intravenous lines and pumps – line inserted into vein; delivers a measured amount of fluid over a period of time.
- b. Nasogastric/nasoenteric tubes – inserted through the nostril; will terminate in stomach (gastric) or small intestines (enteric); used for feeding, to obtain specimens, treat abdominal obstructions, to prevent distention after surgery, drain fluid from stomach using suction.
- c. Urinary catheters – used to provide temporary or permanent drainage of urine. May also be used in sonography to fill a bladder during obstetric or gynecological evaluations.
- d. Suction devices

3. Vital signs – indicators of function of the body

- a. Body temperature – the physiologic balance between heat produced in body tissues and heat lost to the environment. Time of day, age, weight, physical exercise, disease and injuries are factors, which might influence body temperature.

Averages:

Oral/tympanic	37.0C	98.6 F
Axillary	37.7 C	97.6 F
Rectal	38.0 C	99.6 F (most accurate, monitor contraindicators)

- b. Pulse – the pulsation or throbbing of an artery as blood is sent through it when the heart beats. A shock wave along the fibers of an artery. Adults: Count number of pulsations for 30 seconds and multiply by 2. Children and infants, count number of pulsations for full minute.

Averages:

<u>Age</u>	<u>beats/minute</u>
Fetus	120–160
Newborn	140
Child	100–120
Adult	60–100

Note strength and regularity as well as the number of beats per minute.

Sites: Radial artery, Temporal artery, Carotid artery, Femoral artery, Apical – apex of heart, Pedal artery, Popliteal artery

- c. Respiration – exchange of oxygen and carbon dioxide between the external environment and the blood circulating in the body. Adult: Count number chest rise for 30 seconds and multiply by 2. Children and infants, count number of chest rise for full minute.

Averages:

<u>Age</u>	<u>respiration/min.</u>
Infant	30–50
Adult	12–20

Note both quality and the number.

- d. Blood Pressure – the force exerted by the blood on the walls of the vessels as it. Readings vary with age, sex, physical development and health status. Sphygmomanometer – the instrument used to measure blood pressure
 - (1) Systolic – highest point reached during contraction of ventricles.
 - (2) Diastolic – lowest point that the pressure drops during relaxation of the ventricles.
 - (3) Optimal adult blood pressure of adult: 120/80

Average values for arterial pressures:

<u>Age</u>	
1 year	95/65
6–9 years	100/65
Adults	110/65
Pre-hypertension	120/80 and 139/89
Stage 1 hypertension	140/90
Stage 2 hypertension	160/100
Hypotension	80/50 (abnormally low blood pressure)

4. Oxygen therapy – flow of oxygen measured in liters per minute.

a. Low flow types

- (1) Nasal cannula or nasal prongs (prongs inserted into nostril and held in place with elastic band around patient's head). Used when a patient needs supplemental oxygen rather than total oxygen supply.
- (2) Nasal catheter
 - (a) Inserted into nostril and into back of patient's mouth and fastened to patient's cheek or forehead.
 - (b) Used when patient needs additional oxygen at all times.
- (3) Oxygen masks
 - (a) Simple oxygen face mask – transparent mask, fits over nose, mouth and chin
 - (b) Partial rebreathing or reservoir mask – looks similar to simple mask, but has a bag attached that remains constantly inflated.
 - (c) Ventri mask (high flow) – provides most consistent oxygen enrichment.

5. Emergencies

- a. Nausea and vomiting (emesis basin)
- b. Syncope (fainting)
- c. Seizures (focal or generalized brain function disturbance accompanied by loss of consciousness)
- d. Diabetes-related hypoglycemia/hyperglycemia
- e. Cardiac/respiratory events
 - (1) Crash cart
 - (2) Codes
 - (3) CPR

References

- Craig, M. (2012). *Essentials of Sonography and Patient Care*. (3rd ed.). St. Louis: Elsevier.
- Ehrlich, R., and Coakes, D. (2012). *Patient Care in Radiography* (8th ed.). St. Louis: Mosby.

Website: Center for Disease Control at www.cdc.gov