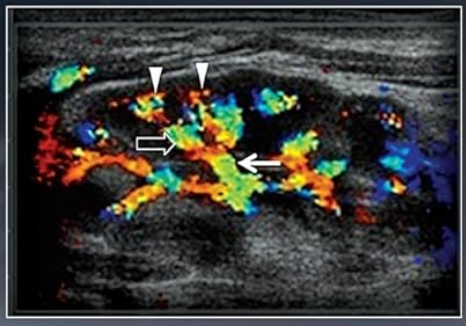
INTRODUCTION TO SONOGRAPHY AND PATIENT CARE

STEVEN M. PENNY

SECOND EDITION



Wolters Kluwer

Introduction to Sonography and Patient Care

SECOND EDITION

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Preface

The occupation of sonographer is both a professionally and personally rewarding career. Sonographers face clinical challenges—both physical and mental—on a daily basis. They struggle to find a view through small windows provided by the human body, while at the same time trying to summarize sonographic findings so that an accurate diagnosis can be accomplished. Sonographers, at their foundation, are patient care overseers. In fact, our primary obligation is to provide the most optimal patient care that we can afford.

It was evident many years ago that educational programs needed a comprehensive textbook to provide a thorough overview of the sonography profession for those who sought to establish a career in this ever-evolving, exceedingly useful, and dynamic imaging specialty. Accordingly, the first edition indeed fulfilled this task. *Introduction to Sonography and Patient Care*, second edition, which is now offered in color, consequently seeks to build upon the usefulness of the first edition by providing much needed updates, with the inclusion of some new topics as well.

The overall structure of this text is not a dramatic shift from the first edition. The two major sections remain, the first being an introduction to sonography and the second being that of an introduction to patient care. In Chapter 1, which is a foundational chapter, novel information regarding mindfulness, learning styles, learning–testing cycle, and self-efficacy have been added. In Chapter 2, an analysis of the self-authoring mind has been made, as well as the argument for servantship and compassion in our profession, particularly in a world that appears to need individuals who truly care for others.

In Chapter 3, an overview of the various specialties in sonography is provided, as well as new information regarding the current and future uses of artificial intelligence in sonographic imaging and photorealistic sonography. Chapter 4 offers some information regarding leadership roles in sonography and career establishment, while Chapter 5 updates some information regarding the need to practice sonography safely in order to have a long-lasting professional career. Over the past few years, there has been a renewed focus on ergonomics and the prevention of musculoskeletal disorders in the sonography profession, and Chapter 5 provides a summary of that research.

Although this text is sprinkled with traces of the importance of ethics and professionalism, Chapter 6 offers further insight into just how valuable a code of ethics is for the sonographer. Chapter 6 ends with a reminder for students that being perceived as lazy in the clinical setting is highly detrimental to one's opportunity for future employment. As a follow-up to ethics, the legal consequences of not maintaining a strong moral compass are provided in Chapter 7. The final chapter in this section, Chapter 8, provides an overview of basic principles and universal ultrasound machine knobology.

The second division of this book is related to a fundamental introduction to patient care. Chapter 9 offers a basic overview of communication, with the addition of new information regarding the importance of appreciating diversity and cultural awareness in healthcare. Chapter 10 provides information related to patient assessment, patient assistance, and even some electrocardiography information for the echocardiography student. Chapters 11, 12, and 13 discuss the role of the sonographer in medical emergencies, infection control, and invasive procedures, respectively. The final chapter, Chapter 14, provides information related to the recommendation of protocols for the various sonographic specialties. Lastly, the appendices, which one will find reference to in the patient care section of the book, offer several pictorial and narrative steps for assorted clinical tasks, such as opening a sterile pack, that may be required of the sonographer. There are also appendices that contain medical terminology, English-to-Spanish phrases, electrocardiographic dysrhythmias, and laboratory tests.

TO STUDENTS

You are embarking on a challenging educational endeavor. It is my hope that by reading this text, you will recognize that you have chosen a noble profession to pursue. Diagnostic sonography is an imaging modality that, if used effectively and responsibly, can save lives. With the recognition of this fact, you must also recognize that you have an enormous responsibility to learn (not just memorize) as much as you can in order to serve each patient that you encounter. Consequently, it would behoove you to read each chapter, take notes, and after you have done so, attempt the critical thinking exercises and chapter review questions. No doubt, your instructors will require testing over the material in this text, but the real test comes with application, and application occurs in the clinical setting. It is true that sonographers are created in the clinical setting and that is where you must focus most of your energies as you manage the courses in your educational program.

Each chapter of this text contains key terms with definitions, images, and "Sound Off" boxes that point out specific important tips to remember. One of the first boxes claims that every clinical encounter, with staff and patients, should be viewed as a job interview. Take early note of this recommendation, because heeding this advice will surely improve your job prospects. There are resources for you online, including a quiz bank that you can use to review the material in each chapter, and resources that your instructor will supply. Lastly, be prepared to serve your patients to the best of your ability, do not hesitate to ask questions, and continually strive to learn more about sonography, healthcare, and the ever-growing applications of ultrasound in medicine.

TO INSTRUCTORS

Introduction to Sonography and Patient Care, second edition, provides you with a comprehensive text and a vast supply of textbook and ancillary resources. Within the chapters, important images and diagrams, "Sound Off" boxes, and carefully constructed tables are dispersed. "Sound Off" boxes highlight key points within the text. The procedures section for patient care is in the back of the book. This section provides bullet point instructions for important clinical competencies such as how to open a sterile pack and how to take a blood pressure. And though students may have been exposed to this information prior to entrance into your program, a review of such vital tasks may be warranted. These procedures can be practiced in the classroom, laboratory, or the clinical setting. Online, you will find a robust test generator, PowerPoint presentations, lesson plans, and a complete image bank, as well as course cartridges for learning management systems. To access the online resources, please visit thePoint. If you choose to adopt this text as part of your curriculum, I would like to thank you, and I pray that it serves you and your students well.

FINAL NOTE

Thank you for choosing to be part of the sonography profession. I pray that you are always mindful of the needs of your patients and that you always treat each one of them as individuals. Always keep in mind that investing just a minimal amount of extra time with a patient may be priceless to them. Take time to talk to them, to truly care for them, and to learn more about them in order to serve them to the best of your ability. I hope that *Introduction to Sonography and Patient Care*, second edition, supplies you with a solid instructional foundation as you venture toward the ultimate goal of becoming a certified professional diagnostic sonographer.

Steven M. Penny

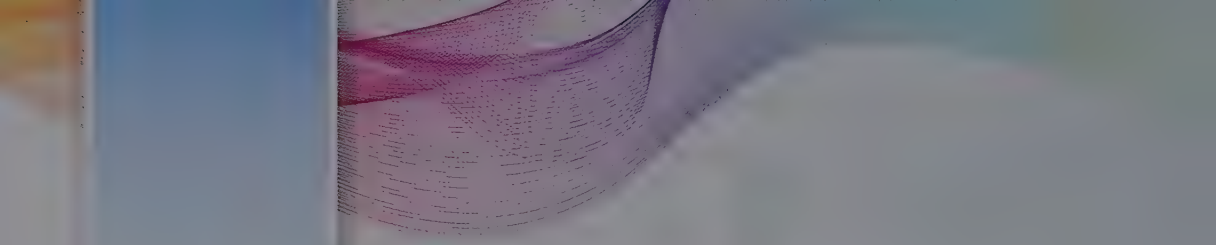
Acknowledgment

I would like to initially thank my Savior for giving me the ability to craft this text and for everything that I am and will become. Secondly, I must remind my family—my wife Lisa, my son Devin, and my daughter Reagan—how much I love them and that I could not do this without them. Without your patience with me, and the love you share with me, I would not be the man I am. Next, I want to thank my editors Sharon Zinner, Caroline Define, and Eric McDermott for encouraging me throughout the creation of this second edition. For their efforts in the first edition, which is also included herein, I would like to thank Dr. Traci Fox and Maureen McDonald. Thanks to Angela Hansen for her contribution to the first edition as well. Finally, I would like to recognize all of my coworkers and my former, current, and future students at Johnston Community College for providing encouragement throughout my educational and writing careers.

Contents

PART 1

Introduction to Sonography



1 Foundations for the Sonography Student

CHAPTER OBJECTIVES

- Briefly explore vital concepts related to student success in sonography, including the anticipation of stress and goal setting.
- Offer insight into classroom and clinical survival skills for sonography students.
- Understand workflow in the hospital setting.
- Appreciate the different imaging modalities that a sonography student will encounter while in the hospital or office setting.
- Recognize how vital critical thinking skills are in the sonography profession.

KEY TERMS

Acoustic window (sonographic window) the optimal location on the body for placement of the ultrasound transducer to demonstrate both normal anatomy and pathology; the best image acquired by manipulating and placing the ultrasound transducer in the most favorable position; some organs can provide a better acoustic window for improved viewing adjacent anatomy

American Registry for Diagnostic Medical Sonography an organization that offers national certification exams for all sonography specialties

American Registry of Radiologic Technologists an organization that offers national certification exams for radiographers and some sonography specialties

Anxiety the general state of feeling worry and fear before confronting something emotionally or physically challenging

Arthrography an x-ray procedure that utilizes a contrast agent to examine a joint, such as the shoulder, knee, or hip

Assumptions reasoning based on guesses or opinion

Audible sound sound range that can be detected by the human ear

Brain dumping a test preparation technique in which a large amount of information is memorized by a test taker and, when the test commences, the test taker "dumps" the information on a scrap piece of paper or the test

Cardiolite a pharmaceutical agent used in nuclear medicine imaging to examine the blood flow of the heart

Cardiologists physicians who diagnose and treat cardiac and blood vessel disorders

Cardiovascular interventional technologist a specialized radiographer that assists physicians in the treatment and diagnosis of cardiac and blood vessel disorders under fluoroscopy

Clinical competencies unassisted sonographic examinations that are graded to determine fundamental proficiency

Clinical findings the information gathered by obtaining a clinical history

Clinical history includes signs and symptoms, pertinent illnesses, past surgeries, laboratory findings, and the results of other diagnostic testing of a patient

Clinical journal a book used by students for personal and professional reflection

Computed tomography an imaging modality that uses x-ray to obtain cross-sectional images of the body in multiple planes; also referred to as CT or CAT scan

Contrast agent a substance that is either ingested or injected into the body to enhance the visualization of specific anatomy; disease contrast agents may also be used to treat disease; also referred to as a contrast medium

Coupling gel a medium placed on the skin to allow ultrasound waves to enter the body; also referred to as ultrasound gel

Critical thinking skills resourceful actions, judgments, and decisions based on the combination of professional knowledge, experience, integrity, and ethical standards

Cross-training when radiographers or other imaging specialists are training to perform another imaging modality in the clinical setting without specific classroom training

CT technologist typically a registered radiographer who has undergone specific classroom and clinical training to perform computed tomography examinations

Diagnostic mammogram a targeted mammogram, typically performed after a screening mammogram to further analyze the characteristics of a breast lesion

Diagnostician an interpreting physician who provides a diagnosis

Differential diagnoses a diagnostic method used to create a short list of possible diseases based on signs and symptoms

Fight-or-flight response the body's physiologic reaction to a real or imagined threat that arises from situations that cause fear or anger

Fluoroscopy an x-ray procedure that allows direct or real-time imaging of structures within the body

Gadolinium a contrast agent used in MRI

Gold standard the leading tool to diagnose certain diseases; for example, mammography is the gold standard for breast imaging, and sonography is the gold standard for gallbladder disease

Heart catheterization a fluoroscopic procedure that involves the passing of a catheter into the right or left side of the heart, typically from the groin or arm, in order to evaluate and treat disorders related to the blood flow of the heart

Hippocratic Oath a pledge observed by physicians and occasionally other healthcare professionals containing some basic guidelines for ethical standards and conduct between the healthcare provider and the patient

Indication a basis for an examination; a valid reason to perform a certain test

Inferences answers that are based on gained factual knowledge using critical thinking

Infrasound the sound range below the normal hearing range of humans

International Classification of Diseases, Tenth Edition (ICD-10) code a healthcare classification system that provides a system of diagnostic codes for classifying diseases

Interventional radiology a branch of radiology that uses various imaging modalities to treat or further characterize disease by means of biopsy or minimally invasive procedures

Invasive procedures procedures that include an imaging modality to treat disease; typically involves the use of catheters, needles, and surgical asepsis techniques (sterile techniques)

Investigative imaging technique used by sonographers by which they obtain sonographic protocol images while simultaneously searching for and identifying abnormalities

Learning styles various approaches that individuals use toward learning

Learning-testing cycle a learning method that we all use as we progress through education programs that includes a preparation phase, performance phase, and reflection phase

Magnetic resonance angiogram MRI technique used to visualize blood vessels

Magnetic resonance imaging imaging modality that utilizes magnetic waves to obtain images of the human body in various planes

Mammography breast imaging technique that utilizes x-rays

Maternal-fetal medicine specialist a physician who has specialized training that focuses on the medical and surgical management of high-risk pregnancies

Megahertz 1 million hertz

Midwife a trained healthcare professional that assists patients throughout pregnancy

Mindfulness the act of intentionally focusing one's complete attention to the present experience on a moment-to-moment basis by using meditation techniques

Mnemonics memorization technique; an acronym is an example of a mnemonic; an abbreviation is formed from the initial components in a phrase or a word in order to aid in quick recall

MRI technologist imaging specialist trained in magnetic resonance imaging procedures

Myelography an x-ray procedure that utilizes a contrast agent to identify abnormalities of the spinal cord

Nuclear medicine imaging modality that employs the use of radioactive material for the diagnosis and treatment of various diseases

Nuclear medicine technologist imaging specialist trained in nuclear medicine procedures

Nuclear stress test a nuclear medicine test that requires the patient to exercise or be injected with a medication that stresses the heart for imaging purposes

Nurse practitioner an advanced practice registered nurse who provides patient care and has the ability to order diagnostic tests under the supervision of a physician

Objective something that is not influenced by personal feeling or opinion in regard to facts

Obstetrician a physician trained in the care of pregnant patients

Pathology a disease process; also could be referring to the profession of pathology, which is the precise study and diagnosis of disease by a pathologist

Personal goals subjectively meaningful aspirations that individuals pursue as they go through life

Physician assistant a healthcare professional who practices medicine on a team under the supervision of a physician or surgeon and who has the ability to order diagnostic tests

Picture archiving and communication system medical imaging technology that allows for the storage of digital studies for quick access and easy storage

Positron emission tomography a technique that utilizes both the radionuclide imaging principles of nuclear medicine and the imaging techniques of computed tomography

Protocol (sonographic) an inclusive order of necessary images acquired during a sonographic examination

Pulse-echo technique ultrasound waves are pulsed into the body by a transducer; the sonographic image is produced when the pulsed wave returns to the transducer

Radiograph an x-ray image

Radiographer an imaging professional trained to obtain x-ray images and assist the radiologist in x-ray procedures

Radiography the imaging specialty that utilizes x-rays to obtain images of the body

Radiologist a physician that interprets radiologic procedures and also uses imaging modalities to treat disease

Radiopharmaceutical a nuclear medicine radioactive material that the patient inhales, ingests, or is injected with for a nuclear medicine test that is capable of concentrating on specific organs or systems in order to evaluate organ function

Real-time imaging instant viewing of internal structures

Scan lab a practice room with ultrasound machines for students to use to gain scanning experience

Scanning (ultrasound) the act of performing a sonographic examination

Scintigraphy a test in nuclear medicine in which the radiopharmaceutical is taken internally and the emitted radiation is captured by a gamma camera

Screening mammogram the initial mammographic images of the breast

Self-efficacy one's belief about his or her capability to achieve a designated level of performance

Signs objective evidence of a disease

Society of Diagnostic Medical Sonography the national membership society for all specialties in sonography; offers

membership benefits and helps set standards for the sonography profession

Sonographer a highly skilled medical professional trained to utilize ultrasound to image the human body

Sonographer report typically a written or typed document that provides basic descriptive information of the sonographic examination, including measurements of normal and abnormal structures, the sonographic appearance of organs and structures, and the manifestation of any sonographically identifiable abnormalities noted during the examination

Sonographic findings information gathered by performing the sonographic examination

Sonography phantoms simulation objects created from tissue similar to the human body that can be used to practice sonographic examination

Stress the body's typical reaction to challenging situations that are perceived as demands on time, energy, or resources with the threat that not enough time, energy, or resources exist to fulfill an obligation

Stressors individual events or perceived challenges placed upon time, energy, or resources that increase stress

Subjective something that is potentially influenced by personal feeling or opinion in regard to facts

Surgical asepsis the absence of viable pathogenic organisms; also referred to as sterile technique

Symptoms any subjective indication of disease, like nausea, weakness, or numbness

Transducer an instrument that emits ultrasound waves that is used by the sonographer to acquire sonographic images

Ultrasound the sound range above the normal hearing range of humans

Vascular interventional radiographers radiographers specialized in vascular intervention

Work ethic effort consisting of perseverance and diligence

INTRODUCTION

Welcome to the sonography profession! If you are reading this text, you have most likely already started pursuing a career in sonography. Over the years, the certified **sonographer**, a highly skilled medical professional, has become a critical part of the healthcare team (Fig. 1-1). Consequently, the fundamental obligations of the sonographer that this book will clearly outline are significant, not only to you but, more importantly, to your future patients. But before we recognize the unique

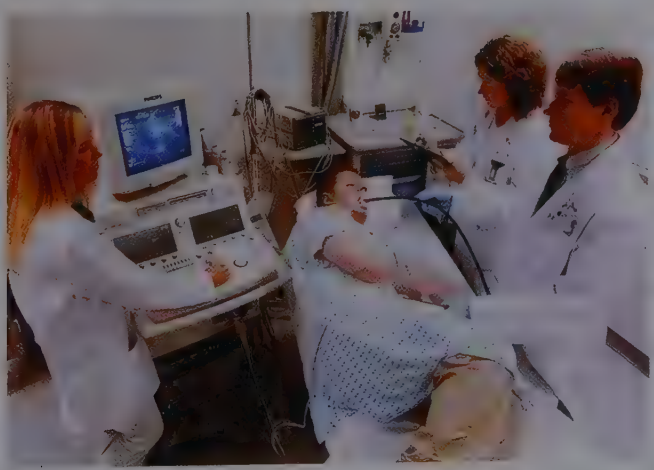


FIGURE 1-1 As a vital healthcare team member, the sonographer (*left*) must be capable of working with other professionals, including physicians and nurses, as demonstrated here during a transesophageal echocardiogram. (Reprinted with permission from Armstrong WF, Ryan T. *Feigenbaum's Echocardiography*. 7th ed. Philadelphia, PA: Wolters Kluwer Health; 2009.)

functions and roles of the sonographer within the medical profession, we must first investigate where you as a student fit in and how you can plan for success now and in your future studies and career. Students can perform at varying levels of competency within a sonography department, from simple observations to completing unassisted but supervised sonographic examinations. This chapter will serve as a guide for student success by providing you with some insight into your educational pursuit and recommended skills to master as you progress through both your didactic and clinical training. Therefore, this chapter will offer an overview of the workflow and the layout of an imaging department, including an overview of the different imaging modalities that you may encounter during your clinical rotations. The overarching objectives that you establish now as you begin your training should be aimed at becoming the best sonographer that you can be. Many of the concepts in this chapter will be returned to again later in this book. However, by initially understanding what is going on around you and how your environment impacts your role as a student, your responsibilities will hopefully be more clearly defined, and your objective toward becoming a certified sonographer will not just be a distant dream but a gratifying journey that has only just begun.

SOUND OFF The overarching objectives that you establish now as you begin your training should be aimed at becoming the best sonographer that you can be.

GOING BACK TO SCHOOL

Prior to endeavoring to comprehend the life-altering obstacles that sonography school entails, we must first recognize the blended group of students that you will refer to as classmates. For some of you, pursuing a career in sonography is a continuation of a career in radiology, cardiology, nursing, vascular technology, or some other medical specialty. Without a sabbatical between academic programs, you have chosen to pursue advanced studies in sonography. Your study skills may be highly honed, and your goals may be clearly established. However, there are other groups of individuals who may find unique challenges. For example, some of you may have chosen to completely change careers, some may have been unemployed for several years or possibly fresh high school graduates, while some of you could possibly have been previous stay-at-home moms or dads.

Firstly, for some students, sonography has become a secondary profession. This means that this person may have worked in a nonmedical profession before deciding to pursue a career in sonography. These individuals may have limited patient care experience, though they find that they have a passion for helping others, a passion that perhaps was never fulfilled in their previous occupation. Secondly, there may be some individuals who have chosen to obtain a degree in sonography, having recently graduated from high school. Inexperience in the college environment can cause additional apprehension and wariness for these students. Lastly, some may have been out of the educational arena for many years and find themselves returning to student status, a position that can feel awkward at times. Though you may not fall into one of these categories specifically, you all share the same goal of becoming a certified sonographer in your respective specialties. In preparation for a patient care environment where compassion should persist, offer support to those you recognize as struggling in their studies, and work together to help each other succeed. If you truly desire to be successful in healthcare, then having the ability to work well with others is critical. It will ultimately benefit you to keep in mind that the people whom you share the classroom with now perhaps one day could be a coworker or even your supervisor.

SOUND OFF Offer support to those you recognize as struggling in their studies, and work together to help each other succeed. It will ultimately benefit you to keep in mind that the people whom you share the classroom with now perhaps one day could be a coworker or even your supervisor.

STRESS: INEVITABLE BUT MANAGEABLE

Stress is not just inevitable; it is normal. Stress is the body's typical reaction to challenging situations that are perceived as demands on time, energy, or resources with the threat that not enough time, energy, or resources exist to fulfill an obligation.[1] Individual events or perceived challenges placed upon time, energy, or resources that increase stress are referred to as **stressors**. These stressors increase **anxiety** and do so with consequent physiologic responses. Anxiety is the general state of feeling worry and fear before confronting something emotionally or physically challenging (Fig. 1-2). The **fight-or-flight response** is the body's physiologic reaction to real or imagined threats that arise from situations that cause fear or anger.[1] Hormones released by the adrenal glands, epinephrine (adrenaline) and norepinephrine, cause an increase in heart rate, shallow and rapid breathing, sweaty palms, and a surge in energy. We have all experienced the sudden rush of adrenaline that occurs when a surprising event happens, such as nearly being involved in an automobile accident or being suddenly awakened in the middle of the night by a telephone call. Stress can also build up over time. Waking up late for school, getting stuck in traffic on the way to clinical, or forgetting to complete important assignments contribute to stress and cause us to feel like we have lost control. Therefore, it is important to recognize the causes of stress in our lives, be prepared in advance, and develop intervention techniques (Table 1-1).

Anxiety, according to the authors of *Under Pressure and Overwhelmed: Coping with Anxiety in College*,[2] is fueled by three mechanisms: cognitive component, physical component, and behavioral component. The cognitive components relate to how we interpret our circumstances. People who experience increased anxiety characteristically expect the worst out of situations. These individuals are generally pessimistic and constantly worry. It is important to note that less than 5% of events that we worry about actually come to fruition.[1] The second component of anxiety is the physical component, the aforementioned physical manifestation or symptoms of anxiety, such as shallow and rapid breathing and sweaty palms. The last component of anxiety is behavior. Of course, we all behave

FIGURE 1-2 Stress is inevitable while in school. Anxiety can set in and cause difficulty with focus and tension and can impact our relationships as well. (Image reprinted with permission from Mohr *Psychiatric-Mental Health Nursing*, 8th ed.)

TABLE 1-1 Dealing with stress and anxiety

Dealing with Stress and Anxiety	Explanation
Anticipate stress, and be prepared.	You can do this by being financially prepared, having a good support system made up of friends and family, maintaining a healthy lifestyle, and managing your time wisely (further details provided in this chapter).
Recognize the symptoms.	Symptoms may include feeling overwhelmed, suffocated, being behind on daily tasks, and physical symptoms like sweaty palms, racing heart, abdominal discomfort, and shortness of breath. Try to identify and remove negative thoughts that contribute to anxiety and increase stress.
Use positive language.	Oftentimes, if you think more positively and use positive language with self-acknowledging statements like "I can do this," you will be successful. Maintain a positive outlook, and you'll hopefully notice that the goals you have established are ultimately reached.
Practice stress-reducing activities.	Walking, running, breathing exercises, playing a sport, practicing relaxation techniques, getting enough sleep, listening to music, and starting a new hobby are all good ways to reduce stress and distract your mind from unsettling stressors.

differently when faced with anxiety caused by stress. Destructive behavior resulting from anxiety includes removing yourself from a situation to avoid potential negative outcomes, dealing with stress with excessive alcohol use or reckless behavior, or procrastinating.[1] Some individuals may overcompensate to avoid anxiety and ultimately overprepare for tests, resulting in poor scores. For test anxiety tips, refer to the section in this chapter titled "Preparing for Tests." Constructive behavior to combat stress should initially involve recognizing that we are indeed stressed by identifying the stressor, analyzing the reason behind the feelings of stress (e.g., loss of control, unpreparedness, etc.), and trying to intercede by performing stress-reducing activities.

Mindfulness is a concept in psychology and mental wellness fields that has undergone consistent examination for the past few decades, though it has been utilized in Buddhism for 2,500 years as a means to provide focus and relaxation.[3] Mindfulness has been defined by many, but essentially it is the act of intentionally focusing one's complete attention to the present experience on a moment-to-moment basis by using meditation techniques.[3] Mindfulness-based training includes mindfulness-based stress reduction techniques that essentially consists of four main components: paying attention to what the body is feeling (recognizing stress); sitting meditation (including focus on breathing, thoughts, and emotions); simple movement exercises like walking, standing, or yoga; and informal meditation exercises (e.g., paying attention to daily activities and performing them well).[3] Mindfulness interventions have been proven to reduce stress sensitivity, decrease anxiety, and even have positive effects on chronic pain and depression.[3]

While many of us see stress as a hindrance, stress can actually be used as a motivator for some people. Studying harder for a difficult exam so that you are prepared is a means to compensate for and combat against anxiety. Feeling prepared and rising to the occasion makes you feel successful and boosts self-esteem. While envisioning worst-case scenarios can lead to increased stress and anxiety, spending time focusing on positive thoughts and success will help ease your mental weariness.[4] We have all had to face the additional stressors of school. The following sections will assist you in your quest to resolve stressful situations, but also keep in mind that your college or academic institution has resources for students and your professors should also be able to assist you in finding help to combat school-induced stress.

Financial Preparedness

Given that there is an expected employment increase of 44% between 2010 and 2020, the demand for qualified sonographers is growing.[5] One natural economic draw for some who choose to pursue a career in sonography is salary. Annual salaries vary per specialty within the sonography profession. As of May 2017, according to the Bureau of Labor Statistics, the median annual wage for a diagnostic medical sonographer working in outpatient care centers was $81,200.[6] In 2018, the **Society of Diagnostic Medical Sonography** (SDMS) reported that the median base hourly wage for a sonographer was $35.16, while the median annual salary for sonography educators was $78,000 (Table 1-2).[7] These figures naturally fluctuate and thus can vary depending upon employment trends—including job location, sonographer credentials and job requirement, and unpredictable benefit packages. Nonetheless, although you have chosen to pursue a career that is in demand, you must be financially prepared to survive college. One of the most vital steps in the arduous process of pursuing a new career is to consider the possible financial ramifications. This means that you must contemplate the consequences of your educational pursuit for not only yourself but for your family and others. Furthermore, economic woes can greatly inhibit your ability to focus on your studies, resulting in worry, academic issues, and emotional instability. Developing a financial budget and agreeing upon this budget with your significant other, if you have one, can greatly reduce the likelihood of financial tension in the future. Along with all of the other vital expenses of life such as housing and food, you must consider the ramification of the costs associated with child care, tuition, activities, technology, books, and travel related to school and the clinical setting when you attempt to develop a working budget (Table 1-3). An easy way to establish a budget is to get a plain piece of paper and write down your income on one side and all of your expenditures on the other. If you are unaware of how much you are spending, simple keep track of all of your bills for 1 month to establish a baseline. Be sure to include all purchases no matter how small. Most likely, there are some items that you can eliminate from the expenditure side in order to save some money.

SOUND OFF **Developing a financial budget and agreeing upon this budget with your significant other, if you have one, can greatly reduce the likelihood of financial tension in the future.**

Once you have determined your needs for funds each month, you may discover that you are actually spending more than you are making. And thus, for many, working during school to pay bills is the only option. In fact, more than half of the students attending college have a job.[8] Sonography programs are highly demanding full-time programs, meaning your didactic workload is much like having a full-time job. The requirements of studying for many hours each night combined with clinical and laboratory rotations can be physically exhausting. Physical exhaustion can then lead to a lack

TABLE 1-2 Base salary details for sonographers for 2018

Salary Detail	Amount
Median *base* hourly wage	$35.16
Median annual *base* salary	$73,132.80[a]

[a]Based on 40 work hours per week and a 52-week year.
Data from SDMS website https://www.sdms.org/news/2018/11/30/updated-sdms-salary-benefits-resources-now-available

TABLE 1-3 Five money-saving tips for the sonography student

Money-Saving Tip	Explanation
Buy used or e-books.	E-book versions of texts can be purchased, and these are typically slightly cheaper than traditional textbooks. Renting books may not be the best option because many sonography books are beneficial to keep for many years as resources for clinical practice. Some used books are still in good shape and using them can save you some money.
Carpool.	Carpooling with a fellow classmate can save everyone money, and it is better for the environment.
Bring your lunch.	Making your lunch at home and bringing it to school or clinical can save you money every week that you might otherwise be spending on eating out. If you do not bring your lunch, be sure to inquire about student discounts at local eateries or use coupons.
Take online courses.	Though online courses may not be cheaper than traditional courses, you will typically save some money in travel expenses, as much of the course-work can be completed at home. While many sonography courses are not offered online, most general education course are at many colleges and universities.
Seek employer reimbursement.	Some healthcare employers may assist you financially while in school and even offer you a position when you graduate.

of focus, and your academic goals could be derailed. Therefore, it may be best to work on weekends and avoid night shifts when possible.

Though additional debt is not always the appropriate solution, many students choose to take advantage of financial assistance. Financial stability throughout school can be maintained with support from employers and the state or federal government through low-interest loans, gifts, grants, and scholarships. Federal student aid applications are available online at www.fafsa.ed.gov. Also, secondary forms of savings that some may be eligible to receive include tax credits for both tuition and fees. It would be wise to consult your tax advisor while in school to determine what tax incentives exist for full-time students, as these may vary from year to year. Seek help when needed, and take advantage of student support services, your academic advisors, and student counseling when you encounter financial strain. Remember, your sonography academic program will end eventually, and therefore the financial sacrifices you make while in school will ultimately benefit you as you begin your new career.

SOUND OFF Your sonography academic program will end eventually, and therefore the financial sacrifices you make while in school will ultimately benefit you as you begin your new career.

Emotional Stability and Support

One of the most significant and ongoing struggles for many students is the challenge of maintaining emotional stability (Fig. 1-3). In preparation for time away from family to study, it is best to preemptively share with loved ones the demands that will impact your individual relationship. Children and spouses need time to adjust to your busy schedule just like you do. But those same individuals

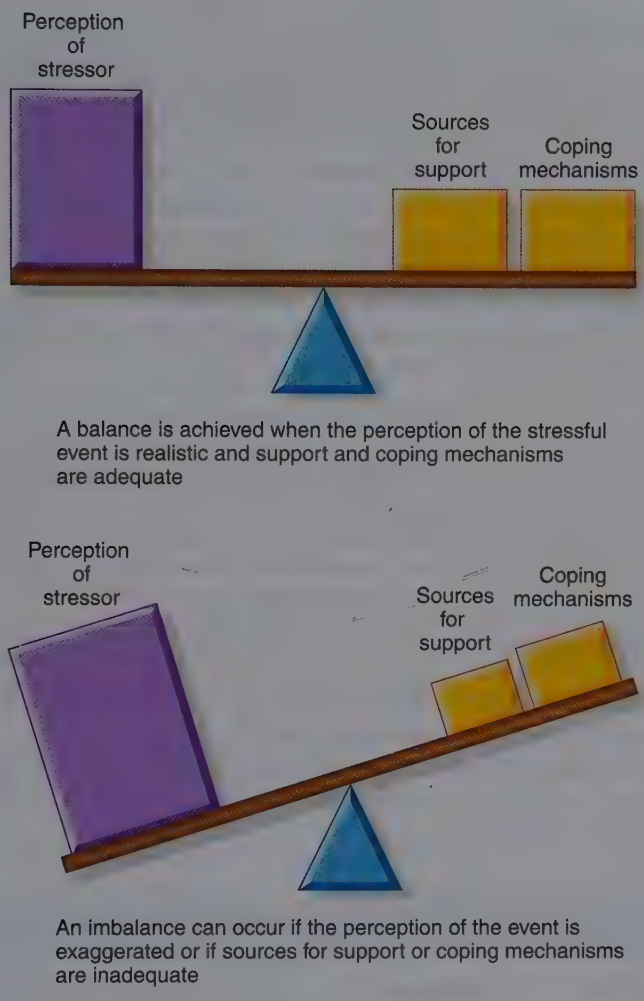


FIGURE 1-3 A person who is mentally healthy is able to maintain a state of emotional balance on most days. Stress can drag us down, causing the scale to tip out of balance, but a person who is mentally healthy is able to adjust to the stress and return to a state of emotional balance. (Reprinted with permission from Taylor C, et al. *Fundamentals of Nursing*. 8th ed. Philadelphia, PA: Wolters Kluwer Health; 2014.)

can also provide encouragement during difficult times. Therefore, a solid support system made up of friends and family can provide one with the emotional sustenance needed to be successful. For some, the spiritual nourishment found in a place of worship strengthens determination and offers a respite from the stresses of life also.

Involving your family or friends in your studies can be both beneficial and work to strengthen relationships. Explain to them your assignments, and utilize them while studying for tests, practicing **transducer** manipulation, patient positioning, or practicing new procedures. Students can also find assistance from other students, sonographers, and faculty members. Sonography program administrators may develop a student mentoring program between first- and second-level students to encourage relationship development and provide additional distinctive student support.

SOUND OFF A solid support system made up of friends and family can provide one with the emotional sustenance needed to be successful.

Physical Well-Being

Before beginning most sonography educational programs, students must undergo a physical examination, which includes immunizations, laboratory tests, and a drug screen. A drug screen tests for various chemical in the bloodstream, including alcohol and illegal drugs. If alcohol or illegal drugs are discovered on a drug screen, you may be dismissed from your educational program or prohibited from your clinical assignment. If a positive drug screen is discovered when you are employed as a sonographer, you will most likely lose your job.

Maintaining your physical well-being is strongly associated with your overall success. Your physical wellness can be maintained with regular exercise, eating a well-balanced diet, and getting adequate sleep. Taking breaks while studying to take a walk outside or to play some basketball can provide a quick stress release and some exercise at the same time.

SOUND OFF If alcohol or illegal drugs are discovered on a drug screen, you may be dismissed from your educational program or prohibited from your clinical assignment. If a positive drug screen is discovered when you are employed as a sonographer, you will most likely lose your job.

TIME MANAGEMENT

Time management is crucial while in school. For those with many family members, finding a balance between spending time with each one and working on schoolwork consists of developing good time management skills (Table 1-4). Many external forces attempt to take up our time. Plan your day wisely, and try to limit your extracurricular activities until your schoolwork is complete in order to reach deadlines (Fig. 1-4). If you are not using electronic devices for school, put the device down and

TABLE 1-4 Time management tips for sonography students

Time Management Tip	Explanation
Use watching television or a movie as a reward, not as time-wasters.	This may sound impossible for some people. Many of us are addicted to entertainment, but it takes us away from schoolwork. Record your favorite shows or movies and watch them after your school-related work is complete.
Put the devices down, and walk away.	Our day is full of seemingly innocent distractions caused by our electronic devices (tablets, computers, smartphones, etc.). Most of what is accomplished may seem important, but most likely, it is not.
Plan your day and week.	Your academic studies should rank high on your list of priorities. Afford time for reading, writing, and studying. Include adequate time in your day planning for eating, relaxing, sleeping, exercising, and family time.
Create your own academic calendar.	When you are provided assignments via a lesson plan from your instructors at the beginning of courses, organize your test, assignments, and projects by writing them on a calendar.
Set your own deadlines for assignments early.	Use the deadlines provided by your professors for assignments as being late. Instead, set your own deadlines early so that you are prepared in advance.

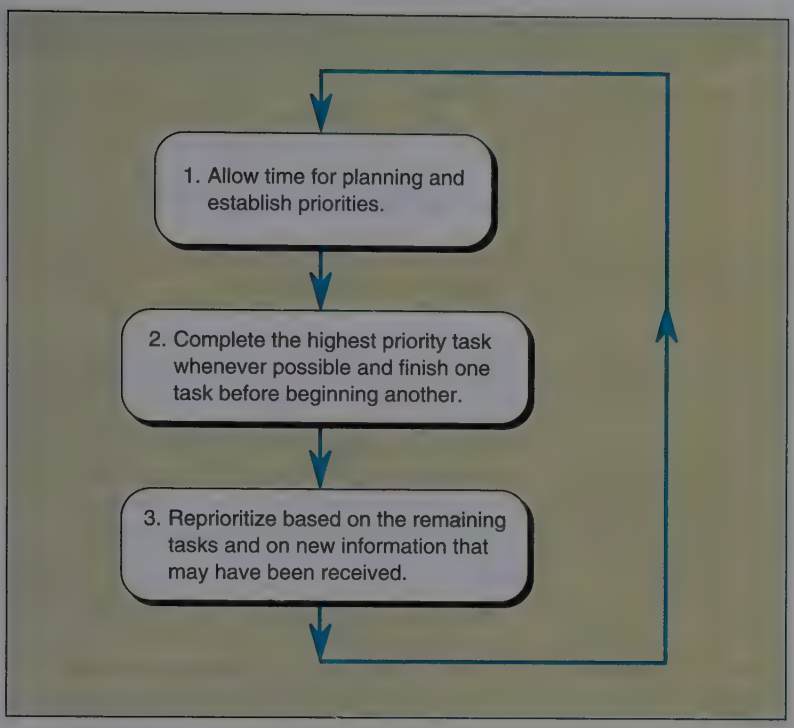


FIGURE 1-4 Three fundamental steps in time management. (Reprinted with permission from Marquis BL, Huston CJ. *Leadership Roles and Management Functions in Nursing*. 7th ed. Philadelphia, PA: Wolters Kluwer Health; 2011.)

walk away! Instead, open your textbooks and read. Delay watching television as well. Instead, if you have the ability, record your favorite shows and use watching them as a reward after your studies are complete.

SOUND OFF If you are not using electronic devices for school, put the device down and walk away! Instead, open your textbooks and read.

THE IMPORTANCE OF ESTABLISHING PERSONAL AND EDUCATIONAL GOALS

Educational requirements for acceptance into sonography programs vary. Creating educational goals starts with research into one's chosen profession and obtaining the foundation needed to have a successful, long-lasting career. Goals have been described as a central part of human motivation and personality, providing us with a direction and an endpoint for us to try to reach or to avoid.[9] Goals can be described as short-term, medium-term, or long-term. One author describes short-term goals as urgent, medium-term goals as reachable in 1 to 5 years, and long-term goals as achievable in more than 5 years.[9] **Personal goals** can be described as subjectively meaningful aspirations that individuals pursue as they go through life.[9] Most people arrange their goals using a hierarchical organization; thus, placing the most urgent goals first and long-term goals last is a traditional way to consolidate goals.

Personal goals may include the desire to spend more time with family, to attend church more, or to lose weight. An educational goal may be to simply pass a test or to obtain your degree. Of course, educational and personal goals often overlap. An example of a long-term educational goal for you is

TABLE 1-5 Five basic steps of goal setting

Five Basic Steps of Goal Setting	Explanation
Make a list of priorities, and rank them.	For the sonography student, your academic studies should rank high on this list. School should be a main priority. Be dedicated, and strive for achievement.
Set measurable and realistic long-term goals.	Establish a realistic GPA to achieve each semester and by the end of your academic studies.
Set short-term goals for classroom and clinical.	Long-term goals are not accomplished without meeting short-term goals along the way. Completing all lab assignments, homework, meeting attendance requirements, and mastering specific scanning skills are all short-term goals to establish from week to week.
Make social and personal goals.	Set aside some time for family and friends, and strive to reach personal fitness, financial, and spiritual goals.
Strive to meet those goals.	Write your goals down and mark them off when you complete them. If you do not achieve them at first, don't stop trying.

Data from Gottesman G. *College Survival: A Crash Course for Students by Students.* 4th ed. New York, NY: Macmillan Company; 1996.

hopefully to become a certified sonographer in your chosen specialty area, or perhaps even becoming a multicredentialed sonographer. Short-term goals and medium-term goals can exist solitarily or can be combined and realized as a means of obtaining a long-term goal. An example of a goal in the classroom is that of preparing and doing well on tests (short-term goals) in the hopes of achieving an excellent grade for the course (long-term goal).

Gregory Gottesman, author of *College Survival: A Crash Course for Students by Students*,[10] suggests five basic steps of goal setting (Table 1-5). It is important to note that the final step involves writing down your goals. Apparently, those who regularly write down goals are 42% more likely to accomplish them compared to those who just simply think about their goals.[11] Involving family members and fellow students in the establishment and implementation of these goals will undoubtedly help you achieve them. Setting personal and educational goals provide a sense of bearing and perseverance. Keep in mind that the achievement of many of your constructive goals while in school will ultimately influence your likelihood for employment and your ability to provide satisfactory patient care.

SOUND OFF Those who regularly write down goals are 42% more likely to accomplish them compared to those who just simply think about their goals.

CLASSROOM SURVIVAL SKILLS

There are numerous common skills that successful students have, according to Susan Roubidoux, author of *101 Ways to Make Studying Easier and Faster for College Students*. Roubidoux claims that among the items on the list, successful students sit near the front of the classroom, have healthy snacks before lectures begin, take good notes, ask questions when clarity is needed, and prepare for

tests efficiently.[12] The didactic or classroom portion of your training can take place before, after, or during your clinical rotations. That is, sonography programs vary as to the time during which didactic training occurs. However, when one encounters a large amount of complicated information, as found in a sonography educational program, it is easy to become overwhelmed.

SOUND OFF Successful students sit near the front of the classroom, have healthy snacks before lectures begin, take good notes, ask questions when clarity is needed, and prepare for tests efficiently.

Learning styles are various approaches that individuals use toward learning, and thus understanding your preferred learning style can be a basic and yet useful preliminary educational step that you can perform in order to be better prepared for the educational trials of sonography school. Learners are often categorized as tactile learners, auditory learners, or visual learners. Tactile learners, which may be referred to as kinesthetic learners, prefer learning by touching or doing, while auditory learners prefer listening or hearing, and visual learners prefer reading or seeing pictures.[13] However, it is important to note that an identified learning style is a preference rather something that is unchangeable and that while identifying your learning style is beneficial, your instructor will most likely utilize differing methods of instruction to reach all learners (e.g., pictures, lecture, video, group work, hands-on activities, etc.) (Fig. 1-5).[14] But by finding out what type of learning style you prefer, you may be able to hone your study skills and improve your ability to retain information. For more assistance, the following classroom survival skills will hopefully provide you with some insight and tips to help you prepare for the challenges of the didactic component of your sonography education.

SOUND OFF It can be beneficial to find out what type of learning style you prefer. A free simple learning style assessment can be found online at http://www.educationplanner.org/students/self-assessments/learning-styles-styles.shtml.

Pertinent Coursework

Courses relevant to your studies can strengthen your understanding of sonography. Sonographers must have a thorough understanding of anatomy, physiology, and pathophysiology. Therefore, these classes can provide both a foundation for your studies and reinforce information that you will encounter in your sonography program. For echocardiography students, a course in electrocardiography would be exceedingly beneficial. Public speaking or communications, writing, fine arts, math,

FIGURE 1-5 Various techniques instructors may use to address learning styles. (Reprinted with permission from American College of Sports Medicine, DeSimone G. *ACSM's Resources for the Group Exercise Instructor*. Philadelphia, PA: Wolters Kluwer Health; 2011.)

and basic physics courses will enhance your likelihood for success as well. Furthermore, medical terminology courses are crucial in understanding the vocabulary of the medical world. Appendix 1 provides a list of common medical abbreviations, prefixes, and suffixes commonly used by sonographers.

With the growing Spanish-speaking population in North America, one could certainly benefit from taking a Spanish medical communication course. Clinical facilities employ interpreters or use technology to communicate with patients who do not speak English. Appendix 2 provides some basic Spanish phrases that may assist you in fundamental communication. However, the use of a trained medical interpreter ensures accurate communication and provides optimal patient care.

SOUND OFF The use of a trained medical interpreter ensures accurate communication and provides optimal patient care.

Some sonography programs require applicants to be registered healthcare professionals, like a **radiographer** or nurse, before acceptance. Conversely, there are also programs with minimum entrance requirements, and these are available to individuals with very little medical background. One health occupation one can pursue to encourage the development of patient care skills is that of certified nursing assistant (CNA). Accordingly, obtaining a CNA certification and working in a patient care setting, even in a part-time or per diem position, can provide you with some valuable patient care experience and practice with interacting with ill patients. The following chapters will further provide insight into how sonographers must interact with patients and how effective communication helps us gather useful information before performing an examination.

Some sonography programs require online coursework that consists of testing, course lecture retrieval, video sharing, and discussion board postings. Occasionally, online modules are provided with textbooks, and assignments are conducted by means of online administration through Blackboard or Moodle. For some individuals returning to school, or those accustomed to a traditional classroom environment, maneuvering through online resources can be daunting. Therefore, you should take advantage of introductory computer training programs offered by your institution to familiarize yourself with virtual classroom navigation. Purchasing a personal desktop or laptop computer would be wise as well, as online research at home may be encouraged by your instructors. When pricing items for school, especially higher-priced items like computers or tablets, ask the retailer about unique discounts for college students. At some institutions, laptop computers can be checked out from the school library or learning resource center as well.

SOUND OFF When pricing items for school, especially higher-priced items like computers or tablets, ask the retailer about unique discounts for college students.

Preparing for Tests

We all prepare for tests differently. Some of us prepare well in advance for tests by studying some every night, while others prepare only the night before. Because instructors vary in their teaching and testing methods, if you know of a student who has taken the courses previously, you could ask him or her how they best prepared for tests. Also, your institution typically has study resources for students, and Table 1-6 provides additional helpful tips for preparing for tests. Regardless of how you study, your aim should be to learn the information, not just to memorize it. You should genuinely understand the concepts because the information that is covered in your didactic classes is applicable to clinical practice and consequently directly impacts patient care.

TABLE 1-6 Test preparation tips

Test Preparation Tips	Specific Goal
Read your textbooks for comprehension.	• Read often: Though medical literature is dissimilar, reading fiction and nonfiction books can also strengthen your reading skills. • Take notes as you read: Highlight specific points, and write notes in the margins. • Take breaks: With a long reading assignment, take intermittent breaks to relax your brain and eyes. • Be prepared for lectures by reading the information in advance.
Take quality lecture notes.	• Be organized and prepared with pencils for note-taking. If utilizing an e-book, have your computer ready to insert notes. • Use highlighters, but remember that simply highlighting information on a PowerPoint presentation or in the textbook is not necessarily adequate note-taking. • Make notes of key points made by your instructor. • If classroom drawings of sketches are utilized by your instructor, draw them yourself in your notes. • If allowed, make audio recordings of lectures.
Create study cards and **mnemonics**.	• Developing a study method that incorporates note cards with questions on one side and answers on the other is a great way to study. • Create mnemonics for lists of materials in order for quick recall.
Form a study group, or find a study partner.	• Exchange e-mail addresses and phone numbers with fellow students, and form a study group. • You and your study partner(s) can meet early before the day of each test in order to quiz each other.
Develop a study schedule, and take breaks.	• Study several times a week or some each night to prevent cramming and information overload. This may help you retain information. • Take breaks between studying, and sometimes use music to help you focus better while you are studying.

SOUND OFF **Regardless of how you study, your aim should be to learn the information, not just to memorize it. You should genuinely understand the concepts because the information that is covered in your didactic classes is applicable to clinical practice and consequently directly impacts patient care.**

Test anxiety is a common educational issue that all students have encountered at times. However, for some students, test anxiety can affect them to the point where their test results are dramatically altered, despite having prepared and grasped the information prior to the test.[15] In fact, studies have shown the scores of students suffering from test anxiety reduce by more than 12% compared to the nonanxious student.[15]

Overcoming severe test anxiety can result in an increase in test scores by a whole letter grade. Some colleges offer resources and counseling for students suffering from test anxiety, and special testing situations for students may be offered by some instructors for those with extreme testing issues. For example, study skills courses and one-on-one behavioral counseling have been shown to be the most effective at reducing test anxiety.[15] Table 1-7 provides some test-taking tips for all students, not just those suffering from anxiety.

TABLE 1-7 Test-taking tips

- Examine the length of the test.
- Estimate the time for different parts.
- Answer one item at a time.
- Look for keywords in the questions.
- Eliminate obviously erroneous answers.
- Return to harder questions.
- Hesitate before changing an answer.
- Make a quick outline of your thoughts before answering essay questions.

Data from Motevalli S, et al. New study skills training intervention for students who suffer from test anxiety. *Asian Soc Sci* 2013;9(7):85–96.

The **learning-testing cycle** is a method that we all subconsciously utilize as we progress through an educational program. This cycle includes a preparation phase, performance phase, and reflection phase. The preparation phase includes studying, of course, and also a study routine that has been established over time that may or may not be helpful. The performance phase is the actual testing attempt, while the reflection phase is the phase of assessment, not only by obtaining a numeric grade but also an evaluation of one's overall strategic performance on the examination.[5] **Self-efficacy** is one's belief about his or her capability to achieve a designated level of performance. Self-efficacy relates to personal confidence. Those with a higher sense of self-efficacy will often employ a deeper determination to succeed.[5] Specifically, the more confidence you have in your knowledge and test-taking skills prior to attempting a test, the more likely you will do well on that test. Building confidence in your test-taking ability is not a straightforward task. However, it has been noted that the more you attempt tests, by perhaps creating your own tests or attempting online practice tests, your long-term retention of information will most likely increase, and your test scores will consequently increase as well.[5]

SOUND OFF The more you attempt tests, by perhaps creating your own tests or attempting online practice tests, your long-term retention of information will most likely increase, and your test scores will consequently increase as well.

Though some instructors may encourage a technique called **brain dumping**, it is not necessarily the best way to approach a test. Brain dumping is a test preparation technique whereby a large amount of information is memorized by a test taker, and when the test commences, the test taker "dumps" the information on a scrap piece of paper or the test. Therefore, if allowed before a test, students write down information on the test that one will most likely encounter. Some students may even be allowed to draw quick sketches of anatomy. Brain dumping is something that should be a last resort, however, as you should strive to learn and not memorize. And though your classroom instructors may allow this practice, the **American Registry for Diagnostic Medical Sonography** (ARDMS), the organization that offers national certification exams for sonographers, absolutely prohibits brain dumping on national certification exams.[16] Regarding this concept, national certification examinations are cumulative. Consequently, your goal should be retaining and comprehending the information, not approaching each test in hopes of discarding the information after you accomplish a decent grade. Actually learning the material is better for developing your academic skills, increasing your likelihood of initially passing your certification exams, and eventually this gained aggregate wisdom will enhance your patient care abilities in the clinical setting.

Following each test, return to your notes and books for a time of reflection, and highlight information that you recognized on the test. As many final examinations are collective, this technique will certainly help you prepare for a large amount of information. It is best to continually review information throughout your educational program as well. Go back to previous materials, and look over your notes when you have an opportunity. If allowed, take your books or notes to clinical to review during times that are slow. A convenient textbook in the clinical setting can be a valuable resource.

Maintaining Motivation in the Classroom

Motivation is an additional key to educational success. Students can become easily overloaded with the amount of work that must be completed in a sonography program. Striving to do your best on every exam can be overwhelming, but it should always be your aim. Although you should be prepared, looking too far ahead can also increase anxiety. Approach one examination at a time, and put full effort into focused, dedicated study time for that one exam, and then move on to the next. Learn to reward your efforts after you do well on a test or examination, and try to avoid feeling depressed over tests on which you think you could have done better. Simply strive to do better on the next one, and make notes of information with which you struggled. Ask your instructors questions regarding specific concepts to gain a better understanding. Lastly, you should utilize your breaks from school to relax your mind and to do enjoyable activities, like gardening, exercising, traveling, or even catching up on sleep. Also, as stated earlier, maintain motivation by setting individual academic goals so that the foundations of understanding established concepts in the classroom impact your clinical practice in a positive manner.

CLINICAL SURVIVAL SKILLS

The following sections will provide a brief overview of the role of the sonographer, how important professionalism is in clinical settings, an explanation of workflow in an imaging department, and a concise explanation of several imaging modalities. As a student, in preparation for clinical, you should utilize a **scan lab** if your program provides one for students. As you advance through clinical, you should initially observe how sonographers interact with patients, the interpreting physician, and others within the healthcare team. It is also imperative for you to recognize the role of the sonographer within the healthcare team and workplace. The following sections will provide some clinical survival skills that may help you even before your first clinical experience.

The Sonographer: A Brief Overview

Though Chapters 2 and 4 provide further information regarding the sonographer and the sonography profession, respectively, it is vital at this time to provide a short synopsis of the obligations of a sonographer before delving into the clinical survival skills themselves. Sonography can be literally interpreted to mean "to draw with sound." A sonographer is a highly skilled medical professional who utilizes special equipment that emits **ultrasound** waves to create a diagnostic image of the human body (Figs. 1-6 and 1-7). These images are most often interpreted by a physician. **Audible sound** ranges are typically between 2 and 20,000 Hz. While **infrasound** is less than 2 Hz, ultrasound is greater than 20,000 Hz (Table 1-8). However, sonographers, when performing diagnostic sonography, utilize a much higher-frequency range, typically between 2 **megahertz** (MHz) and 15 MHz, though some transducers may incorporate higher frequencies. Essentially, ultrasound waves are pulsed into the body by a transducer with the help of a **coupling gel** (Fig. 1-8). The sonographic image is produced when the pulse strikes an object within the body and returns again to the transducer, a process referred to as the **pulse-echo technique** (Fig. 1-9). This happens rapidly. Therefore, sonography offers a **real-time imaging** analysis of dynamic internal structures. Real-time imaging provides us with instantaneous viewing of structures, much like watching a live video emanating from inside the human body.

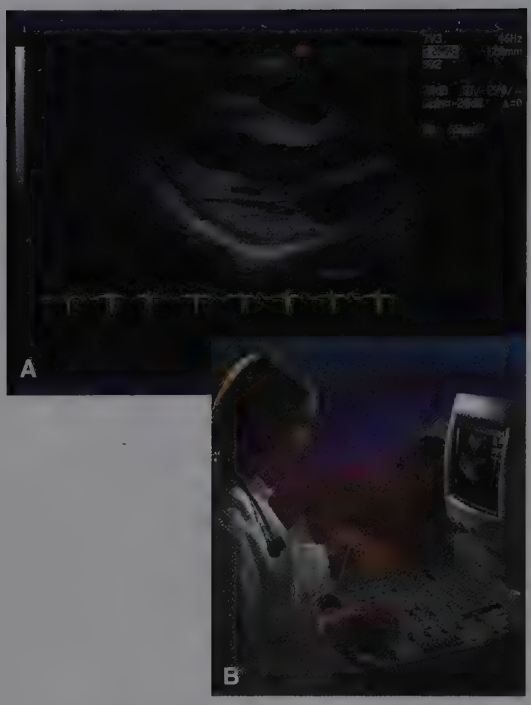


FIGURE 1-6 Echocardiographer. **A.** Normal echocardiogram sonographic image. **B.** The sonographer places the transducer in a left intercostal space in the parasternal line, overlying the heart to obtain image **A**. (Reprinted with permission from Moore KL, et al. *Clinically Oriented Anatomy*. 7th ed. Philadelphia, PA: Wolters Kluwer Health; 2013.)

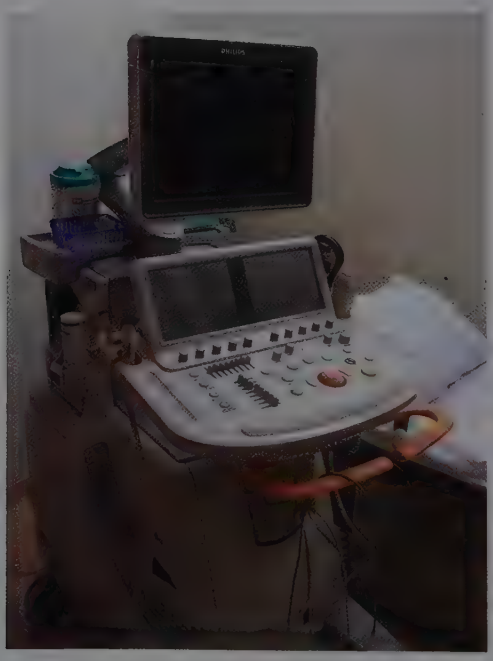


FIGURE 1-7 A Philips ie33 ultrasound machine is an example of equipment that sonographers utilize. There are several companies that produce ultrasound machines. (Reprinted with permission from Garcia MJ. *Noninvasive Cardiovascular Imaging: A Multimodality Approach*. Philadelphia, PA: Wolters Kluwer Health; 2011.)

TABLE 1-8 Ranges of sound

Sound	Ranges
Infrasound	<2 Hz
Audible sound	Between 2 and 20,000 Hz
Ultrasound	>20,000 Hz
Diagnostic ultrasound	Between 2 and 15 MHz (or higher)

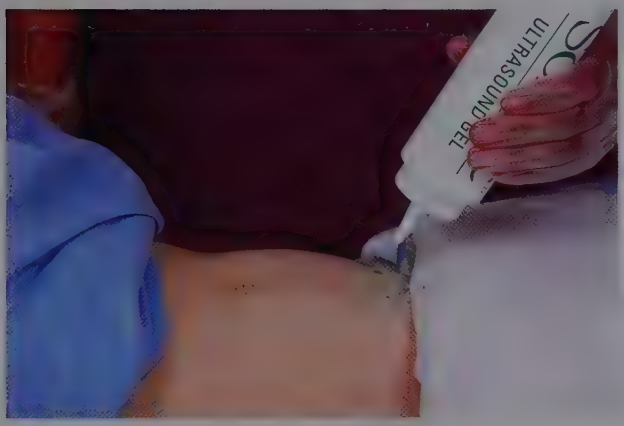


FIGURE 1-8 To image the body, sonographers utilize ultrasound gel, which may be dispensed in a gel bottle, as seen here, or via individual packets. (Reprinted with permission from Lynn P. *Taylor's Clinical Nursing Skills*. 3rd ed. Philadelphia, PA: Wolters Kluwer Health; 2010.)

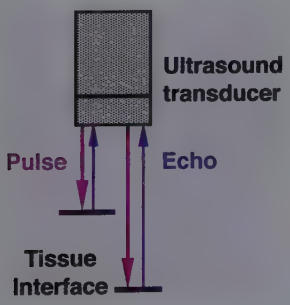


FIGURE 1-9 Pulse-echo technique. The transducer transmits a brief pulse of sound energy into tissue. The transmitted pulse encounters tissue interfaces, or boundaries, that reflect a portion of the sound beam back to the transducer. The depth of the tissue interface is determined by the round-trip time of flight for the transmitted pulse and the returning echo. The echo is then demonstrated on the monitor as a single dot. (Reprinted with permission from Klein J, et al. *Brant and Helms' Fundamentals of Diagnostic Radiology*. 5th ed. Philadelphia, PA: Wolters Kluwer Health; 2018.)

SOUND OFF Real-time imaging provides us with instantaneous viewing of structures, much like watching a live video emanating from inside the human body.

Before the examination, the sonographer obtains a clinical history, ultimately acquiring **clinical findings**, which are used to form a basis for the examination. After the examination, the sonographer offers a **sonographer report**, which provides basic descriptive information of the study, including measurements, the **sonographic findings** (such as the appearance of organs and structures), and an account of any sonographically identifiable abnormalities noted during the examination (Fig. 1-10). Interpreting physicians utilize this information along with viewing the sonographic images to develop a diagnosis. Therefore, the sonographer should have the ability to locate, measure, and sonographically describe **pathology** within the body.

Although you may witness it at times, sonographers should not be diagnosticians. A **diagnostician** is someone who produces a diagnosis from images and oftentimes shares the diagnosis with the patient. Physicians are diagnosticians. Furthermore, though the investigative imaging that we perform helps the interpreting physician to create a diagnosis, sonographers do not officially diagnose images. Sonographers who provide diagnostic information to patients may be held legally liable. Ask questions, and become familiar with sonographic dialogue. Specific sonographic descriptive terminology will be provided throughout this book, and you will encounter this unique form of analysis in the clinical setting daily. This book will further guide you in interacting with patients, sonographers, and physicians in clinical settings in upcoming chapters and offer some insight into the legal implications that exist in the medical profession.

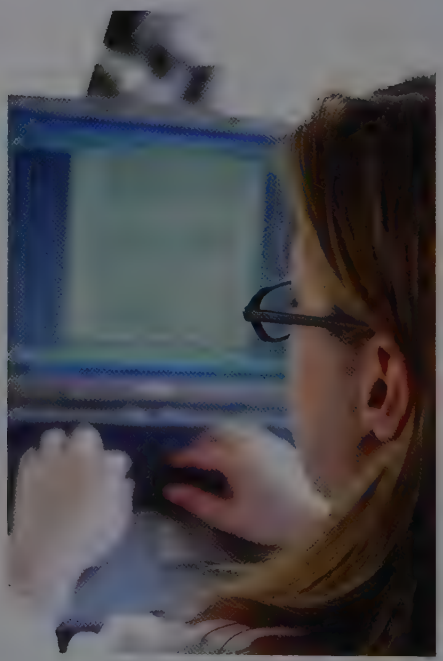


FIGURE 1-10 The sonographer completes the sonographer report immediately after the examination. (Reprinted with permission from DeLaet R. *Introduction to Health Care & Careers.* Philadelphia, PA: Wolters Kluwer Health; 2011.)

SOUND OFF Sonographers who provide diagnostic information to patients may be held legally liable.

Utilizing the Scan Lab

The act of performing the sonographic examination may be referred to as **scanning**. As you can easily deduce from the above brief description of the sonographer, the ability to accurately scan is essential. However, scanning experience is cumulative. In essence, the more you scan, the better scanner you will be and the more confidence you gain in your abilities. Therefore, confidence in yourself as a scanner is something you acquire with time through practice and experience. Your instructors cannot teach confidence. If your sonography program provides a place where students can practice basic sonographic procedures on each other, often referred to as a scan lab, you should utilize it as much as possible (Fig. 1-11). And since the art of scanning takes much practice, whether an instructor is available to provide assistance or not, being in the scan lab offers more exposure to sonography equipment, potentially more scan time, and more experience with normal anatomy.

Your program most likely contains **clinical competencies** as part of the curriculum. These are unassisted sonographic examinations for which you are graded to determine fundamental proficiency. The scan lab can provide the student sonographer with much needed scanning practice in preparation for competencies. If scan lab instructors are not available, one can utilize his or her textbooks and other students for assistance. Furthermore, if a fellow student is not available, some sonography programs provide **sonography phantoms**, which offer simulation for practice (Fig. 1-12). When creating your time management schedule for the week, include time for scan lab practice, as routine scanning practice is critical for success as a sonography student. You should also be in the scan lab to observe other students scanning.

SOUND OFF Confidence cannot be taught by your instructors. The more you scan, the better scanner you will be and the more confidence you will gain in your abilities.

FIGURE 1-11 Image of an ultrasound scanning laboratory where students practice sonographic imaging. (Image provided by Johnston Community College with permission.)

FIGURE 1-12 Example of an intraoperative ultrasound (IOUS)/laparoscopic ultrasound (LUS) phantom. **Upper left:** an ultrasound phantom specifically made for IOUS/LUS. **Upper right:** IOUS scanning training using a phantom. **Lower left:** LUS scanning training using a phantom placed in a trainer box. **Lower right:** a sonogram of the phantom, showing the pancreas and vascular structures. Note a stone (*arrow*) in the pancreatic portion of the bile duct. PV, portal vein; VC, vena cava; AO, aorta. (Reprinted with permission from Fischer JE, et al. *Fischer's Mastery of Surgery*. 6th ed. Philadelphia, PA: Wolters Kluwer Health; 2011.)

One study of sonography students claimed that the majority of first-year students prefer to scan after the sonographer in the clinical setting.[17] The research claimed that the students preferred this method of observation because they were more capable of finding organs in the specific patient by recognizing how the sonographer demonstrates the organs; they were more able to mimic the transducer manipulation and techniques after they watched the sonographers; they were more likely to discover an **acoustic window**, also referred to as a sonographic window; and they were able to learn protocols more easily (Fig. 1-13).[17] However, more advanced students may choose to scan before the sonographer. Whether you choose to scan before or after the sonographer, you should always strive to scan as much as possible.

SOUND OFF Routine scanning practice is critical for success as a sonography student. The importance of pursuing scanning opportunities cannot be overstated. Scan! Scan! Scan!

Essentials of Professionalism in Clinical

How you perform in clinical settings is equally, if not more, important than how you perform in the classroom. Though obtaining respectable grades in the classroom is critical, the sonographer is

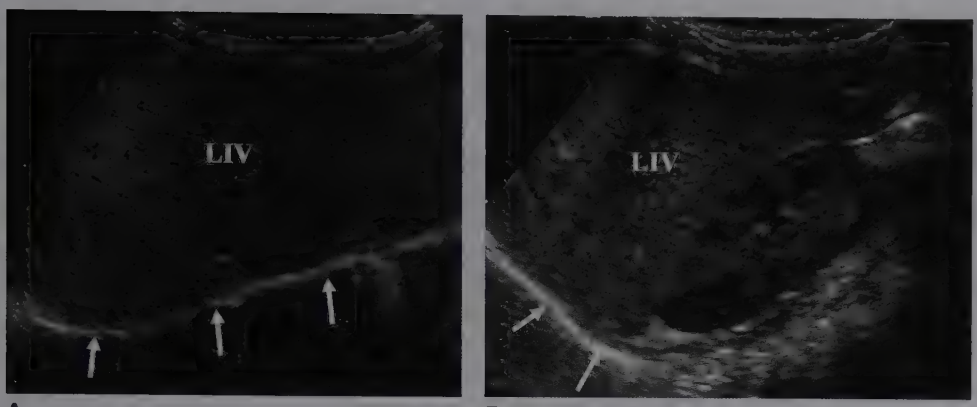


FIGURE 1-13 Acoustic window. Transverse **(A)** and longitudinal subcostal **(B)** sonographic image using the liver (*LIV*) as an acoustic window demonstrates the echotexture of the diaphragm (*arrows*) and right kidney. (Reprinted with permission from Siegel MJ. *Pediatric Sonography*. 4th ed. Philadelphia, PA: Wolters Kluwer Health; 2010.)

ultimately defined by clinical competence and the ability to provide skilled patient care. Sonography is a profession. It was officially identified as such in 2002 when the Bureau of Labor Statistics classified diagnostic medical sonographer as a distinct occupation. Consequently, there are specific requirements that a professional is expected to meet. For example, a professional must achieve certain educational criteria, they must meet minimum standards to practice within the profession, they are often required to obtain certification, and the profession in which they practice typically has professional associations with established codes of ethics and competency standards.[18] Sonographers are thus professionals and should therefore conduct themselves as such.

SOUND OFF **Though obtaining respectable grades in the classroom is critical, the sonographer is ultimately defined by clinical competence and the ability to provide skilled patient care.**

Closely associated with professionalism is the concept of medical ethics. Although Chapter 5 will provide greater detail concerning patient confidentiality and ethical standards that sonographers must appreciate and practice, one must recognize the importance of the **Hippocratic Oath**. The Hippocratic Oath, observed by physicians and occasionally other healthcare professionals, contains some basic guidelines for ethical standards and conduct between the healthcare provider and the patient. Table 1-9 provides a summary of concepts found in the Hippocratic Oath.

Regarding patient confidentiality, the Health Insurance Portability and Accountability Act (HIPAA) of 1996 included provisions that required the safeguarding of patient information, thereby establishing

TABLE 1-9 Key concepts of the hippocratic oath

- Place the patient's interests before your own.
- Protect your patients from harm or injustice.
- Treat all patients equally.
- Respect the patient's rights.
- Protect patient confidentiality.

strict rules for maintaining patient confidentiality. Your obligation as a student in healthcare and later as a healthcare worker is to protect patient information. One can accomplish this by not sharing diagnostic information with those who are not directly involved in the patient's care, including the patient's family members, your family members, and strangers. One should never speak about a patient's sonographic exam or confidential medical information in front of another person, in an elevator, at the lunch table, or anywhere information could be overheard by bystanders, even if unintentional. There are confidential locations in clinical that have been designated by clinical instructors where case discussions can take place.

Maintaining patient privacy is another continual objective for healthcare workers. Keeping our patients content and unexposed to maintain their dignity is of utmost significance. Sonography involves examining personal areas, including the chest, breast, and genital organs. You must attempt to maintain a patient's dignity by keeping him or her draped, especially when the examination is not in process.

Essentials of Work Ethic in Clinical Settings

There is always some task that needs to be performed in the department, and your role as a sonography student is to be supportive. Table 1-10 provides some minor tasks that you can perform in clinical that assist sonographers in their daily responsibilities. Maintaining professional conduct is critical to clinical achievement. Whether you recognize it or not, every clinical rotation is a job interview. Your clinical preceptors and instructors evaluate your successes and deficits in clinical, and consequently, you should view them as a prospective employer. In regard to treating your clinical assignment as a job, attendance and punctuality are essential. Make the commitment early in your training to be at clinical and to be there on time.

Employers not only recognize employees and students who are on time, they also appreciate someone on whom they can count. Being reliable and accountable can prove to be invaluable components of **work ethic** (Fig. 1-14). Everyone appreciates someone on whom they can rely. And everyone has been frustrated by broken promises from those who have offered assistance but not delivered. Being accountable means upholding your obligations in clinical and admitting when you have made mistakes. Sonographers are responsible for patients' lives, and mistakes should be identified and remediated as quickly as possible. Therefore, honesty is always the best policy in patient care. Chapter 2 will provide greater detail regarding work ethic and professionalism.

Sonography departments are centered on a common theme—patient service. Consequently, daily schedules are constructed to accommodate a certain amount of allotted time for each examination. As a sonography student, your ultimate goal should be to increase your scanning speed without sacrificing accuracy. But how does one gain more scan time? Getting work done on time and accurately helps sustain a work environment with reduced stress and thus one that is more conducive to learning. By simply being attentive to time and serving when needed, you can help a sonographer reduce their need to perform ancillary duties, thus in turn increasing the likelihood that you will be able to scan.

TABLE 1-10 Daily tasks for the sonography student

- Assist in completing paperwork.
- Assist in patient care and transporting patients.
- Clean stretchers, chairs, and ultrasound machines.
- Clean ultrasound transducers.
- Inform sonographers of needed supplies.
- Replace dirty linens after exams.
- Review protocols.
- Stock coupling gel.
- Stock rooms with linens and supplies.

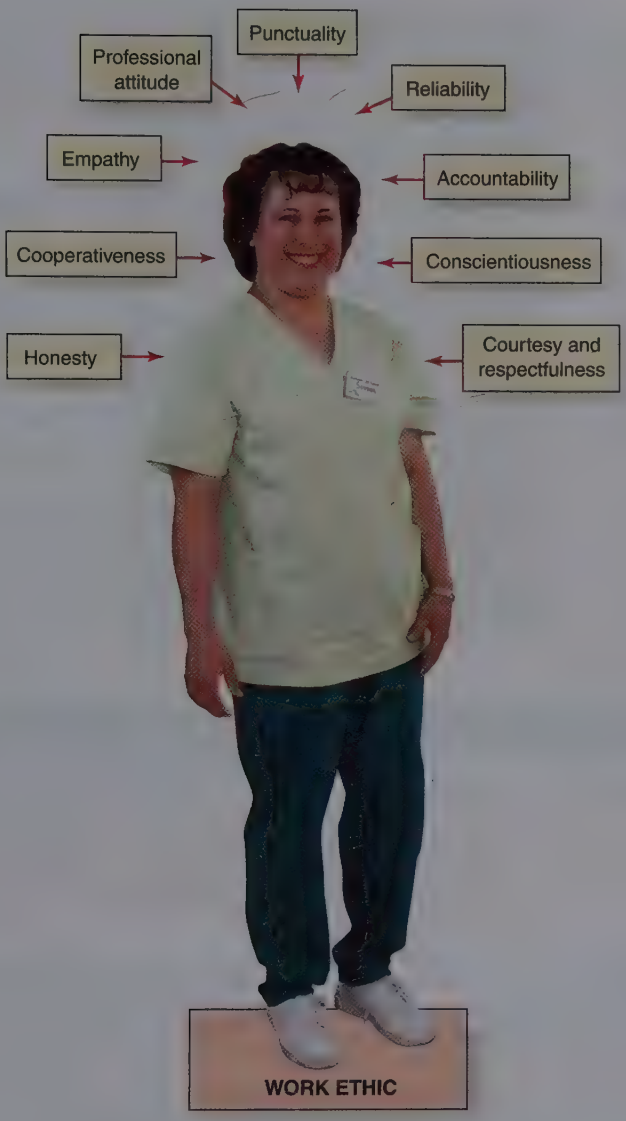


FIGURE 1-14 Professionalism and a strong work ethic go hand in hand. Many qualities contribute to a strong work ethic. (Reprinted with permission from Carter P. *Lippincott Textbook for Nursing Assistants.* 5th ed. Philadelphia, PA: Wolters Kluwer Health; 2019.)

SOUND OFF **Whether you recognize it or not, every clinical rotation is a job interview. Your clinical preceptors and instructors evaluate your successes and deficits in clinical, and consequently, you should view them as prospective employers.**

As a student, your attitude and amount of enthusiasm that you bring to clinical are constantly examined. If you consistently have a negative attitude about learning your chosen profession, you may possibly want to review the reasons why you chose this profession to pursue. For example, if you are constantly on your cell phone or viewing your smartwatch, then the sonographer or clinical instructor working with you will most likely interpret this action as laziness or disinterest. Continually checking your cell phone is rude and disrespectful to patients. The best choice would be to leave such devices out of the patient care setting.

SOUND OFF Continually checking your cell phone is rude and disrespectful to patients. The best choice would be to leave such devices out of the patient care setting.

CLINICAL ORIENTATION AND INFORMATION GATHERING

As a student, the requirements for your clinical rotations may be similar to those for another employee of the healthcare facility. For that reason, it is your responsibility to maintain professionalism, as you represent not only your school but also the clinical facility. It is also your duty to apply up-to-date changes that occur within the facility to your clinical practice. Most healthcare facilities require that students undergo criminal background checks. If a criminal incident occurs during your years of study, it is your obligation to inform your school and program directors. While many legal infractions are inconsequential, there are some crimes that may prevent you from graduating and/or being eligible to attempt national certification.

Throughout your clinical experience, you may be required to visit numerous healthcare facilities. Therefore, you must be informed concerning the unique policies and procedures of each institution before interacting with patients. Table 1-11 offers some clinical orientation recommended tasks that you should undertake, perhaps on your first few days of attendance. Remember, it is your responsibility to recognize and adjust to any changes in hospital policies and procedures as well (Fig. 1-15).

TABLE 1-11 Clinical orientation tasks for the sonography student

Clinical Orientation Task	Explanation
Obtain a map of the department.	Maps of departments are often posted on walls. These maps include room numbers, patient bathrooms, emergency exits, and locations of fire extinguishers. If your department does not have one, you can draw one for yourself.
Locate emergency crash carts (Fig. 1-15).	It is vital that you know the exact location of emergency crash carts. Some departments may have separate pediatric and adult crash carts, so know the difference.
Make copies of sonographic protocols.	Have protocols available in your pocket or in a notebook. Memorize the protocols, and ask questions concerning any variations in protocols.
Familiarize yourself with ultrasound machines.	Study the keyboards of each ultrasound machine in the department. Especially, find vital keys such as freeze, depth, overall gain, color Doppler, pulsed-wave Doppler, M-mode, and focus. Learn how to power on the machines and change transducers.
Locate supplies.	Masks, gowns, coupling gel, towels, sheets, invasive procedure supplies, and other patient care items should be located.
Locate material safety data sheets (MSDS) and policies and procedure manuals.	Ask your clinical supervisor where you can locate the MSDS material concerning chemicals used within the sonography department as well as the location of the policy and procedure manuals.
Obtain a list of emergency codes.	You should know the emergency codes for the department as well as how and when you should make an emergency call. For example, "code red" often refers to a fire. You should know what to do when a code red is announced.

FIGURE 1-15 The crash cart contains emergency medication and equipment. Always be aware of where the closest crash cart is in the clinical setting. (Reprinted with permission from Rosdahl CB, Kowalski MT. *Textbook of Basic Nursing*. 10th ed. Philadelphia, PA: Wolters Kluwer Health; 2011.)

SOUND OFF While many legal infractions are inconsequential, there are some crimes that may prevent you from graduating and/or being eligible to attempt national certification.

Understanding Workflow

Gaining an appreciation on a systemic level of an organization by viewing the entire process of how a patient moves through the organization can help you see just where you fit in. Consequently, it is vital for a sonographer and sonography student to not only understand his or her role in the imaging department but also appreciate how sonographic studies work to serve the goal of providing ordering physicians a definitive diagnosis. A patient would need to visit an imaging department when a licensed medical practitioner has ordered an imaging examination. The ordering physician targets the examination based on **clinical history**, physical examination, and laboratory reports, and he or she develops a possible list of **differential diagnoses** with the information gathered.

All patients must have an order, similar to a prescription, from a licensed physician or clinician, **physician assistant**, **nurse practitioner**, or perhaps a **midwife**. These healthcare practitioners may be employed within private practices or hospitals. For instance, an **obstetrician** can order an obstetric sonogram to be completed in the hospital setting. Also, an emergency room physician can order a lower venous sonogram to be completed within the vascular sonography department of the same hospital. A patient may have to undergo multiple imaging tests during his or her visit. It is important to recognize when multiple examinations are requested, because some imaging studies should be performed before or after others.

Ordering physicians must clearly offer an **indication**, or reason, for a diagnostic examination. An example of an indication for an abdominal sonogram is right upper quadrant pain. An indication

serves to provide the sonographers and interpreting physician with a limited clinical history with the goal of establishing the correct diagnosis. There is also an **International Classification of Diseases, Tenth Edition (ICD-10) code**, which is a healthcare classification system that provides a system of diagnostic codes for classifying diseases.

Imaging Departments and Modalities

Though imaging departments vary, especially between specialties within sonography, most imaging facilities center on the interpreting physician (Figs. 1-16 and 1-17). All imaging studies must have an interpreting physician. For most general imaging, exams are interpreted or read by a **radiologist**. A radiologist is a physician who specializes in reading diagnostic imaging exams, and in some cases, he or she may utilize imaging modalities to assist in the treatment of disease. Furthermore, vascular surgeons may interpret vascular exams, and **cardiologists** may interpret echocardiograms. For obstetric and gynecologic studies, a radiologist, obstetrician, or **maternal-fetal medicine specialist** may be involved in proposing a diagnosis. Other physicians may be trained to interpret diagnostic imaging exams, though extensive training is frequently required.

Sonography departments differ in location and responsibility. In the hospital, echocardiography and vascular sonography may be located near or within the cardiology department, while general abdominal, gynecology, and obstetrics are often located in radiology. Vascular sonography may be performed in radiology as well. Stand-alone physicians' offices or outpatient diagnostic centers that utilize sonography may require sonographers to perform a wide range of sonographic studies that may involve several different specialties (e.g., abdomen, vascular, obstetrics, etc.). Regardless of the location, the sonography department will almost certainly consist of individuals with varying years of clinical and didactic training experience. The certifications of these individuals may vary as well. You may encounter lead sonographers, sonography department managers, and staff sonographers during your rotations. No matter what the role, each team member works to accomplish the goal of providing adequate and accurate patient care. The following sections will provide you with a brief overview of the different modalities within the imaging profession that you will most likely encounter during your clinical studies.

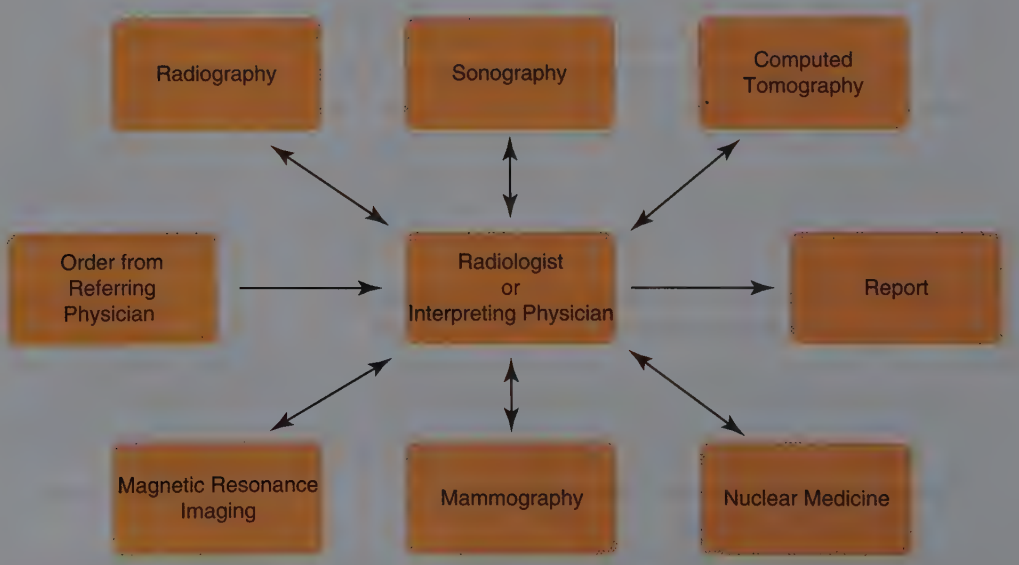


FIGURE 1-16 Layout of an imaging department and workflow from the referring physician to the final report.

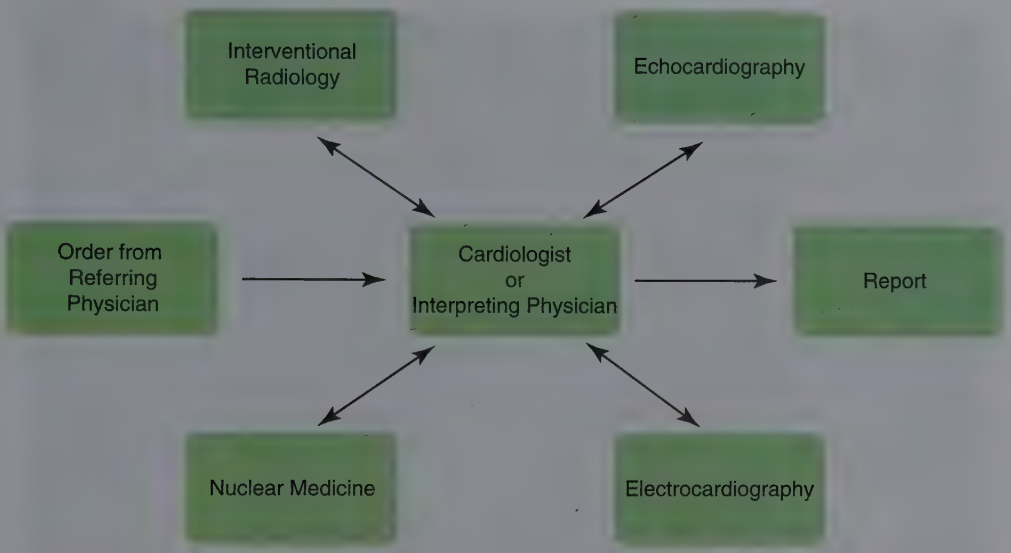


FIGURE 1-17 Layout of a cardiology department and workflow from the referring physician to the final report.

Radiography

Radiography is the oldest of the diagnostic modalities within the imaging department. On November 8, 1895, Wilhelm Conrad Röntgen accidentally discovered an invisible ray that produced an image of the bones within his hand.[1] He eventually created the first **radiograph**, when he imaged his wife's hand. His discovery ultimately led to what he termed "x-rays." Since then, the radiography field has been crucial in the diagnosis of not only broken bones but many other diseases within the human body. Radiographers, also referred to as radiologic technologists, are trained medical professionals that utilize x-ray or ionizing radiation to obtain images of the body. Radiographers not only image bones, they also use x-ray to evaluate the chest and gastrointestinal and genitourinary systems. Some gastrointestinal studies performed in radiography include barium enema examinations, upper gastrointestinal series, and pyloric stenosis examinations, while genitourinary examinations include intravenous pyelograms (IVPs) and voiding cystourethrograms (VCUGs) (Fig. 1-18). Most radiographic examinations require the radiographer to position an x-ray tube near the patient to obtain an exposure. However, radiographers may also assist the radiologist or other physicians during **fluoroscopy**, **myelography**, **arthrography**, and gastrointestinal imaging. Furthermore, portable radiography is often employed in patient rooms, within the emergency department, and during surgical procedures within the operating room. Since potential occupational exposure to radiation exists, radiographers must wear a radiation monitoring badge. These badges provide information regarding radiation exposure. Though x-ray films were once used, departments currently utilize digital radiography. Radiographers and other technologists use digital technology to store and view images on a computer within a **picture archiving and communication system** (PACS) (Fig. 1-19). These images are typically interpreted by a radiologist, though other trained health care professionals may interpret them as well, such as orthopedic physicians.

Many radiography educational programs in the United States now offer associate degrees, though some offer diplomas or baccalaureate degrees. The **American Registry of Radiologic Technologists** (ARRT) offers a national certification examination for radiography student candidates who meet certain didactic and clinical criteria. Once certified by the ARRT, a radiographer achieves the title of *registered technologist* (radiography) or *RT(R)*. There are also several subspecialty modalities that a radiographer can further pursue within the field of radiology, like **computed tomography** and **mammography**.

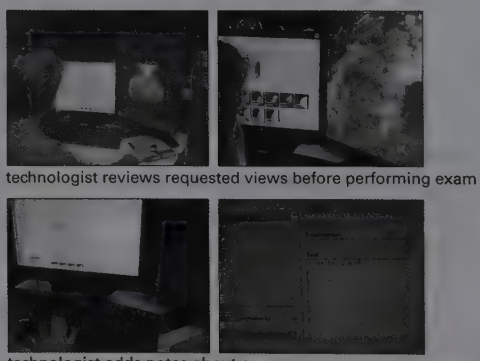
FIGURE 1-18 Image of a voiding cystourethrogram in a patient with bilateral vesicourethral reflux disease. (Reprinted with permission from Schrier RW. *Diseases of the Kidney and Urinary Tract.* 8th ed. Philadelphia, PA: Wolters Kluwer Health; 2006.)

SOUND OFF **The "ALARA" principle is practiced by imaging professionals, including sonographers. This mnemonic reminds professionals to keep patient exposure "as low as reasonably achievable." Though ultrasound does not involve ionizing radiation, sonographers should also practice ALARA.**

Computed Tomography

Computed tomography (CT) also uses x-ray, like radiography, to obtain images of the body. For that reason, some radiographers have utilized **cross-training** to specialize in the field of CT, though dedicated didactic training is currently available. CT provides high-resolution sectional viewing of the

A



B

FIGURE 1-19 PACS workstations allow the radiologist **(A)** and the technologist **(B)** to communicate with each other. In these images, a mammographer is depicted, though sonographers utilize PACS also. (Reprinted with permission from Andolina VF, Lillé SL. *Mammographic Imaging.* 3rd ed. Philadelphia, PA: Wolters Kluwer Health; 2010.)

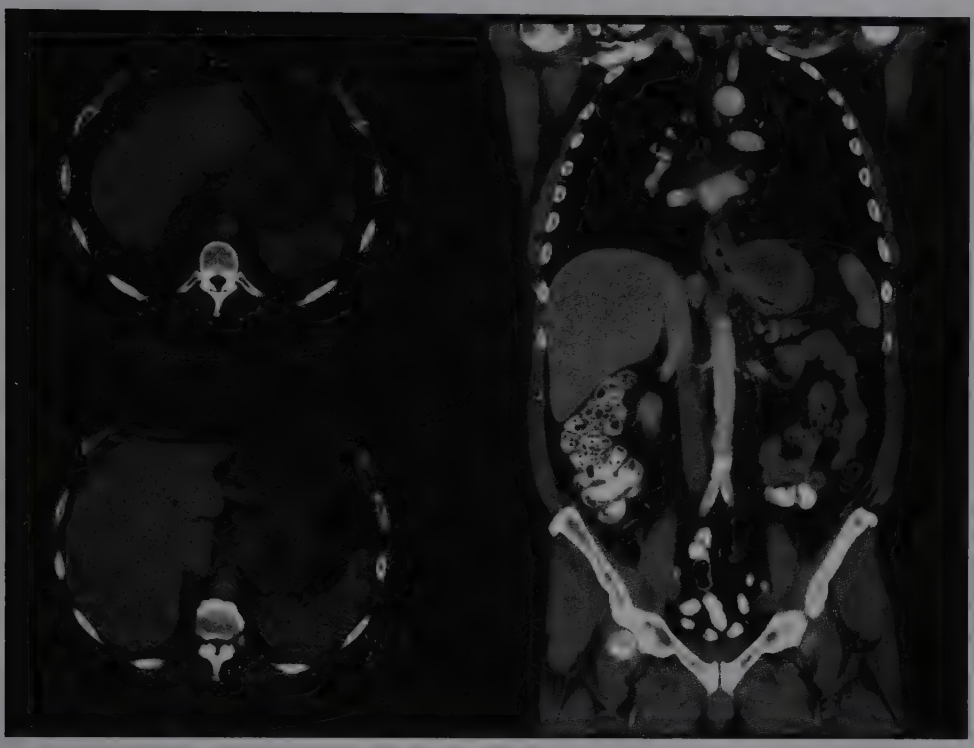


FIGURE 1-20 Computed tomography. Axial and coronal computed tomography (CT) images of the abdomen. (Reprinted with permission from Guimaraes M, et al. *Embolization Therapy: Principles and Clinical Applications.* Philadelphia, PA: Wolters Kluwer Health; 2015.)

body in multiple planes (Fig. 1-20). Instead of a stationary x-ray tube, as utilized in radiography, CT employs an x-ray tube that rotates around the patient, thereby offering the ability to obtain imaging slices of the patient (Fig. 1-21).

CT is often utilized in trauma, during **invasive procedures**, and routine outpatient procedures. Occasionally, a **CT technologist** performs examinations that require the patient to ingest or be

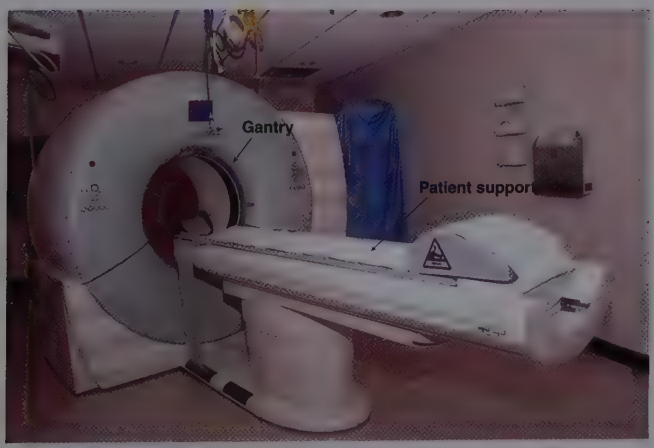


FIGURE 1-21 A CT scanner consists of a table and the gantry, which houses the x-ray tube. (Reprinted with permission from Fosbinder RA, Orth D. *Essentials of Radiologic Science.* Philadelphia, PA: Wolters Kluwer Health; 2011.)

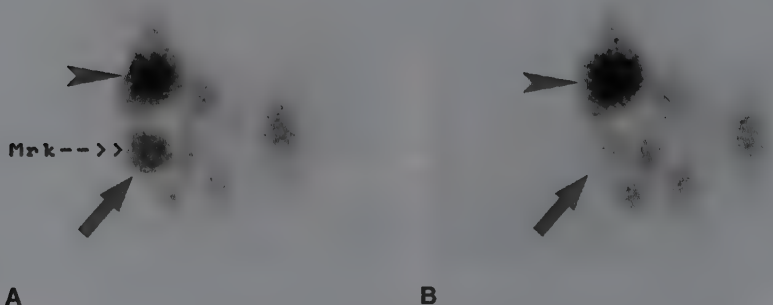
injected with a **contrast agent**. For example, for some gastrointestinal CT examinations, patients must drink barium or other ingestible contrast agents. Other CT examinations require an injection of iodine-based contrast into the venous system, thereby facilitating evaluation of the vascular system and improved characterization of certain masses.

Sonographers, especially those who perform abdominal or gynecologic studies, should work to establish an understanding of CT, as many sonographic procedures are often correlated with CT examinations. Also, it is important to note that some CT and radiography examinations should be completed after sonographic examinations, as contrast agents may inhibit the ability to obtain optimal sonographic images, especially if barium is employed. Radiographers may specialize in CT through the ARRT by obtaining postprimary education and clinical training.

Nuclear Medicine Technology

Nuclear medicine utilizes radioactive material for the diagnosis and treatment of various diseases. A nuclear medicine test requires that the patient inhale, ingest, or be injected with radioactive material known as a **radiopharmaceutical**. These radiopharmaceuticals are capable of concentrating on specific organs or systems in order to evaluate organ function, like the thyroid gland, kidneys, skeletal system, and urinary system. A **nuclear medicine technologist** operates a gamma camera strategically placed near the patient to detect the radiation emitted by the radiopharmaceutical, thus creating an image. The radiopharmaceutical may also be used to differentiate normal and abnormal structures within the body. For example, during a nuclear medicine thyroid examination, the radiopharmaceuticals can accumulate in an area of pathology that may be referred to as a "hot spot." Conversely, a "cold spot" indicates an area of decreased absorption of the radiopharmaceutical and could also indicate the presence of various diseases (Fig. 1-22). Two-dimensional imaging of various organs in nuclear medicine may be referred to as **scintigraphy**. Furthermore, some radiopharmaceuticals are utilized to treat disease or evaluate the function of organs. For example, a hepatobiliary iminodiacetic acid (HIDA) scan is another nuclear medicine test that can be used to evaluate the liver and biliary system, including the gallbladder, for appropriate function.

Technetium (Tc99m) sestamibi, often designated under the trade name **Cardiolite**, is a pharmaceutical agent used in nuclear medicine imaging to examine the blood flow of the heart. This test, often referred to as a **nuclear stress test**, requires that the patient exercise, often by way of a treadmill, though some patients require a special drug that artificially stresses the heart, thus simulating active exercise. Echocardiography may be utilized to further analyze the heart and surrounding anatomy before or following nuclear medicine tests.



A B

FIGURE 1-22 Nuclear medicine images of thyroid nodules. **A.** A radioactive marker (*Mrk*) was placed over a 2-cm palpable nodule (*arrow*) in the right thyroid lobe. **B.** The image on the right, without the marker, demonstrates the palpable nodule (*arrow*) to be cold. The second palpable nodule in the right upper lobe (*arrowhead* in both **A** and **B**) is shown to be hot. A biopsy of the cold, palpable nodule demonstrated in **(B)** confirmed that the nodule was papillary thyroid cancer.

Positron emission tomography (PET) is a technique that utilizes both the radionuclide imaging principles of nuclear medicine and the imaging techniques of CT. Some facilities may purchase a CT scanner that includes PET technology. Nuclear medicine technologists may also acquire images with a single-photon emission tomography (SPECT) imaging machine, which adds further physiologic analysis of organs and specific diagnosis of pathology in order to develop a specialized treatment plan. SPECT creates three-dimensional images of the anatomy as well.

There exists several dedicated nuclear medicine training programs throughout the United States, and the ARRT and the Nuclear Medicine Technology Certification Board offer certification for technologists. A nuclear medicine technologist must undergo specific training dedicated to radiation safety, as exposure to both them and the patient is inevitable. Furthermore, some radiation exposure to sonographers during sonographic examination may occur following nuclear medicine injections or studies when patients are required to have further testing. For example, a patient who has recently undergone a thyroid nuclear medicine examination may still have some active radiation emitted from the thyroid. Though exposure is minimal to bystanders in most cases, student sonographers who are pregnant may be required to wear a fetal radiation monitoring badge to screen for possible exposure.

SOUND OFF In some facilities, radiologists have the ability to overlay CT and nuclear medicine imaging examination, such as SPECT/CT or PET/CT, a process referred to as hybrid imaging.

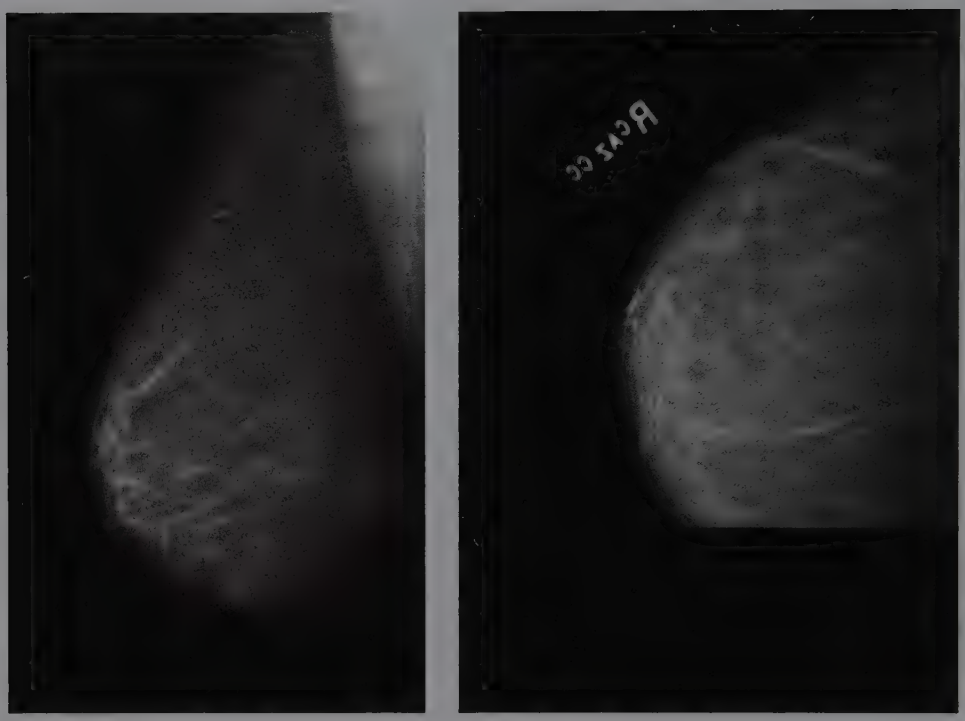
Mammography

Mammography, the **gold standard** in breast imaging, employs x-rays to obtain an image of the breast. Like CT technologists, mammographers are specialized radiographers who pursue continuing education and specific on-the-job clinical training, with the ARRT offering a national certification examination. Since 2015, the American Cancer Society has strongly recommended that all women have the opportunity to begin having an annual **screening mammogram** starting between the ages of 40 and 44 years.[19] It is important to note that other organizations, such as the American College of Radiology, may have different recommendations, especially for those patients who are considered high-risk. Patients may also present to the imaging department with a palpable nodule or lump within the breast. Mammography is not recommended in some cases of palpable disease, especially in younger patients, and thus, sonography may be used as the initial screening imaging tool.

Women suspected to have disease on screening mammograms may require further breast imaging, including a **diagnostic mammogram**, breast sonogram, or magnetic resonance imaging (MRI) of the breast. For this reason, sonographers should familiarize themselves with mammographic views of the breast in order to understand the location of breast pathology and the mammographic appearance of disease. Screening examinations typically involve two projections of the breast: cranial-caudal (CC) and mediolateral oblique (MLO) (Fig. 1-23). Diagnostic mammograms include special compression views and focal imaging for specific lesions. Digital mammography is currently widely employed, and three-dimensional mammography is a supplementary technique.

Magnetic Resonance Imaging

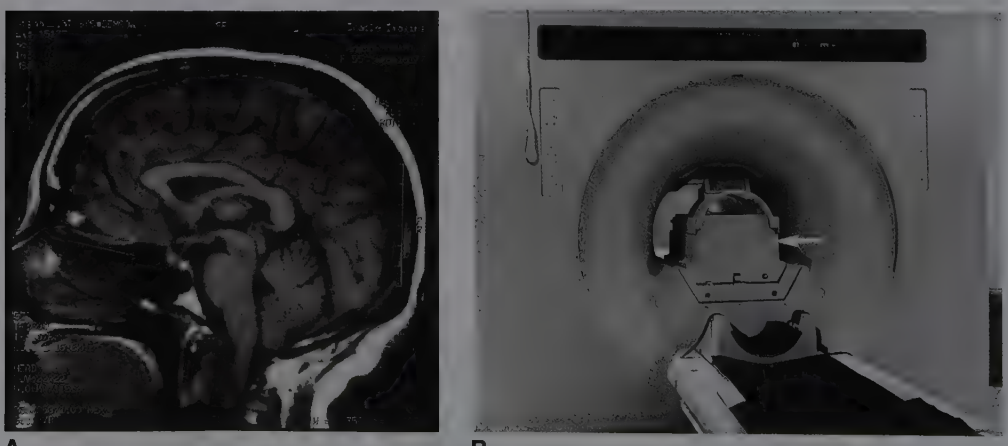
Unlike radiography and CT, **magnetic resonance imaging** (MRI) uses a powerful magnetic field, radio waves, and a devoted computer system to create sectional images of the human body (Fig. 1-24). MRI provides excellent resolution of internal structures, and the images can be obtained in numerous sectional planes. To better visualize structures, patients may be injected with a contrast agent, most likely **gadolinium**. MRI is used to evaluate disease all over the body, including the extremities, brain, spine, breast, and abdominal structures. Occasionally, MRI is even utilized during pregnancy. A **magnetic resonance angiogram** (MRA) is a special MRI procedure that is used to



A B

FIGURE 1-23 Mammogram images of the breast in mediolateral oblique projection **(A)** and cranial-caudal projection **(B)**.

evaluate vascular structures more closely. An **MRI technologist** is often a specialized radiographer who has been trained both in didactic information and clinical preparation to work in MRI. The MRI machine is essentially a large magnet, and therefore, special precautions must be taken in MRI to prevent metallic structures from entering the MRI room where the machine is located. Be aware of caution signs placed near an MRI machine, and always ask for help before transporting patients near the MRI room.



A B

FIGURE 1-24 MRI image of the brain **(A)** and the MRI scanner **(B)**. (**Part B:** Reprinted with permission from Dutton AG, et al. *Torres' Patient Care in Imaging Technology*. 8th ed. Philadelphia, PA: Wolters Kluwer Health; 2012.)

Cardiovascular Interventional Technology and Vascular Interventional Technology

A **heart catheterization**, often referred to as a heart cath or cardiac angiogram, is performed with the assistance of a **cardiovascular interventional technologist**. Specialized radiographers assist radiologists and other physicians in **interventional radiology** to complete these and other vascular studies under the assistance of fluoroscopy. During a heart catheterization, x-ray dye is utilized to image the vessels of the heart for signs of occlusion. The access point for the catheters used during the procedure is through either an upper extremity or leg. **Vascular interventional radiographers** also assist radiologists in stent placement for organs like the liver. Many of these procedures are performed under **surgical asepsis**, and treatment of certain diseases can be performed during the examination. The ARRT offers certification for both cardiovascular technology and vascular interventional technology.

APPRECIATING CRITICAL THINKING

According to the *Scope of Practice and Clinical Standards for the Diagnostic Medical Sonographer* published by the Society of Diagnostic Medical Sonography, "diagnostic medical sonographers use independent, professional, ethical judgment, and critical thinking to safely perform diagnostic sonographic procedures."[20] Thus, a significant component of performing adequate patient care is both acquiring and utilizing **critical thinking skills**. Critical thinking skills are resourceful actions, judgments, and decisions based on the combination of professional knowledge, experience, integrity, and ethical standards.[1] Critical thinking has been described as the disciplined art of ensuring that you use the best thinking of which you are capable in any set of circumstances.[21] Furthermore, a critical thinker in sonography would utilize broad in-depth analysis of evidence to make decisions and communicate his or her beliefs clearly and accurately.[22] According to one source, critical thinking development can be assessed in stages (Fig. 1-25). An important aspect of critical thinking in sonography is the application of a code of ethics to our decision-making process. Throughout this book, both ethical and legal issues related to sonography and health professions will be provided.

SOUND OFF Critical thinking is the disciplined art of ensuring that you use the best thinking of which you are capable in any set of circumstances.

The professional practice of a sonographer is a cerebral occupation.[23] Indeed, the function of problem-solving and critical thinking skills is especially unique in the imaging profession for practicing sonographers. Whereas some imaging professionals utilize technical skills to acquire routine images for interpreting physicians, sonographers must have the ability to correlate clinical history with sonographic findings in order to guide the sonographic examination. The clinical history of a patient includes **symptoms** and **signs**, pertinent illnesses, past surgeries, laboratory findings, and the results of other diagnostic testing, including the results of the other aforementioned imaging studies in this chapter. It is important to note the difference between a sign and a symptom. A symptom is the **subjective** physical manifestation of a disease that a patient experiences. For example, abdominal pain, headaches, and nausea are all clinical symptoms. A sign is **objective** evidence of a disease. For example, a sign could be hematuria or high blood sugar, as both of these involve a specific test that can prove the presence of blood in the urine and high levels of sugar in the blood, respectively.

An example of clinical history information could be a patient who has persistent right upper quadrant pain, elevated laboratory values, and a recent cholecystectomy. Sonographic findings comprise the information gathered by completing the sonographic examination. An example of a sonographic finding includes the visualization of an enlarged common bile duct that contains gallstones in the same patient; these findings may lead to the diagnosis of retained gallstones in the common bile duct—choledocholithiasis.

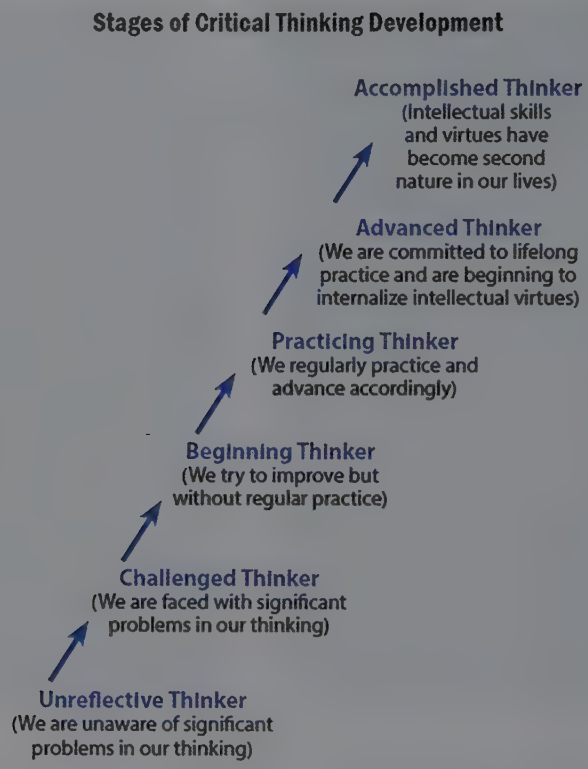


FIGURE 1-25 Stages of critical thinking. (Reprinted with permission from The Foundation for Critical Thinking.)

Essentially, sonographers perform **investigative imaging**. This means that we obtain sonographic **protocol** images while simultaneously searching for and identifying abnormalities. That is to say, with the use of a standard sonographic protocol, the sonographer explores the relevant anatomy, identifying normal structures and abnormalities, with the goal of assisting the interpreting physician in establishing an accurate diagnosis. This task placed on the sonographer is a unique and vital responsibility. Placing this much responsibility on the sonographer can seem rather daunting, especially for students, but it is a duty that you, with much practice, can someday embrace. The more one observes and participates in sonographic examinations, the more one gains an appreciation for how vital critical thinking is to patient care. Table 1-12 provides some qualities of those who use critical thinking effectively.

SOUND OFF With the use of a standard protocol, the information that we gather from the patient and from the medical history helps to guide our examinations with the goal of assisting the interpreting physician in establishing an accurate diagnosis.

The development and utilization of critical thinking skills in sonography is an ongoing career-long undertaking that involves reasoning. There are many elements of reasoning, including information, **inferences**, and **assumptions**. In order to make optimal decisions in life, obtaining accurate information regarding the problem at hand is vital. Information includes observations, data, facts, and experiences.[21]

TABLE 1-12 Qualities of well-cultivated critical thinkers

- Asks vital questions and recognizes problems
- Gathers and assesses relevant information
- Comes to well-reasoned conclusions and solutions
- Tests conclusions and solutions against relevant criteria
- Thinks with an open mind
- Communicates effectively with others in order to figure out solutions to complex problems

Obtaining reliable information is the most significant component of critical thinking and decision-making. Furthermore, critical thinkers continually strive to learn not only the correct information but what portion of the information is imperative to understand. Medical books are full of important data, facts, and observations obtained through clinical studies and trials. A critical thinker should be able to take a large amount of information and break it down into understandable and usable facts. For example, a cardiac student who has been asked to read a journal article on the topic of tetralogy of Fallot can practice critical thinking by reading the article and then asking him or herself, "How does this article apply to patient care, and how can it improve my understanding about the disorder?" That is to say, one should determine through reasoning exactly how each assignment, whether didactic or clinical, applies to the ultimate goal of becoming a clinically minded sonographer. Once the aforementioned cardiac sonography student encounters a patient with tetralogy of Fallot in the clinical setting, the student should be capable of recalling the essential information needed to provide specific patient care for that individual with a more targeted sonographic examination.

Once the correct information is gathered, a sonographer can make certain inferences in which reasoning is based on gained factual knowledge using critical thinking. In the medical profession, our inferences must be based on facts. For example, a sonographer is asked to perform an abdominal sonogram. During the sonogram, the sonographer recognizes that the liver appears to have multiple liver masses. An inference made by the sonographer is that the patient has metastatic liver disease. This inference, or conclusion, can be further analyzed and essentially proven by correlating further sonographic findings with the patient's medical and laboratory history. Though the sonographer is not required to make a diagnosis, the sonographer must still understand the medical and sonographic implications of metastasis to the liver in order to evaluate the patient effectively with ultrasound, as other organs and systems may be involved. A skilled sonographer uses critical thinking skills to improve patient care. One author applied scientific methodology and specific steps to the art of critical thinking in sonography (Table 1-13).[24]

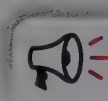
TABLE 1-13 Steps for successful critical thinking in sonography

Observation	Patient complaints, clinical symptoms, patient input and cues
Hypothesis	Reason for referral, tentative diagnosis, indications for examination, ICD-10 code
Data collection	Subjective patient information, laboratory information, physical findings, sonographic findings, past medical history
Data analysis	Correlation of lab findings, clinical data, interpretation of sonographic images, and other pertinent findings
Conclusion	Sonographer's description and impression of findings, sonographic diagnosis, final report

Data from Baun J. Scientific thinking as a framework for critical thinking in diagnostic medical sonography. *JDMS* 2004;20:202–207.

There is a vast difference between making inferences and making assumptions. Critical thinkers can distinguish between fact and opinion.[24] While inferences are based on fact, assumptions can be based on guesses or opinion. Making assumptions concerning patient care and safety is never appropriate. For example, assuming that a critically ill patient who has been sleeping on the stretcher throughout a sonogram can be left alone after a sonographic examination can be disastrous. The patient could fall off the stretcher and injure him or herself. A critical thinker will not only talk to the patient before leaving the room but put up the side rails of the stretcher and also inform a coworker that the patient is in the room or ask for someone to stay with the patient.

Critical thinkers have the ability to raise discriminating questions in an attempt to identify better ideas, establish a deeper question, or to find solutions to issues.[25] For example, a patient presents to the sonography department with pelvic pain for a pelvic sonogram. The sonographer performs the pelvic sonogram without obtaining any medical history and does not visualize the uterus or ovaries during the sonogram. While presenting the sonogram to the interpreting physician, the sonographer is asked if the patient has had a hysterectomy. The sonographer claims "I assume she has. I could not find the uterus or ovaries." Making an assumption in this situation negatively affects patient care. A sonographer applying critical thinking skills will consistently delve deeper into patient history to discover the most essential facts and establish inferences or conclusions based only on those facts.

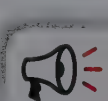


SOUND OFF A sonographer applying critical thinking skills will consistently delve deeper into patient history to discover the most essential facts and establish inferences or conclusions based only on those facts.

Student Application of Critical Thinking

Critical thinking ensures that the actions of the sonographer consistently reflect the cumulative didactic and clinical training received when caring for patients. There is a clear, positive correlation between the amount of clinical experience one has and diagnostic accuracy. Essentially, the more experience you gain in clinical, the higher the probability that your interpretation or suspected diagnosis will be correct.[24] As you progress through your education, you will naturally gain critical thinking skills by observing seasoned sonographers in practice. In fact, observation is crucial to critical thinking. We gain much knowledge from watching others. Student sonographers should evaluate the way in which sonographers interact with patients, other healthcare workers, and interpreting physicians. Students should also take note of relevant clinical history and scanning techniques utilized for specific studies.

Observation in clinical includes making both mental and physical notes. The construction of a **clinical journal** (or clinical diary) for institutional information and professional reflection is a priceless practice for some students. Writing in a journal can be therapeutic, and returning to the journal weekly can help develop critical thinking skills, especially when writing down new pieces of information learned every day. Instructors may develop online discussion boards for students to confer about clinical experiences and candidly share thoughts. Table 1-14 provides some information to include in your clinical journal. Everyone experiences bad days in clinical, but hopefully, the good days will ultimately outnumber the bad.



SOUND OFF It is important to remember that everyone experiences bad days in clinical, but hopefully, the good days will ultimately outnumber the bad.

TABLE 1-14 Personal clinical journal components

Note: Clinical journals should never include patient identifiers like names and medical record numbers.

- Institutional components
  - Map of the department
  - Location of fire exits
  - List of codes
  - Location of crash carts
- Personal components
  - Goals for the day
  - Daily observations
  - Daily personal reflection
  - Interesting pathology
  - Interesting cases
  - New facts learned

SUMMARY

Going back to school can be complicated, especially when it's sonography school. Stress is inevitable. However, with the help of some of the tips in this chapter, hopefully you will be better financially prepared, have better emotional stability and physical well-being, and understand the importance of time management. Classroom survival skills, such as test-taking preparation tips and maintaining motivation throughout your education, should facilitate a more conducive learning experience.

Sonographers are created in clinical. This chapter provided insight into workflow and the various imaging modalities and professionals that sonographers encounter in clinical. The sonographer was briefly described with the hope that you can gain a basic understanding of the profession before greater details are offered in the upcoming chapters. The manner in which critical thinking skills permeate the sonographer's decision-making process was clearly established as well. The importance of critical thinking will be established throughout this text.

You have chosen a noble profession to pursue. Sonography school is demanding but rewarding. It is stressful but manageable. Make the decision now to develop classroom and clinical skills that are geared toward providing all patients with adequate care. Your ultimate goal should be to treat all patients with respect, protecting their dignity and serving them equally. This is something our patients both expect and deserve.

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THINKING CRITICALLY

1. Choose a pathology from another sonography class or one you have noted in clinical. Read your textbook concerning that pathology. On a piece of paper, write down the clinical findings of the pathology and sonographic findings. What would a sonographer need to know about this pathology in clinical?
2. It is Friday. You have three tests next week: one on Monday, one on Wednesday, and one on Friday. How would you manage your time wisely so that you can be successful on all three tests? Would you study just the night before each test? Would you study some each night for all three tests? Why?
3. What types of techniques would you use to prepare for the tests mentioned above? Would you make note cards? Would you study with a classmate?
4. Today is your first day at clinical. What tasks can you perform to assist the sonographer? What questions should you ask on your first day? What supplies should you locate?
5. Describe an instance where you have had to use critical thinking to solve a problem.
6. Observe a sonographer in the clinical environment and try to identify an instance where he or she had to use critical thinking before, during, or after a sonographic examination. How did that decision impact patient care?
7. Write down some personal and educational goals and place them where you will see them every day so that you can be reminded of what you would like to achieve. Check them off as you accomplish them.

CHAPTER 1 • REVIEW QUESTIONS

1. **What are resourceful actions, judgments, and decisions based on the combination of professional knowledge, experience, integrity, and ethical standards?**
   a. Critical thinking skills
   b. Investigative imaging skills
   c. Time management skills
   d. Clinical history skills

2. **What is the body's typical reaction to challenging situations that are perceived as demands on time, energy, or resources?**
   a. Subjective concerns
   b. Objective concerns
   c. Stress
   d. Anxiety

3. **Which of the following is the general state of feeling worry and fear before confronting something emotionally or physically challenging?**
   a. Subjective concerns
   b. Objective concerns
   c. Stress
   d. Anxiety

4. **What imaging modality utilizes both features of nuclear medicine and computed tomography?**
   a. PET
   b. CT
   c. MRI
   d. MRA

5. **Which of the following is not a quality of a well-cultivated critical thinker?**
   a. Gathers and assesses relevant information
   b. Asks vital questions and recognizes problems
   c. Thinks with a closed mind
   d. Tests conclusion and solutions against relevant criteria

6. **All of the following are suggested daily tasks for the sonography student in clinical except:**
   a. replaces dirty linens after exams.
   b. completes preliminary reports unassisted.
   c. informs sonographers of needed supplies.
   d. reviews protocols.

7. **What is the normal range of human hearing?**
   a. Between 2 and 4 kHz
   b. Less than 2 Hz
   c. Between 2 and 20,000 Hz
   d. Above 20,000 Hz

8. **What term is described as reasoning or answers based on gained factual knowledge using critical thinking?**
   a. Assumptions
   b. Inferences
   c. Brain dumping
   d. Work ethic

9. **Which of the following would be a contrast agent used in MRI?**
   a. Iodine
   b. Gas bubbles
   c. Gadolinium
   d. Technetium

10. **Which of the following is not provided by the sonographer on a sonographer report?**
    a. Diagnosis
    b. Descriptive sonographic terminology
    c. Location of pathology
    d. Measurements of normal and abnormal structures

11. **Which of the following would be best described as a symptom?**
    a. Positive urine pregnancy test
    b. Chest radiography report
    c. Biopsy results
    d. Nausea

12. **Which of the following best describes the pulse-echo technique?**
    a. The ultrasound transducer sends an ultrasound wave into the body.
    b. The ultrasound transducer listens to sound waves that are emitted naturally by the body.
    c. The ultrasound transducer sends an ultrasound wave into the body and then listens for the returning echo.
    d. The ultrasound transducer is a camera that utilizes pulsed magnetic waves and echoes to acquire images.

13. **What term may be used to describe the optimal location on the body for placement of the ultrasound transducer to demonstrate both normal anatomy and pathology?**
    a. Contrast window
    b. Protocol
    c. Real-time imaging
    d. Acoustic window

14. **Which of the following would not be a valid time management tool for the sonography student?**
    a. Plan your week.
    b. Set your own early deadlines.
    c. Create your own academic calendar.
    d. Check during class if any assignments are due for the day.

15. **Which imaging modality utilizes radioactive material in order to acquire images?**
    a. Nuclear medicine
    b. CT
    c. MRI
    d. Radiography

16. **Which of the following should not be included in a personal clinical journal?**
    a. Medical record numbers
    b. Interesting cases
    c. Personal thoughts
    d. Scanning tips learned

17. **Which of the following would not be considered clinical history information?**
    a. Headaches
    b. Gallbladder wall thickening demonstrated during the sonogram
    c. Microscopic hematuria
    d. Diarrhea

18. **Which of the following would not be considered sonographic findings?**
    a. A palpable breast mass noted during an examination
    b. A mass noted on the kidney during a sonogram
    c. Pericardial effusion noted during echocardiography
    d. Vascular stenosis noted during a sonogram of the renal arteries

19. **Which of the following techniques does not employ ionizing radiation to acquire images?**
    a. Fluoroscopy
    b. Radiography
    c. MRI
    d. CT

20. **What are the typical ranges of diagnostic ultrasound?**
    a. 2 to 4 kHz
    b. Less than 2 Hz
    c. Between 2 and 15 MHz
    d. Above 20,000 Hz

2 The Sonographer: A Closer Look

CHAPTER OBJECTIVES

- Examine personality typewatching and emotional intelligence and how they relate to sonography.
- Appreciate work ethic in sonography.
- Recognize how vital character is to the sonographer.
- Understand the responsibilities and challenges of the clinical sonographer.
- Comprehend the need to effectively communicate with sonographers and interpreting physicians.

KEY TERMS

Accountability responsibility for one's actions

Acoustic enhancement area of brightness distal to weakly attenuating reflectors; also known as posterior enhancement or through transmission

Acute sudden onset

Agreeableness one's tendency toward being accommodating, caring, and trusting

Altruism selflessness, taking others' perspectives, *and* showing concern for others for the sake of the other rather than oneself

Anechoic without echoes

Assertiveness being self-confident without being aggressive

Big five personality traits structure used for the classification of personality traits; also referred to as the five-factor model

Burnout work-related condition during which one experiences physical and emotional exhaustion

Callback pay additional monies earned because one is asked to return to work after normal business hours, results from taking call

Character the way a person thinks, feels, and acts

Chronic gradual onset or an ongoing condition

Clinical correlation the process of obtaining clinical history and contrasting that information with sonographic findings

Clinical correlation ambiguity lacking the ability to obtain a thorough clinical history and relate the information with the sonographic findings of the examination

Clinical hypotheses educated guesses based on clinical history findings

Cognition the act or process of knowing

Commission on Accreditation of Allied Health Education Programs the national accreditation granting body for sonography education (CAAHEP)

Compassion the ability to feel for others and for their well-being

Compassion fatigue a complication often discovered in people who work in helping professions like sonography; results from the combination of traumatic stress and burnout

Compassion satisfaction the pleasure one gains from being able to help others and the feeling that one has the ability to make a positive difference in patients' lives

Competence the ability to complete a job successfully

Complex a structure that has both fluid-filled and solid components

Conscientiousness dependability, being responsible, and orderliness

Constructive criticism courteous manner of offering well-reasoned positive and negative opinions about the work of others

Continuing medical education education required to maintain certification or licensure in a healthcare profession

Courtesy demonstrating polite behavior

Echogenic a structure that produces echoes; often used synonymously with hyperechoic

Echogenicity the number of echoes within a structure

Emotional intelligence the enhanced ability to recognize emotions in oneself and others and the capacity to use those emotions to improve emotional and intellectual growth and decision making

Empathy a trait that demonstrates that one understands, to the point of feeling, how another person feels

Empathy-altruism hypothesis states that empathy directed toward improving another's welfare will naturally evoke altruistic behavior

Enthusiasm eagerness or excitement for what one is doing

Extraversion being outgoing, sociable, and energetic

Five-factor model structure used for the classification of personality traits; also referred to as the Big Five

Fortitude strength of mind that allows someone to face difficult circumstances with courage

Health Insurance Portability and Accountability Act of 1996 law that is aimed at protecting the patient's rights and reducing waste, fraud, and abuse in the healthcare industry

Heterogeneous of differing composition

Homogeneous of uniform composition

Honesty fairness and truthfulness in behavior

Humility meekness in dealing with others

Hyperechoic describes a structure that produces echoes; often used synonymously with echogenic

Hypoechoic having few echoes within a structure

Inductive reasoning form of reasoning whereby one makes an educated guess based on facts

Integrity thinking with honesty and choosing the best paths to follow based on high standards

Isoechoic having the same echogenicity

Joint Review Committee on Education in Diagnostic Medical Sonography organization that establishes standards, reviews, and recommends education accreditation for sonography programs

Kinesthetic learning hands-on learning

Mature caregiver a worker that can maintain a healthy balance by demonstrating compassion while maintaining a professional distance

Neuroticism emotional stability and the ability to remain calm and composed under duress; people high in neuroticism tend to have high anxiety, worry, fear, and anger

Occupational stress stress related to job duties in the workplace; results in negative psychological and physiologic effects

Openness one's inclination toward being autonomous, imaginative, and independent minded

Personal values things that someone holds in high regard and that are highly desirable and worthy of esteem

Physiology the study of the function of the human body

Recertification the process of completing tests following initial certification in sonography to maintain qualifications

Reputation the way in which others view us

Respect to demonstrate polite regard for others

Role ambiguity the frustration that arises when job expectations differ between employer and employee

Self-authoring mind a mind that is independent, is leadership driven, has strong problem-solving abilities, and is capable of making critical decisions

Self-confidence belief in oneself and one's abilities

Self-motivation the perception to recognize a goal and the courage and strength to reach that goal

Servantship how healthcare practitioners serve the needs of patients and the community; also referred to as servanthood

Shadowing failure of the sound beam to pass through a structure

Sincerity genuineness

Socialized mind a mind that responds to the environment around it constantly, simply bouncing from reaction to action

Sonographic anatomy normal anatomy as it is demonstrated on a sonogram

Sonographic reasoning a reasoning process for the sonographer by which he or she integrates the data obtained through clinical history gathering to the study at hand in order to facilitate optimum diagnostic results

Standards the basis for one's conduct

Strengths the potential for effective actions

Tact always being aware of and considerate of the feelings of others

Taking call the process by which a sonographer is paid a small amount of money to be on standby via telephone for emergency cases after regular department hours, including nights and weekends

Traumatic stress the consequence of wanting to help a traumatized or suffering person

Typewatching the process of identifying personality types

INTRODUCTION

In Chapter 1, you were encouraged to establish some short-term and long-term personal and professional goals. We also briefly examined the role of the student in the clinical setting, including a brief overview of the sonographer. In this chapter, we will take a closer look at those who perform the sonographic procedures and some of the challenges they face in the clinical setting. Before psychoanalysis of others takes place, however, it may be more beneficial to start with a look in the mirror.

Though it is an obvious statement to make, we are all different, and though you and your classmate's career paths have now aligned, your backgrounds can vary drastically. Therefore, one cannot simply look at others, make blanket observations, and try to infer possible character traits without first asking some important questions about oneself. Thus, as you read this chapter, strive to learn more about yourself, and attempt to utilize this knowledge while you are in school and as you progress in the direction of, and eventually past, your established goals. And while this chapter will provide some common characteristics of successful healthcare workers, you must, in the end, exploit your identified strengths to the best of your ability as you endeavor to become a certified sonographer.

KNOW YOURSELF BEFORE YOU KNOW OTHERS

Chinese philosopher Laozi once stated, "He who knows others is wise; he who knows himself is enlightened."[1] The following sections will provide information related to personality **typewatching**. You should strive to learn more about yourself as you progress through your education. There are two fundamental questions to ask yourself as you read the information in this section: (1) Do you know yourself? (2) If you know yourself, can you change the aspects of your personality that you do not like? For patient care, identifying your personality type will assist you in understanding how you view others, how you can utilize your **strengths** in sonography, and how you can improve your interactions with everyone, especially patients.

Identifying Your Personality Type

Healthcare workers tend to have high satisfaction that results from career stability, the opportunity to serve others, the ability to perform meaningful and interesting work, and the prospects for advancement.[2] But have you ever been asked the question, "Why did you choose sonography?" Your truthful answers can differ from something noble like "to help patients," or something self-interested like "for the money" (neither of which is a wrong answer). Researchers have sought to find out why individuals choose to pursue careers in caring professions like nursing or sonography. One study reported the following reasons that individuals provided for entering the nursing profession: opportunity for caring, rewarding career, stepping stone to another career, career security, previous work or socialization experience, job satisfaction, and the positive manner in which nurses are portrayed in the media.[3] Since sonography is a helping occupation, these findings would most certainly also be applicable to those who pursue sonography as a profession.

The Myers-Briggs Type Indicator is an approach to analyzing personality types that was created by Katharine Cook Briggs and Isabel Briggs Myers and was based on the previous work of Carl Jung (Fig. 2-1).[4] This tool helps identify one's tendency toward a certain personality type, a process called typewatching. According to the theory, as a result of genetic and environmental factors, each of us has inclinations for definite personality types. These include varying components of the following: **extraversion** (E) or introversion (I); sensing (S) or intuition (N); thinking (T) or feeling (F); and judging (J) or perceiving (P) (Table 2-1). Consequently, there are 16 possible personality types according to Briggs and Briggs Myers that can include combinations of the above listed preferences. A free Myers-Briggs test can be accessed online at http://www.humanmetrics.com/cgi-win/jtypes2.asp.

Though most researchers agree that there is no single "type" of person who chooses a profession or work in a particular vocation, they do agree that there are particular combinations of personality traits that predispose people to certain professions and interests in life.[3] One large study of nurses and nursing students sought to identify common personality traits using a psychobiologic model of personality devised by C. Robert Cloninger called the temperament and character inventory (TCI).[5] Much like the Myers-Briggs test, the TCI is used to examine seven basic personality dimensions of temperament and **character** that theoretically interacts in ways to create the exclusive personality of an individual.[5] The study ultimately revealed that the nurses had an average ability to cope with uncertain situations; they perceived themselves as a valuable part of the community; they were modest risk takers and slightly impulsive; and they were high in sensitivity and sociability, hard-working, ambitious, realistic, resourceful, and team players.[5]

The **Five-Factor Model** (FFM), also known as the **Big Five personality traits**, is another structure used for the classification of personality traits. The Big Five traits of personality are domains that define personality and account for individual differences. These traits include **openness**, **conscientiousness**, extraversion, **agreeableness**, and **neuroticism**. Openness to experience refers to one's inclination toward being autonomous, imaginative, and independent minded. People who are open minded have tendencies toward seeking unfamiliar situations that allow for greater access to novel experiences and differing perspectives.[6] Conscientiousness relates to dependability, being responsible, and orderliness. Extraversion is described as being outgoing, sociable, and energetic.[7] Agreeableness is one's tendency toward being accommodating, caring, and trusting.[8] Neuroticism relates to emotional stability and the ability to remain calm and composed under duress; those individuals with high neuroticism tend to have high anxiety, worry, fear, and anger.[8] The FFM has a considerable amount of empirical support. Much research ratifies its validity for comparing, contrasting, and integrating diverse sets of personality traits.[6] Furthermore, the FFM can predict other life outcomes, such as achievement in school and work, physical and mental health, and social behavior.[9] For example, the openness and intellect aspects of the test can actually be used to predict creative achievement in the arts and sciences, respectively.[9] Completing a basic personality assessment can be beneficial to recognize one's tendencies. A free personality test that measures the Big Five can be found at https://www.123test.com/personality-test/index.php.

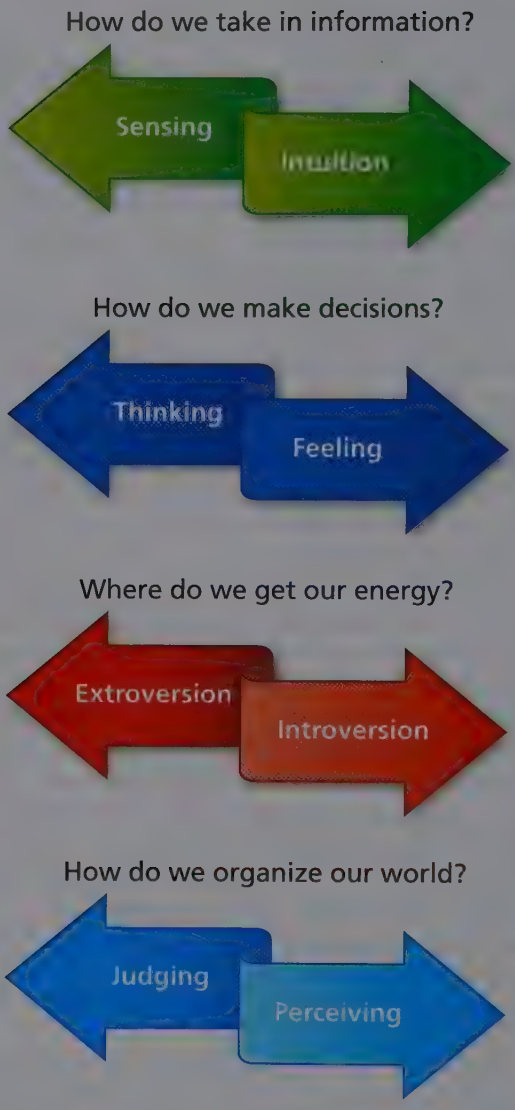

FIGURE 2-1 Myers-Briggs personality types: People differ in the way they get energy, take in information, make decisions, and organize the world. Understanding your personality preferences aids communication. (Reprinted with permission from Williams A. *Massage Mastery*. Philadelphia, PA: Wolters Kluwer Health; 2012.)

But why is it important to identify your personality type for a career in sonography? The use of personality testing as part of the employee selection process can be traced back to the 1930s.[10] Some organization may still use a form of personality testing as part of the interview processes to see if a potential employee is a good "fit" for the organization, while many of them also use it as a means of career development.[2,10] However, most recently personality assessment concerns have arisen over the possibility for discrimination under the Americans with Disability Act.[10]

But even if your prospective employer does not perform personality testing, you could use the information as part of your interview process, especially as a tool to answer the often-asked interview question "Can you tell me about yourself?" Furthermore, once you are aware of your talents, you can look for situations in which you can best utilize your abilities to your advantage (Table 2-2).[11] Hopefully, you have already recognized that sonography is the profession for you. Now, it is your obligation to find your strengths and use them to the best of your ability to provide patients with the greatest individualized care that *you* can afford.

TABLE 2-1 Summary of Myers-Briggs personality typing

Do you lean more toward any of the following personality components?
Extroversion: You typically tend to speak first and think later, enjoy parties and being in a crowd, and don't mind sharing your many opinions.
Introversion: You prefer to be in a small group of people you know—and in fact enjoy being alone—and you are considered a good listener.
Sensing: You prefer to focus on concrete ideas and prefer specific answers and less theory.
Intuition: You enjoy figuring out how things work, look forward to your future prospects, and can multitask.
Thinking: You believe in truth and justice, are impartial, and are not concerned with popularity.
Feeling: You try to avoid conflict, love helping others, and often sacrifice for the good of others.
Judging: You don't like surprise parties, look serious most of the time, and enjoy keeping lists.
Perceiving: You find it difficult to focus on one task at a time, enjoy playing games, and cherish new experiences.

While some researchers have expressed concerns that dishonesty can transpire in personality testing, thereby skewing the results, others feel that this issue does not necessarily affect the validity of the test.[12] Furthermore, other critics of personality typing claim that a situation determines a certain behavior, and this is true, though they often explain this phenomenon through examples of extreme situations. None of us know how we would react to a bear chasing us until the bear starts to chase us. Thus, personality trait recognition is valuable because life mostly consists of a wide-ranging list of perplexing but often routine situations.[13] Hopefully, personality testing will help you recognize your inclinations in routine situations as you deal with new people every day in school and in clinical settings.

TABLE 2-2 Advantages of different personality types

Personality Type	Advantages
ESTJ, ISTJ, ESFJ, ISFJ (~40% of American population)	Traditionalist, practical, very organized, solid, trustworthy, dependable
ESTP, ISTP, ESFP, ISFP (~30% of the American population)	Approach problems with flexibility, courage, and resourcefulness; risk takers and good negotiators
ENFJ, INFJ, ENFP, INFP (~15% of the American population)	Great motivators, conflict resolvers, great communicators, charismatic, accepting of others' opinions
ENTJ, INTJ, ENTP, INTP (~15% of the American population)	Have great vision and are innovators; big-picture people; good strategists, planners, and can understand and explain theories

E, extroversion; S, sensing; T, thinking; F, feeling, P, perceiving; J, judging; N, intuitive; I, introversion.
Data from Tieger PD, Barron-Tieger B. *Do What You Are: Discover the Perfect Career for You Through the Secrets of Personality Type*. Boston, MA: Little, Brown and Company; 2001.

Emotional Intelligence

The concept of **emotional intelligence** (EI) has been around for several years. EI has been thoroughly studied and consequently defined by many researchers; the fundamental thought is that those who have fully developed EI have an enhanced ability to recognize emotions in themselves and others, and they have the capacity to use those emotions to improve emotional and intellectual growth and decision making.[14] This view assumes that when done well, combining emotions and **cognition** facilitates decisions, manages emotions, improves relationships, and ultimately results in more intelligent decisions.[14]

One of the most widely accepted views of EI was described by Daniel Goleman. He claimed that EI is the strongest predictor of success in the workplace, even more important than academics, and he further asserted that we can improve our performance in the workplace by further developing our EI.[15] Goleman claimed that there are five components of EI: self-awareness, self-regulation, motivation, **empathy**, and social skills (Table 2-3).[15]

SOUND OFF Some consider emotional intelligence to be the strongest predictor of success in the workplace.

Over 80% of people with high EI are high performers.[16] Furthermore, researchers have proven that high EI is essential for healthcare professionals. Many have claimed that EI represents a set of core competencies for identifying, processing, and managing emotions that enable nurses to cope with daily demands in a knowledgeable, approachable, and supportive manner.[14] EI has been proven to be important in decision making in the clinical environment and for professional relationship growth.[14] Furthermore, the ability for a healthcare worker to manage his or her interpersonal and intrapersonal skills increases both the capacity to cope with the stresses of work and job satisfaction.[17] There are two online tools that are useful for measuring EI: a measurement for judging how good someone is at reading other's expression and the emotions quotient test. These can be found in Table 2-4. Fortunately, improving one's EI can be accomplished. For example, to develop higher EI, one author claimed that we should try to understand and manage ourselves by spotting our emotions and others' emotions in books, movies, and music; practice the art of listening; accept

TABLE 2-3 The five components of emotional intelligence

Component	Explanation
Self-awareness	Having a thorough understanding of one's emotions, strengths, weaknesses, needs, and ambition
Self-regulation	An ongoing conversation we must have with ourselves that frees us from feelings
Motivation	To achieve beyond everyone's expectations, including one's own; to achieve for the sake of achieving
Empathy	Being aware of and considerate of other people's feelings
Social skills	Combining friendliness, cooperation, and effective communication to improve interactions

Data from Seema G. Emotional intelligence in classroom. *Adv Manage* 2012;5(10):16–23.

TABLE 2-4 Emotional intelligence online resources

Emotional Intelligence Tests	Online Resource
How good are you at reading facial expressions?	http://greatergood.berkeley.edu/ei_quiz/
How high is your emotional intelligence?	http://www.edu-nova.com/apps/emotional_quotient.html

feedback; only get mad on purpose; and have an explanation for our decisions, instead of just making them based solely on emotions.[16] The topic of EI, as it relates to leadership, will be returned to later in Chapter 4.

Strength Recognition and Professional Maturation

Can you change at this point in your life? Our personalities are strongly influenced by both genetics and early events in our lives that we have absolutely no control over.[13] Consider the possibility that someone in your class also has your exact personality type (e.g., ISTP, ESTP, etc.). Are these people just like you? Certainly not; we are all, of course, different in many ways. At this point in your life, if you are classified as extroverted (extraverted), you will most likely not resort to introversion, or vice versa.[13] However, we can control how our extroversion or other traits are expressed. For example, one of the possible interaction issues identified for an extrovert is to talk first and then listen. An extrovert who wanted to modify this supposed weakness in interaction could make a conscious attempt to listen first and sort thoughts carefully before talking. Essentially, this person would decide to listen, pause, reflect, and then talk. However, this person is still an extrovert, but he or she controls the trait with personal restraint and, as a result, most likely improves communication.

If a single part of your personality is causing you concern or difficulty with dealing with people during routine communications, you should find alternative ways in which to express those traits that are less destructive to your ultimate communication goal.[13] In essence, "you don't have to change yourself, you just have to change your self's outlet," and while no one can blame you for who you are, you are ultimately responsible for how you act.[13] Keep in mind that personality testing determines only a propensity toward certain behaviors in routine situations. Learning about your individual strengths and weaknesses is a lifelong challenge, and you should return to the task of acknowledging these traits, especially before applying for jobs.[18] People who have well-defined identities know what they like, what they believe in and value, and how to utilize their strengths to enhance their lives and the people around them.[19] But ultimately the answer to whether or not you can change is up to you. If you recognize a perceived personality trait that you want to manage better, remember, you must first want to change to make a change.

Accepting and making appropriate mediations to the manner in which we present ourselves to others is part of the personal maturation process. Accordingly, the maturation from student to independent sonographer is much like maturing from an adolescent to an adult. In 1994, Robert Kegan coined the term self-authorship.[20] Kegan made the argument that the **self-authoring mind** is a necessary foundation for adults to accomplish in order to meet the typical expectations of work, home, and school.[21] Adult development should be a journey from dependence on external authorities to a more mature system of the mind.[22] The self-authoring mind is independent, is leadership driven, has strong problem-solving abilities, and is capable of making critical decisions rapidly because it has a well-developed internal compass (Table 2-5).[23] Furthermore, self-authored individuals have an internal "seat of judgment" and the ability to make choices about external expectations outside of the social

TABLE 2-5 Elements of self-authoring and a brief explanation of each

Element of Self-Authoring	Explanation
Trusting the internal voice	The realization that although you cannot control reality, you can manage your reactions to external stimuli.
Building an internal foundation	Establishing a self-guiding philosophy or framework that includes beliefs, values, and relationships that you use to react to reality.
Securing internal commitments	Shifting from establishment of a self-guiding philosophy to the utilization of that philosophy in life.

Data from Welkener MM, Baxter Magolda MB. Better understanding students' self-authorship via self-portraits. *J Coll Student Dev* 2014;55:580–585; Magolda MBB. Three elements of self-authorship. *J Coll Student Dev* 2008;49(4):269–284.

environment and are self-initiating, guided by their own visions, responsible for their experience, and able to develop interdependent relations with a wide variety of individuals.[20,21]

In contrast, the **socialized mind** is one that responds to the environment around it constantly, simply bouncing from reaction to action. These individuals are good team players and faithful followers, but unfortunately find that their primary motivator for behavior is the approval of others.[23] Kegan discovered that regrettably about 58% of adults primarily operate using a socialized mind, while only 35% operate with a self-authored mind.[23]

The need to establish an independent mind in healthcare is vital, especially in the field of sonography, where autonomous judgments can save lives. Kegan noted that self-authorship encourages stronger relationships because the focus is on creating authentic mutually beneficial relationships instead of reactionary superficial associations. In this way, the self-authored sonographer continually recognizes the innate value of each patient, continues to learn and build a knowledgeable foundation, acknowledges the need to understand more about his or her patients and career, and selflessly begins to serve. Maturing as a sonographer takes time and experiences. Moving from a socialized mind to a self-authoring mind should be your goal. But it all begins with acknowledging the fact that serving patients is the fundamental priority of all sonographers.

SERVING IN HEALTHCARE

Though Chapter 6 will give further details about ethics in healthcare, a brief overview is needed at this point. Working in healthcare demands both physical and emotional **fortitude**. Though the physical demands are minimal in sonography relative to other occupations such as a lumberjack or plumber, the work ethic required to be successful in sonography is equivalent. Ethics at work is not only knowing the right thing to do, but doing it.[24] This means that most of us have the capability of knowing what is right or wrong, but our personal ethics require that we choose the right thing to do *always*. So what is the "right thing" to do?

Parents, teachers, and other adults all over the world teach children to smile and play nice, be prompt, look their best, do their best, obey the rules, tell the truth, and say "please" and "thank you."[24] Accordingly, it was no surprise when over 1,500 employers were asked what they expected from each and every employee; the survey findings revealed that

> *Employers are searching for positive, enthusiastic people who are dressed and prepared properly, who go out of their way to add value and do more than what is required of them, who are honest, who will play by the rules, and who will give cheerful, friendly service regardless of the situation.*[24]

In plain terms, employers want employees (in our case, sonographers) who demonstrate **honesty** and **integrity**, who have positive attitudes; who are reliable, professional, self-motivated, and respectful, and who demonstrate cheerfulness and friendliness.[24]

Patients expect the following from healthcare workers: competent care, someone who listens, clear communication, **courtesy**, **compassion**, empathy, understanding, **sincerity**, and **respect**.[2] If we compare the two lists of expectations between employers and patients, several common qualities manifest—respect, **competence**, honesty, and friendliness. The correlation makes sense, however, if you understand that fundamentally, patients are customers, and hospitals are businesses trying to please those customers. Both employers (hospitals) and customers (patients) expect the same things, and as employees, it is our obligation to simultaneously please both. To accomplish this, we must look closer at these expectations to recognize how character in healthcare is so vital.

Character

Character may be defined as the way a person thinks, feels, and acts.[25] It is something that is not always identifiable in a brief encounter, but rather it is a pattern of behavior that one demonstrates consistently.[26] **Personal values** are tenets that someone holds in high regard and that are highly desirable and worthy of esteem (Fig. 2-2).[26] Combined, our character and personal values help form our **reputation**, or the ways in which others view us. It is important for individuals who pursue careers in healthcare to have certain character traits and personal values and to maintain a high-quality reputation, all of which contribute to one's ethics.

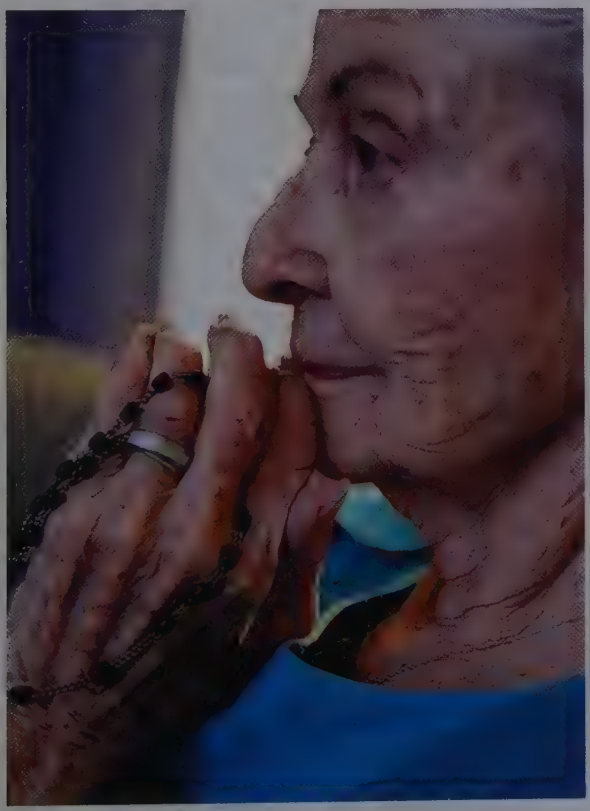

FIGURE 2-2 Personal values are tenets that someone holds in high regard and that are highly desirable and worthy of esteem. We all have our own set of personal values, and it is important for us to respect our patient's values. (Reprinted with permission from Rosdahl CB, Kowalski MT. *Textbook of Basic Nursing*. 10th ed. Philadelphia, PA: Wolters Kluwer Health; 2011.)

The demonstration of your personal values and the character traits that you exhibit to others help establish your personal reputation. It is exceedingly important to start off on the right foot in healthcare, because your reputation will follow you wherever you go. And though you may not recognize it now, the sonography profession is a small community in which sonographers know many other sonographers in the region. For this reason, your reputation as a student is important to your future success as a professional.

SOUND OFF **It is exceedingly important to start off on the right foot in healthcare, because your reputation will follow you wherever you go.**

For example, your social life is often put on display for everyone in the world to see. You must recognize that online activity and personal online social media, such as Facebook, Twitter, and Instagram, are often examined by prospective employers. Consequently, you need to be watchful concerning online posts of negative judgments and irresponsible behaviors that are perceived as unfavorable for someone pursuing a professional healthcare occupation. For example, posts that display alcohol abuse, even if you do not chronically abuse alcohol, may be viewed by some as behavior that is counterproductive to professionalism. Be careful what you upload to the Internet in order to protect your reputation. If you have questionable Internet activity on social media, it may be wise to delete that activity and continue to be mindful concerning future online interactions.

SOUND OFF **You must recognize that online activity and personal online social media, such as Facebook, Twitter, and Instagram, are often examined by prospective employers. Be careful what you upload to the Internet in order to protect your reputation.**

The American Society of Echocardiography (ASE) further states that sonographers should have the following traits: flexibility, **enthusiasm**, and confidence (Fig. 2-3).[27] Though the communication aspect of patient care will be discussed further in Chapter 9, it is important to examine these desires of our patients and a few other character traits that are invaluable to patient care.

FIGURE 2-3 Enthusiasm is one of many important personal attributes for healthcare workers. (Reprinted with permission from DeLaet R. *Introduction to Health Care & Careers*. Philadelphia, PA: Wolters Kluwer Health; 2011.)

SOUND OFF Patients want the following from healthcare workers: competent care, someone who listens, clear communication, courtesy, compassion, empathy, understanding, sincerity, and respect.

Competent Care and Flexibility

Performing a sonographic procedure independently requires a certain level of competence. Competence is essentially the possession of necessary knowledge and skills to carry out a specific job appropriately and safely in a consistent manner.[26] For accredited sonography programs in association with the **Commission on Accreditation of Allied Health Education Programs** (CAAHEP) and the **Joint Review Committee-Diagnostic Medical Sonography** (JRC-DMS), **standards** have been created to normalize competency and education in accredited sonography programs. Standards are the minimum requirement to which an accredited program is held accountable.[28] These standards include meeting competency requirements for sonography students in all specialty areas.[28]

To ensure proficient patient care, programs include clinical competencies, which are unassisted sonographic procedures that students perform on campus in a scan lab or in the clinical setting. Throughout the length of educational programs, students undergo competency testing in order both to meet standards of the accreditation and to ensure that a certain level of patient care can be provided upon graduation. With patient care, you should never "just wing it." It is your responsibility to be prepared and to keep up to date on current procedures, techniques, technology, and new equipment. It is also important to note that many employers require new hires to perform competencies as part of the orientation process. Employers may also require prospective employees to scan as part of the interview process to assess competency.

Sonography is a dynamic, constantly changing profession, and as professionals, it is our duty to remain competent. This requires that the sonographer has flexibility and be able to adjust to our continuously evolving healthcare system. New research and inventions regularly transform the role of the sonographer from altering protocols to technologic advancement. Being flexible in your work schedule may also be needed, as oftentimes sonographers are required to stay late after hours and take call.

A competent person can accept **constructive criticism** and value the honest opinions of instructors, coworkers, and others.[29] While it does recognize weaknesses in judgment, constructive criticism mostly provides well-reasoned, valid opinions about the work of others. If you are insecure about your abilities, never hesitate to ask questions or ask for help. Sonographers are legally required to meet a certain standard of care, which includes being competent at the tasks they are performing.

SOUND OFF Sonographers are legally required to meet a certain standard of care, which includes being competent at the tasks they are performing.

Courtesy and Respect

Healthcare needs to be delivered with **tact**. Tact means always being aware and considerate of the feelings of others.[29] Patients expect us to be courteous in the way that we interact with them. Courtesy can be defined as demonstrating polite behavior. Courtesy goes hand in hand with tact. One recent study confirmed that healthcare provider courtesy had the greatest influence on patient satisfaction.[30] In 2002, the Centers for Medicare & Medicaid Services and the Agency for Healthcare Research and Quality created the Hospital Consumer Assessment of Healthcare Providers and System (HCAHPS) 27-item survey to serve as a national standardized instrument for measuring overall patient

experience and satisfaction.[31] The goals of the HCAHPS survey are to create incentives for hospitals to improve patient care, enhance public **accountability** in healthcare by increasing transparency, and create incentives for hospitals to improve quality of care.[31] Since July 2007, hospitals subject to Medicare Inpatient Prospective Payment System (IPPS) provisions must collect, submit, and publicly report these data to receive full annual payments.[31] Hospitals that fail to do so receive a reduction in payments. Accordingly, patient satisfaction is linked to reimbursement for these institutions. Several of the questions on the survey are directly related to courtesy, the responsiveness of hospital staff to the patient needs, and the overall effectiveness of healthcare provider communication.

Unfortunately, using good manners is not an inherent attribute for some people, but it is required in healthcare. An example of showing courtesy toward patients could be asking them if they need anything, like perhaps a warm blanket, before the exam begins.[32] Also, respecting those you encounter during the day demonstrates that you value others. You can demonstrate respect in patient care by being polite, shaking the patient's hand when you meet him or her, and paying attention when the patient is talking. There is evidence that lesbian, gay, bisexual, and transsexual (LGBT) individuals may suffer from disparity in respect and care.[33] Communicating with these individuals and the respect that you offer them should not differ from any other patient population. You should always show empathy, refrain from judgmental behavior, and learn and use appropriate terminology in regard to the LGBT patient and should not be intrusive.[33] You should also verbally show respect by using the appropriate title for the individual (e.g. Dr., Mr., Ms., Mrs., etc.) and by using the patient's last name.[32] Being courteous and respectful also includes using simple expressions like "please" and "thank you." Believe it or not, simple expressions like these can go a long way toward developing relationships with instructors, sonographers, physicians, and anyone else, especially during an initial encounter.

Compassion, Empathy, and Altruism

Servantship, also referred to as servanthood, can be defined as how healthcare practitioners serve the needs of patients and the community.[34] In this regard, fundamentally a sonographer is essentially a patient servant whose primary goal is to meet the needs of patients by performing diagnostic examinations (Fig. 2-4). The three important aspects of servantship are compassion, empathy, and **altruism**, with altruism being the ultimate goal.

William Bennett once wrote, "Just as courage takes its stand *by* others in a challenging situation, so compassion takes its stand *with* others in their distress."[35] With compassion, we have a propensity to consider the feelings of our patients and their well-being. Compassion has been defined as a virtuous and intentional response to know a person, to discern the person's needs and alter the person's suffering through relational understanding and action (Fig. 2-5).[36] Consequently, compassion is an important component of patient care. Five defining elements of compassion have been identified: recognition, connection, altruistic desire, humanistic response, and action (Table 2-6).[37] These are active steps in the process of compassion that have wonderful consequences, such as contentment, hope, trust, and patient satisfaction, and even provide the patient with a sense of self-worth.[37] Proving compassion can also be beneficial to the giver of compassion, resulting in what is termed **compassion satisfaction**. Compassion satisfaction has been defined as the pleasure one gains from being able to help others and the feeling that one has the ability to make a positive difference in patients' lives.[38] We need to remind ourselves that our patients come to us with a certain need, and having compassion informs our obligation to help those who are ill.

Empathy is similar to compassion but on a higher level. Empathy, which may be confused with sympathy, demonstrates that you understand to the point of feeling how another person feels (Fig. 2-6).[32] That is to say, the difference between empathy and compassion is perspective. Thus, empathy includes both the ability to share the emotions of others and the understanding of the emotions of others.[39] Empathy in the clinical setting is perceived by patients as warmth and competence.[39]

FIGURE 2-4 Serving all patients is the fundamental function of the sonographer. (Reprinted with permission from Ford SM. *Roach's Introductory Clinical Pharmacology*. 11th ed. Philadelphia, PA: Wolters Kluwer Health; 2017.)

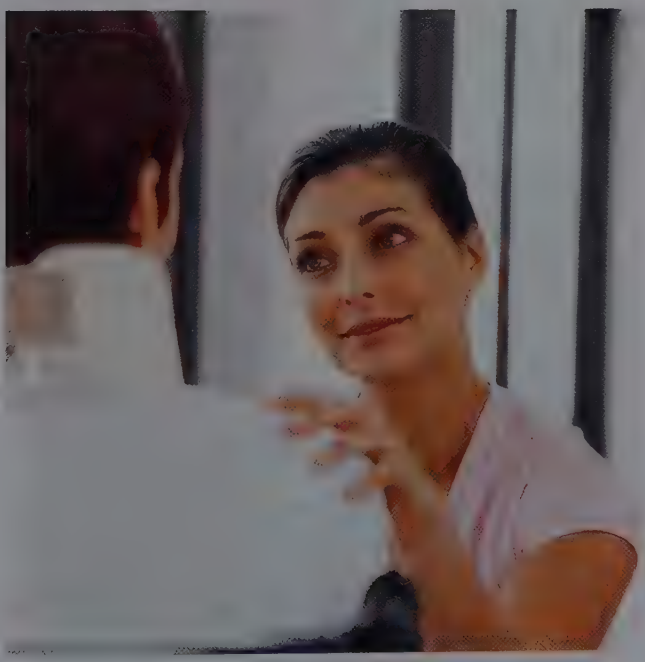

FIGURE 2-5 Compassion has been defined as a virtuous and intentional response to know a person, discern his or her needs, and alter his or her suffering through relational understanding and action. (Reprinted with permission from Taylor C, et al. *Fundamentals of Nursing*. 7th ed. Philadelphia, PA: Wolters Kluwer Health; 2010.)

TABLE 2-6 Elements of compassion

Elements of Compassion	Definition
Recognition	Recognizing the patient's adverse circumstance, physical suffering, psychological pain, or emotional well-being
Connection	Personal connection and attentiveness through active communication
Altruistic desire	Selfless help to aid another
Humanistic response	Person-to-person understanding of what it is to be human
Action	Undertaking of an act or responsive behavior

Adapted from Taylor A, et al. Compassion in healthcare: a concept analysis. *J Radiother Pract* 2017;16(4):350–360; Table 3.

The demonstration of empathy is related to numerous positive outcomes, including increased patient satisfaction, good patient rapport, increased adherence to treatment, increased diagnostic accuracy, reduced medical errors, and positive health outcomes.[39] Striving to demonstrate empathy through nonverbal communication, such as open body postures, eye contact, smiling, and touch, expresses one's involvement, availability, attention, warmth, encouragement, respect, and understanding toward

FIGURE 2-6 Empathy versus sympathy. Empathy demonstrates that you understand to the point of feeling how another person feels. Sympathy is simply feeling sorry for someone. (Reprinted with permission from Videbeck SL. *Psychiatric Mental Health Nursing*. 7th ed. Philadelphia, PA: Wolters Kluwer Health; 2016.)

others.[39] To develop empathy, one has to attempt to view the world through others' eyes.[2] Placing yourself in a patient's circumstances helps you appreciate what he or she is going through at the time. One author claims that empathy is perhaps the single most important restraint from immoral or antisocial behavior.[13] In sonography, you will encounter exceedingly ill and dying patients, both young and old. An empathetic sonographer listens to patients without judging, demonstrates an honest attempt to understand the patient, and, through identifiable actions, reveals a sincere willingness to help. It has been demonstrated that actually focusing on the needs of others typically results in an increase in both personal and professional satisfaction.[34]

The **empathy-altruism hypothesis** states that empathy directed toward improving another's welfare will naturally evoke altruistic behavior.[34] Altruism is on an even higher level than both compassion and empathy. Altruism is described as selflessness, taking others' perspectives, *and* showing concern for others for the sake of the other rather than oneself.[34] Specifically, altruistic behavior in patient care focuses solely on others for the sake of others and not for monetary gain, professional recognition, or even patient appreciation.[34] Simply stated, an altruistic sonographer merely performs the occupation in the hopes of serving others.

SOUND OFF An empathetic sonographer listens to patients without judging, demonstrates an honest attempt to understand the patient, and, through identifiable actions, reveals a sincere willingness to help all patients.

The Cost of Caring and Finding the Balance

Though having compassion for these individuals and striving for empathy and altruism is warranted, it appears that multiple encounters that require extended amounts of compassion can actually contribute to burnout. **Compassion fatigue** has been mentioned in the literature as a complication often discovered in people who work in helping professions, like sonography, for several years.[40] Compassion fatigue results from the combination of **traumatic stress** and burnout.[41] Traumatic stress is unique in that it is a consequence of "wanting to help a traumatized or suffering person."[40] Essentially, compassion fatigue is the "cost of caring."[42] Though some of the causes of compassion fatigue may be individualistic, there appears to be a link with an unhealthy work environment and lack of leadership.[43] Sonographers must often deal with patients undergoing traumatic events, such as heart attacks, miscarriages, strokes, or cancer, and they may certainly therefore suffer from compassion fatigue. You can test for compassion fatigue at http://www.healthyplace.com/psychological-tests/compassion-fatigue-self-assessment/.

The short-term results of compassion fatigue may include nervousness, cynicism, pessimism, low self-esteem, anger at coworkers, and job dissatisfaction.[40] Long-term effects include weight issues, overall poor work performance, noticeable personality changes, and a desire to leave the profession.[40] There appears to be an innate self-preservation mechanism in which many people tend to build emotional barriers between themselves and their patients in order to fend off compassion fatigue, resulting in a decrease in empathetic feelings.[44] However, instead of reducing empathy, a sonographer can learn coping techniques that maintain the level of compassion while preventing the arduous effects of compassion fatigue (Table 2-7). One study indicates that those with high EI tend to have better coping abilities, are more in touch with their emotions, can regulate their emotions, and experience lower levels of distress and stress-related emotions.[44,45] Thus, the higher the EI you have, the less likely you are to suffer from compassion fatigue. Lastly, stress management, relaxation techniques, exercise, rest, a healthy diet, and forgiveness decrease the effects of compassion fatigue and increase compassion satisfaction.[34] An individual who can find stability between the self and others may be referred to as **mature caregiver**, for these workers maintain a healthy balance and are able to demonstrate compassion while maintaining a professional distance.[34] Your maturation as a sonography professional

TABLE 2-7 Coping with compassion fatigue

- Be informed and learn more about compassion fatigue at http://www.compassionfatigue.org/.
- Know that compassion fatigue is inevitable, and be prepared.
- Establish support groups.
- Encourage others to talk about traumatic events they experience at work in a weekly meeting.
- Consider seeking outside assistance, or visit employee health.

Data from Tellie M. Compassion fatigue—the cost of caring. *Nursing Update* [serial online] 2008;32(8):34–37. Available from: CINAHL with Full Text, Ipswich, MA. Accessed March 20, 2014.

should include continual self-reflection and mediation as you try to balance the challenges of life while caring for others to the best of your ability.

SOUND OFF Maturation as a sonography professional includes continual self-reflection and mediation as you try to balance the challenges of life while caring for others to the best of your ability.

Accountability, Honesty, and Integrity

Healthcare workers must hold themselves accountable. Accountability means that one is responsible for one's actions. Sonographers are accountable to their patients, their employers, and their profession. The Society of Diagnostic Medical Sonography (SDMS), American Society of Echocardiography (ASE), and the Society of Vascular Ultrasound (SVU) have established a code of ethics for the sonographer. An analysis of codes of ethics is provided for you in greater detail in Chapter 6. The SDMS Code of Ethics consists of three primary principles promoting the well-being of patients: a high level of competence, honesty and integrity in communication, and maintaining the public trust.[46]

We have all heard the saying "honesty is the best policy." This idiom is particularly true in healthcare, where being dishonest can ultimately result in the loss of human life. For example, perhaps, a sonographer in a rush to leave on time haphazardly performs a liver sonogram, omits some protocol images, and unfortunately misses a small malignant tumor in the liver. The sonographer then reports to the radiologist that the liver appears within normal limits, even though the sonographer did not adequately image the liver. This is untruthful because the sonographer did not spend enough time analyzing the liver. As a result, instead of the cancer being imaged during a screening exam like sonography, it has a chance to spread further, possibly both extending the time of discovery and even reducing the life span of the patient. By taking the proper amount of time, the sonographer could have found the tumor, and immediate follow-up investigation and treatment could ensue.

Integrity and honesty go hand in hand. Integrity may be defined as thinking with honesty and choosing the best paths to follow based on high standards.[47] Standards are morals, ethics, or habits established by customs, authorities, or an individual that are deemed satisfactory.[48] One must recognize that second-rate standards never result in a first-rate person (Table 2-8).[47] Demonstrating integrity in every situation is a challenge for some, but choosing to have integrity is always the proper decision.

For example, a sonography student is assigned an online, at-home assignment and instructed to not use his or her textbook during the assignment. Realistically, there may be no manner in which the student would be caught for cheating if he or she used the textbook. The student could get away with cheating. However, does he or she really escape the repercussions of cheating? Who ultimately suffers in the end? Indeed, the student suffers eventually, as he or she may need to recall the material on a final examination or a registry. Cheating negates integrity, and it will inevitably catch up with you.

TABLE 2-8 First-rate standards in sonography

- Understand the overarching rules of the sonography profession and practice within the scope of practice defined by our professional organizations.
- Continually evaluate your character and be sure to hold yourself to high standards.
- Always be a good example for coworkers and those you encounter.
- Treat patients with respect and endeavor to appreciate their uniqueness, while at the same time providing high-quality patient care.
- Work well with others and try not to burn bridges. You never know when you might need the assistance of someone.

Data from American Society of Echocardiography online. Sonographer FAQs. Retrieved February 3, 2019 from http://www.asecho.org/sonographer-faqs/

What about the patients that the student encounters in the clinical setting? Couldn't this momentary lapse in integrity ultimately affect the life of a person?

These are candid questions about integrity and honesty that you need to consider. We are all faced with dilemmas in our lives that challenge our integrity. Making terrible decisions always affects someone. Some may argue that doing the right thing is not always easy. That is incorrect. Doing the right thing is always easy if you have integrity.

SOUND OFF Some may say that doing the right thing is not always easy. This is incorrect. Doing the right thing is always easy if you have integrity.

Self-Motivation and Enthusiasm

Self-motivation could potentially be the characteristic that most influences a person's behavior.[49] Self-motivation is the ability to do what needs to be done without being influenced or initiated by someone else. It requires the perception to recognize a goal and the courage and strength to reach that same goal. Completing tasks without being told is vital in healthcare. Every day, sonographers complete work-related tasks that are not distinctly spelled out in their job descriptions—transporting patients, assisting patients with hygiene needs, calling physicians' offices, etc. Though not all job duties are clearly outlined sometimes, sonographers are often self-motivated independent workers who recognize tasks that must be done and complete them. Sonographers also demonstrate self-motivation by learning new equipment, procedures, and techniques, even if the job does not explicitly demand alterations in the routine. Self-motivators also take it upon themselves to constantly learn about their chosen profession.

Both sonographers in clinical and instructors in the classroom recognize your inclination toward self-motivation almost right away in your assignments and diligence in your work. In the classroom, you demonstrate self-motivation by being prepared for class, tests, and class discussions ahead of time. In clinical, consistently demonstrate your willingness to learn, and inquire often about assisting sonographers. Self-motivation is demonstrated by your initiative and enthusiasm to learn.

Enthusiasm is defined as an eagerness or excitement for what you are doing.[29] If we return to the list of employer/ASE-required traits for employees and sonographers, we can recognize that there is a common theme of enthusiasm, friendliness, and positive attitude. Demonstrating a positive attitude and enthusiasm about your career is an important aspect of professional work ethic, and you should make it evident in everything you attempt.[26] People are often classified as either optimists or pessimists. From the personality testing that you completed in this chapter, you can probably decipher