

THE REGISTERED APPRENTICESHIP OCCUPATIONS AND STANDARDS CENTER OF EXCELLENCE (AOSC)

Diagnostic Medical Sonographer National Occupational Framework

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Introduction to Using This Document

Under the Registered Apprenticeship Technical Assistance Centers of Excellence award, the Urban Institute leads the Occupations and Standards work. One of the main objectives of Urban's project is to create high-quality, well-researched, consensus-based work process schedules that are nonproprietary and widely available. This document is a product of that work and contains three sections: the occupational overview, the work process schedule, and the related technical instruction.

The **occupational overview** is a general introduction, including alternative job titles, any prerequisites, and, if applicable, the total number of hours needed to complete a time-based or hybrid program.

The **work process schedule** outlines the major job functions, competencies, and/or hours an apprentice completes in a registered apprenticeship program. It outlines what apprentices are expected to learn on the job with the support of a mentor or journeyworker (a worker mastering the competencies of an occupation in a particular industry), including both core competencies and those deemed optional by experts in the field. The work process schedule is the foundational document guiding a program.

Urban works with numerous experts to ensure the content is thoroughly researched and vetted to reflect the expectations of industry, educators, labor unions, employers, and others involved in apprenticeship for this occupation. Sponsors and employers can use the work process schedule as their program standards with assurances it has been approved by experts in the field.

The **related technical instruction** presents considerations for the coursework that apprentices will undertake to supplement on-the-job learning. It is intended to serve as a reference to sponsors exploring their options for the accompanying classroom, virtual, or hybrid training.

How to Use the Work Process Schedule

Sponsors can adapt the work process schedule to accommodate their needs for competency- or time-based or hybrid programs. In a **competency-based** apprenticeship, sponsors assess apprentices' progress across core and optional competencies listed in the work process schedule. In a **time-based** apprenticeship, apprentices complete a predetermined number of hours across major job functions and the program overall. In a **hybrid** apprenticeship, sponsors monitor apprentices' hours spent on major job functions and assess their proficiency across competencies.

Each program type has a different method of assessment:

- **For a competency-based program**, apprentices engage in activities and make progress toward proficiency in the identified competencies. Sponsors overseeing apprentices' work assess their mastery of the outlined competencies using the following rating scale:

- 4—Competent/proficient (able to perform all elements of the task successfully and independently)
- 3—Satisfactory performance (able to perform elements of the task with minimal assistance)
- 2—Completed the task with significant assistance
- 1—Unsuccessfully attempted the task
- 0—No exposure (note the reason—absence, skill isn't covered, etc.)

The competencies may be completed in any order. Apprentices must perform at a level 4 or 3 in all competencies listed as “core” to complete the apprenticeship program successfully.

- **For a time-based program**, sponsors monitor apprentices' completion of hours in training across major job functions. The total number of hours recommended for this occupation is listed in the occupational overview and is based on guidance from the US Department of Labor. Generally, apprentices must have at least 2,000 hours overall for on-the-job learning, but occupations of greater complexity may require more hours. Sponsors will provide apprentices with supervised work experience and allocate the total number of hours across the major job functions to adequately train their apprentices.
- **The hybrid approach** blends both competency- and time-based strategies. Sponsors measure apprentices' skills acquisition through a combination of completing the minimum number of hours of on-the-job learning successfully demonstrating identified competencies. Sponsors will assess apprentices' proficiencies as described for competency-based programs with a rating scale of 0–4 for every core competency. Generally, apprentices have at least 2,000 hours overall for on-the-job learning, but occupations of greater complexity may require more hours. Sponsors will document apprentices' completion within a minimum and maximum range of hours assigned for each major job function.

Diagnostic Medical Sonographer Occupational Overview

Occupational Purpose and Context

Diagnostic Medical Sonographers specialize in using multifrequency sound waves to create images, known as sonograms or ultrasounds, that depict the body's organs and tissues. Sonography is often the first imaging test performed when a disease is suspected. The sonographer uses a transducer to scan parts of the patient's body. The transducer emits sound pulses, the echoes of which form computer images that physicians use for diagnosis.

Diagnostic medical sonographers prepare patients by explaining procedures and answering questions. They prepare exam rooms and equipment and position patients properly for imaging. They operate equipment to conduct tests and obtain diagnostic images. They review images for quality, and when suitable images are obtained, they record the findings for review by a physician or other supervising health care professional.

Potential Job Titles

Diagnostic medical sonographer, medical sonographer, registered diagnostic medical sonographer (RDMS), registered vascular technologist (RVT), registered diagnostic cardiac sonographer (RDCT), staff sonographer, ultrasonographer, ultrasound technician, ultrasound technologist, cardiac sonographer, obstetric/gynecological sonographer, vascular sonographer, abdominal sonographer, maternal/fetal sonographer

Apprenticeship Prerequisites

Diagnostic medical sonographers typically undergo an educational program culminating in a formal degree or a postsecondary certificate, such as a bachelor's or associate's degree program. This education program includes both didactic and clinical components. Employers may require that workers have demonstrated competence in the specialty area(s) to be performed, including sonographer certification by the American Registry for Diagnostic Medical Sonography (ARDMS), American Registry of Radiologic Technologists (ARRT), or Cardiovascular Credentialing International (CCI).

Recommended Length of Apprenticeship (Time/Hybrid Programs Only)

The recommended length of time for on-the-job learning in a Diagnostic Medical Sonographer is 2,000 to 3,000 hours. This recommended length of apprenticeship is in consideration that job functions of a diagnostic medical sonographer can be performed only by a fully trained diagnostic medical sonographer who has been certified according to the standards of the Joint Review Committee on Education in Diagnostic Medical Sonography (JRC-DMS). Many employees are already certified in other professions concurrent with their clinical training in sonography, but that employment is paid for the performance of job functions for which they are certified, not for sonography.

Work Process Schedule

Diagnostic Medical Sonographer

ONET Code: 29-2032.00

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Instructions for Use:

Competency-based programs: In the “performance level achieved” column of the work process schedule (see examples starting on the next page), assess apprentices’ performances on each competency with the scale below. No monitoring of hours is required for this approach. See “Guidelines for Competency-Based, Hybrid and Time-Based Apprenticeship Training Approaches,” US Department of Labor, Employment and Training Administration, Office of Apprenticeship, October 20, 2015, <https://www.apprenticeship.gov/sites/default/files/bulletins/Cir2016-01.pdf>.

- 4—Competent/proficient (able to perform all elements of the task successfully and independently)
- 3—Satisfactory performance (able to perform elements of the task with minimal assistance)
- 2—Completed the task with significant assistance
- 1—Unsuccessfully attempted the task
- 0—No exposure (note the reason—absence, skill isn’t covered, etc.)

Time-based programs: In the “hours” row, specify the number of hours apprentices will fulfill for each job function. No assessment of competencies is required for this approach.

Hybrid programs: In the “performance level achieved” column, assess apprentices’ performances on each competency using the 0–4 scale above. In the “hours” row, identify a range of hours apprentices should spend working on each major job function.

Job Function 1: Assesses and evaluates patient's past and present health status		
Hours (time-based and hybrid programs only):		
Competencies	Core or optional	Performance level achieved (0–4) (competency-based and hybrid programs only)
A. Determines if a translator is needed and arranges for one if necessary	Core	
B. Verifies patient identification using multiple indicators such as full name and date of birth	Core	
C. Verifies that the ordered examination or procedure corresponds to the patient's clinical history and current presenting indications	Core	
D. Reviews patient medical history and supporting clinical information such as prior imaging	Core	
E. Evaluates any patient limitations that may affect the procedure, including insufficient patient preparation, risk of allergic reactions, or patient's inability or unwillingness to undergo the examination or procedure, and responds as needed	Core	
F. Ensures that the sonography examination order is complete, contains relevant information, and that the prescribed procedure is compliant with clinical indication and protocol	Core	
G. Consults the facility's policies and supervising physician or other referring health care provider on how to proceed if the ordered examination or procedure does not correlate with the patient's clinical history and presentation	Core	
H. Verifies that the patient, or their representative, understands and provides consent for the diagnostic sonographic examination or procedure	Core	
I. Complies with privacy and confidentiality standards and supervising physician or facility protocols	Core	
J. Verifies the patient's pregnancy status, if applicable	Core	

Job Function 2: Communicates with and educates the patient		
Hours (time-based and hybrid programs only):		
Competencies	Core or optional	Performance level achieved (0–4) (competency-based and hybrid programs only)
A. Communicates explanations and instructions to the patient or their representative in a manner that is clear and effective for the patient	Core	
B. Exercises cultural sensitivity in communications with patients and families	Core	
C. Educates the patient about procedures and associated biological effects	Core	
D. Responds to questions or concerns from the patient or their representative (without hinting at diagnoses or suggesting outcomes)	Core	
E. Confirms examination preparation requirements such as fasting or bladder filling	Core	
F. Monitors the patient's need for information and reassurance throughout the procedure and provides information within the limits of their role	Core	
G. Communicates authorized information from other health care providers to the patient or their representative, as directed	Core	
H. Refers specific diagnostic, treatment, or prognosis questions from the patient (or their representative) to the physician or other supervising health care professional, except as authorized by written facility policies and procedures	Core	

Job Function 3: Analyzes and determines the protocol for the diagnostic examination or procedure		
Hours (time-based and hybrid programs only):		
Competencies	Core or optional	Performance level achieved (0–4) (competency-based and hybrid programs only)
A. Adapts the protocol according to the patient's disease process or condition, any contraindications, or other factors such as insufficient patient preparation (in consultation with a preceptor)	Core	
B. Consults appropriate medical personnel to determine an action plan, as needed	Core	
C. In consultation with an advisor, adapts the protocol according to any physical environment where the examination or procedure must be performed (e.g., operating room, sonography laboratory, patient's bedside, emergency room) to ensure patient safety and comfort and minimize risk of sonographer injury, including work-related musculoskeletal disorder (WRMSD)	Core	
D. Applies independent judgment to optimize patient safety and comfort, diagnostic quality, and efficient use of resources while achieving the objective of the procedure and following written supervising physician or facility protocols	Core	
E. Determines that all procedural requirements are in place to achieve a quality procedure	Core	
F. Determines the need for and selects supplies and accessory equipment (e.g., selects a proper transducer)	Core	
G. Determines the course of action for an emergent situation	Core	
H. Selects appropriate equipment settings and patient positions	Core	
I. Integrates medical history, previous studies, and current symptoms to determine the appropriate diagnostic protocol and customize the examination or procedure to the patient's needs	Core	
J. Uses professional judgment to adapt the protocol or consult appropriate health care providers, when necessary, to optimize examination or procedure images, findings, or results	Core	
K. Verifies that the planned procedure applies elements of the As Low As Reasonably Achievable (ALARA) standard, including lowest output power, most efficient scan time,	Core	

and the shortest dwell time (where appropriate), consistent with acquiring the required diagnostic images and related information		
L. Follows facility protocol and consults with the physician or other supervising health care professional to determine if an intravenous ultrasound contrast agent or other pharmacologic agent may enhance image quality or obtain additional diagnostic information	Core	

Job Function 4: Implements protocols		
Hours (time-based and hybrid programs only):		
Competencies	Core or optional	Performance level achieved (0–4) (competency-based and hybrid programs only)
A. Prepares patient for exam by explaining the procedure, including preparing patient for what sensations to expect (such as cold gel, local anesthesia, and biopsy procedures)	Core	
B. Transfers patient to ultrasound table, positions patient properly, and applies gel	Core	
C. Applies principles of aseptic technique	Core	
D. Performs the examination or procedure	Core	
E. Explains to the patient each step of the procedure as it occurs and elicits the cooperation of the patient	Core	
F. Observes the screen and adjusts equipment settings as needed for optimal imaging	Core	
G. Troubleshoots technical issues while scanning for later notification, notifying supervisor and following chain of command for communicating equipment malfunction and repair needs	Core	
H. Adapts the protocol according to images obtained or changes in patient's clinical status during the examination or procedure with orders of physician or other supervising health care professional	Core	
I. Monitors the patient's clinical and comfort status and performs basic patient care tasks as needed	Core	
J. Activates emergency protocols, contacts appropriate personnel, and administers first aid or basic life support, including taking vital signs and performing CPR if needed	Core	
K. Notifies appropriate health care providers when immediate medical attention may be necessary, based on the examination or procedure images, findings, or results, or the patient's condition	Core	
L. Adjusts console settings to optimize images following ALARA	Core	

M. Adjusts scanning technique as appropriate to optimize image quality and diagnostic information	Core	
N. Utilizes multiple patient positions to evaluate anatomy, as needed	Core	
O. Obtains Doppler velocities and measurements, as needed	Core	
P. Performs remote procedure protocols, as needed	Core	
Q. Assists in collection and labeling of tissue and fluid specimens, as needed	Core	

Job Function 5: Evaluates images, findings, or results		
Hours (time-based and hybrid programs only):		
Competencies	Core or optional	Performance level achieved (0–4) (competency-based and hybrid programs only)
A. Performs examination measurements and calculations per protocol	Core	
B. Confirms that the procedure, as performed, complies with the applicable protocol	Core	
C. Evaluates images to determine if additional images will improve the procedure or treatment outcome	Core	
D. Evaluates images for technical quality	Core	
E. Identifies limitations in the examination or procedure, such as equipment failure or lack of patient preparation	Core	
F. Reviews all data for completeness and accuracy	Core	
G. Reviews and adheres to quality assurance processes and tools	Core	
H. Identifies and reports exceptions to the expected outcome	Core	
I. Notifies appropriate health care provider(s) of exam results, images, or patient condition, including potential	Core	

abnormalities (including possible pathological conditions or abnormalities)		
J. Determines whether to extend the exam and initiates additional techniques, procedures, or imaging, with physician or other supervising health care professional approval	Core	

Job Function 6: Implements safety and quality improvement programs and protocols, including quality of care standards and sonographer health and well-being standards		
Hours (time-based and hybrid programs only):		
Competencies	Core or optional	Performance level achieved (0–4) (competency-based and hybrid programs only)
A. Assumes responsibility for the safety of the patient throughout the sonographic examination, and assesses the patient’s physical, emotional, and mental status prior to discharge	Core	
B. Maintains a safe environment for patients and staff, minimizing potential hazards	Core	
C. Prepares safety or accident reports for adverse or sentinel events	Core	
D. Reports symptoms of abuse or neglect, according to facility protocols	Core	
E. Practices proper body mechanics and posture to avoid injuries, including WRMSDs	Core	
F. Maintains proper workflow to avoid WRMSDs, including the use of ergonomic scanners and proper design and set-up of the bed, machine, and workstation	Core	
G. Maintains proper workload to avoid WRMSDs, including limiting the length of examinations and having adequate breaks between examinations	Core	
H. Recognizes and reports signs and symptoms of WRMSDs and changes in health status or well-being	Core	
I. Carries out quality assurance protocols and quality improvement measures within the facility	Core	
J. Implements or participates in programs the facility offers to improve the health and well-being of sonographers, including the reduction of stress and WRMSDs	Optional	

Job Function 7: Documents care		
Hours (time-based and hybrid programs only):		
Competencies	Core or optional	Performance level achieved (0–4) (competency-based and hybrid programs only)
A. Reviews examination images, reports examination results, and compiles preliminary findings	Core	
B. Determines which images to include in documentation, emphasizing differences between healthy and pathological areas, accuracy, conciseness, and completeness	Core	
C. Ensures correct annotation of images	Core	
D. Adheres to American College of Radiology (ACR) or American Institute of Ultrasound Medicine (AIUM) reporting guidelines, including demographics, clinical details, and findings summary to physician or other supervising health care professional	Core	
E. Documents adaptations of the facility's protocol, including contraindications, insufficient patient preparation or inability or unwillingness to complete the examination procedure, or physical circumstances under which the examination or procedure was performed	Core	
F. Documents and reports any possible critical findings	Core	
G. Creates, transmits, and archives documentation following appropriate state and federal requirements	Core	
H. Archives digital images and associated data securely, such as through a Picture Archiving and Communication System (PACS)	Core	
I. Maintains patient privacy and confidentiality following privacy laws (including Health Insurance Portability and Accountability Act standards) and facility policies and procedures	Core	
J. Communicates test or assessment results to appropriate medical professionals	Core	
K. Provides a written or electronic sonographer's impression, including images and findings, to the	Optional	

interpreting physician or supervising health care professional, with a verbal report if needed		
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Job Function 8: Cleans and maintains equipment		
Hours (time-based and hybrid programs only):		
Competencies	Core or optional	Performance level achieved (0–4) (competency-based and hybrid programs only)
A. Cleans medical equipment, including low-level and high-level disinfection techniques	Core	
B. Assesses and maintains the integrity of medical supplies, properly disposing of them when indicated	Core	
C. Maintains inventory of medical supplies or equipment and identifies needs for ordering medical supplies or equipment	Core	
D. Submits maintenance requests for performing repairs as necessary	Core	
E. Confirms that equipment performance, maintenance, and operation comply with the manufacturer's specifications	Core	
F. Conducts or reports need for preventive maintenance for ultrasound equipment	Core	
G. Cleans and prepares exam room and ultrasound equipment to conduct sonography examinations following protocols for infectious disease, sterilization as indicated, and patient safety	Core	

Job Function 9: Performs facility and administrative duties		
Hours (time-based and hybrid programs only):		
Competencies	Core or optional	Performance level achieved (0–4) (competency-based and hybrid programs only)
A. Assists with the education and training of sonography students and physician residents	Core	

B. Notifies supervisor and follows chain of command for communicating equipment malfunction and repair needs	Core	
C. Assists with the daily operation of the sonography facility	Core	
D. Maintains awareness of unauthorized access to controlled area	Core	
E. Coordinates work with physicians or other health care team members, including providing assistance during invasive procedures	Optional	
F. Supervises other patient care personnel as needed	Optional	
G. Performs clerical duties, such as scheduling exams or special procedures, maintaining medical facility records, or archiving computer images	Optional	
H. Participates in maintenance of facility reports, database records, and logs	Optional	

Job Function 10: Participates in professional development, including self-assessment standards, education standards, collaboration standards, and ethical standards

Hours (time-based and hybrid programs only):

Competencies	Core or optional	Performance level achieved (0–4) (competency-based and hybrid programs only)
A. Obtains and maintains professional certification/credentialing and state license, if required, in areas of clinical practice	Core	
B. Trains in new developments, technologies, and trends in relevant areas of clinical practice	Core	
C. Shares knowledge and expertise with colleagues, students, and members of the health care team	Core	
D. Adheres to accepted professional ethical standards and maintain professional accountability	Core	
E. Complies with federal and state regulations, accreditation standards, and written supervising physician or facility policies	Core	
F. Refrains from performing procedures outside of the scope of practice of sonography and authorized health care procedures, education, training, or research	Core	

G. Supports patient rights and acts as a patient advocate	Core	
H. Communicates effectively with members of the health care team regarding patient welfare while maintaining patient privacy in written, digital, and verbal communication	Core	
I. Promotes a collaborative atmosphere with members of the health care team	Core	
J. Upholds ethical standards for patient care at all times, including respecting patients' rights and the privacy of medical information, and providing patient care with kindness, compassion, dignity, and respect for all	Core	
K. Performs only sonographic examinations that are appropriately authorized and procedures for which one is trained and competent	Core	

Related Technical Instruction

Diagnostic Medical Sonographer

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Instructions for Use:

Registered Apprenticeships must include at least 144 hours of Related Technical Instruction (RTI). Courses offered by accredited colleges and universities may be assigned a credit hour determination rather than a contact hour determination. In general, an academic credit unit is the equivalent of 15 clock hours of instruction.

Development and Use of this RTI Outline: Employers and academic institutions may approach RTI in markedly different ways. Our goal was not to identify the single best way to provide RTI, or to identify a single provider whose content we deemed to be superior. However, given the role the Joint Review Committee on Education in Diagnostic Medical Sonography plays in accrediting diagnostic medical sonography programs, we relied heavily on their self-study checklist to identify learning objectives relevant to this occupation. RTI providers may organize learning objectives differently or assign different names to courses than reflected below. The RTI outline, below, is intended to assist sponsors in identifying critical elements of classroom instruction as part of their apprenticeship program.

Licensure or certification requirements: New Hampshire, New Mexico, North Dakota, and Oregon require medical sonographers to be licensed by the state. Other states require medical sonographers to be credentialed, meaning they must pass an examination administered by a private agency.

The ARDMS issues the Registered Diagnostic Medical Sonography (RDMS) credential. To earn the credential, individuals must pass the physics exam and a corresponding specialty exam within five years. Specialty exams are offered in the following areas: abdomen, breast, fetal echocardiography, obstetrics and gynecology, and pediatric sonography.

ARRT offers sonography and vascular sonography credentials to those who have completed at least an associate degree and an ARRT-approved sonography program.

Cardiovascular Credentialing International (CCI) offers credentials for individuals who work in cardiac ultrasound (registered congenital cardiac sonographer—RCCS), vascular ultrasound (registered phlebology sonographer—RPhS), and vascular ultrasound (registered vascular specialist—RVS).

Degree requirements for licensure or certification, if applicable:

ARDMS recognizes multiple educational pathways to certification. These include:

- completion of a two-year allied health education program that is patient care related plus a minimum of 12 months of full-time clinical experience;
- graduate of or student in a CAAHEP-accredited program in diagnostic medical sonography, diagnostic cardiac sonography, or vascular technology;
- graduate of a bachelor's degree program in any major, plus a minimum of 12 months full-time clinical experience; or

- graduate of or student in a non-CAAHEP-accredited bachelor's degree in sonography or vascular technology plus a minimum of 12 months of full-time clinical experience completed within the program.

ARRT offers sonography and vascular sonography credentials to those who have completed at least an associate degree and an ARRT-approved sonography program.

CCI offers multiple pathways to their ultrasound credentials, including:

- completion of a diploma, associate, or baccalaureate program in health science and one-year full-time experience in the ultrasound specialty area and completion of 600 hours of specialty ultrasound studies;
- completion of a non-programmatically accredited program in the ultrasound specialty area with a minimum of one year of specialty training and 800 clinical hours that must be part of the program or completed before completion of the program;
- or hold another ultrasound credential with six months full-time work in the specialty area of the new credential.

CCI once had a work-based pathway to their credential for individuals who do not already hold another ultrasound credential, but that pathway was phased out in June 2023.

Accreditation requirements of instructional provider for licensure or certification, if applicable:

Individuals seeking licensure, where available, and/or the RDMS credential (typically a prerequisite for licensure) are encouraged to complete educational programs accredited by the Joint Review Committee on Diagnostic Medical Sonography of the Commission on Accreditation of Allied Health Education Programs (CAAHEP). Those interested in earning a credential in sonography from ARRT must hold an associate's degree or higher and complete an ARRT-approved program in diagnostic medical sonography.

Anticipated changes in licensure or certification requirements, if known: None known

Examples of state licensure or certification requirements:

New Hampshire—Individuals must hold a current sonography certification or registration issued by ARDMS, ARRT, or CCCI, pass a criminal background check, and complete an application process implemented by the state.

New Mexico—Individuals are required to complete an approved medical imaging or radiation therapy modality program accredited by an accreditation agency recognized by the US Department of Education or the Council on Higher Education Accreditation. These accrediting organizations include CAAHEP, JRCERT, and JRCNMT, and provide a credential in diagnostic medical sonography from ARDMS, ARRT, or CCI.

Examples of RTI providers for this occupation

Professional associations and labor organizations: Professionals credentialed by the American Registry for Diagnostic Medical Sonography (ARMS) meet the criteria in both knowledge and expertise in sonography. ARMS offers examinations and credentials within the sonography field (<https://www.ardms.org/discover-ardms/examinations-and-credentials>). The Society of Diagnostic Medical Sonography is a professional membership organization that educates the medical community, sonographers, and sonography students in the science of diagnostic medical sonography. The Society of Diagnostic Medical Sonography offers unlimited access to SDMS CME opportunities in the SDMS Learning Center, as well as peer-reviewed research, scientific articles, and case studies in JDMS (<https://www.sdms.org/about>).

Military: Branches of the US military service offer enlisted service members complete basic military training to gain skills through classroom study, including practice with medical imaging equipment and on-the-job experience (<https://www.todaymilitary.com/careers-benefits/careers/sonography-technicians>).

States/municipalities: Not applicable

Federal Agencies: Not applicable

Colleges and universities: Many community colleges offer certificate and degree programs in diagnostic sonography and other sonography areas.

No-cost online providers: Not applicable

Continuing education or specialty education providers: On-the-job training offers apprentices experience with sonography practice, its application areas, and reporting documentation. Apprentices will use imaging ultrasound equipment and perform diagnostic procedures to form images of the study. During this experience, the apprentices will help the doctor diagnose and treat conditions and prepare relevant reports and clinical statements (<https://ojt.com/career-pathways-exploration-initiative/diagnostic-medical-sonographers>).

Prerequisite knowledge, skills or experience typically required by RTI providers for this occupation

Individuals must have good interpersonal skills, pay attention to details, and have visual acuity that permits the identification of fine details. Many employers and states require diagnostic medical sonographers to pass a criminal background check before being enrolled, licensed, or hired.

Introduction to Working in Clinical Settings and Employer Onboarding

Hours: 20–30

Sample learning objectives

- Describe the role of diagnostic medical sonographers as part of a patient care team and the scope of practice and limitations associated with each team member.
- Explain the importance of patient privacy, explain the laws that protect patient privacy, and adequately respond to requests for information from other members of the health care team, family members, researchers, and others.
- Explain the limitations on the type of information a diagnostic medical sonographer can provide to patients about the results of imaging studies.
- Explain the importance of reviewing, interpreting, and providing accurate and properly written patient care notes.
- Describe the risks of bloodborne pathogens and contagious diseases and the steps diagnostic medical sonographers must take to protect themselves and others from the risks of disease transmission.
- Explain the employer's policies for punctuality, recording work hours, requesting time off, notifying the employer in the event of illness or injury that prevents one from working, and reporting concerns about the employer's policies and practices or those of other employees.
- Describe the employer's policies regarding workplace conduct and ethics.
- Explain the proper procedures for reporting concerns related to patient and peer safety, medical ethics, or the care of patients and their families.
- Demonstrate the ability to dress and groom appropriately for work in the health care setting.
- Demonstrate the ability to communicate clearly and professionally, work effectively with difficult people, diffuse anger and tension, and engage in active listening to resolve conflicts.
- Explain the obligation of the diagnostic medical sonographer to engage in professional development through continuing education, participation in professional meetings, and reading peer-reviewed journals.

Medical Terminology

Hours: 20

Sample learning objectives

- Identify the meanings of root words, prefixes, suffixes, and combinations typically used in health care settings.
- Correctly define and pronounce commonly used medical terms, symbols, and abbreviations.
- Define, identify, and correctly use terminology related to radiography and other imaging modalities, including radiologic oncology.
- Transcribe and interpret radiographic orders and requisitions, as well as the content of patient medical histories, medical procedures, and clinical or diagnostic reports.

Mathematics for Allied Health Professionals

Hours: 30–45

Sample learning objectives

- Demonstrate the ability to convert between metric and English units of measure.
- Correctly use and manipulate exponents.
- Perform calculations involving addition, subtraction, multiplication, and division.
- Convert fractions to decimals and decimals to fractions; add, subtract, multiply, and divide fractions and decimals; and calculate proportions and ratios.
- Calculate rates of change.
- Calculate percentages and use percentages to determine the amount of materials to be used.
- Use scientific notation and manipulate numbers expressed with exponents.
- Use algebraic techniques to solve unknown variables, solve linear equations, follow the correct order of operations, use the distributive law, and solve systems of equations.
- Define the various types and components of triangles, determine interior and exterior triangle angles, use the Pythagorean Theorem to solve problems for right triangles, and determine the perimeter and area of triangles.
- Identify squares, rectangles, parallelograms, trapezoids, hexagons, octagons, pentagons, and quadrilaterals, and calculate their perimeter and area.
- Calculate a circle's diameter, radius, circumference, and arc.
- Use the Laws of Sines and Cosines to determine angles.
- Define and use mean, median, mode, and standard deviation.
- Create and interpret graphs.

Anatomy and Physiology

Hours: 45–60

Sample learning objectives

- Explain the importance of maintaining homeostasis in the body and describe the various mechanisms used by the body's systems.
- Use proper nomenclature to describe location or directional aspects of anatomy, to identify body planes, and to identify body cavities.
- Name, identify, and describe the function of the components of the body's systems (integumentary, cardiovascular, nervous, respiratory, endocrine, muscular, skeletal, digestive, lymphatic, urinary, reproductive, circulatory, and pulmonary).
- Identify anatomical structures in axial, sagittal, and coronal planes.
- Explain the chemistry of living systems, including the structure of atoms and molecules; the importance of maintaining the appropriate pH or acid-base balance; the structure and function of cells; intercellular and intracellular movement including by osmosis and diffusion; the chemistry of water, carbon and oxygen; the structure and function of deoxyribonucleic acid and ribonucleic acid and the processes of transcription and translation; and cellular systems for the production and consumption of energy.
- Identify the key components of cells, tissues, organs, and organ systems.
- Explain the components and processes involved in cellular metabolism.
- Describe the most common sources of anatomical or physiological pathology and the impact of pathology on each of the body's systems.
- Demonstrate the use of basic laboratory equipment, including microscopes, dissection tools, spirometers, sphygmomanometers, hydrometers, blood typing and analysis, centrifuges, etc.

Physics

Hours: 45–60

Sample learning objectives

- Recite and explain the laws of motion, force, and gravity and explain their applications.
- Explain the laws of thermodynamics and discuss the concepts of energy and work.
- Describe how light and sound waves function in our environment, and analyze how light waves bend around objects.
- Distinguish between absorption, transmission, reflection, refraction, and diffraction.
- Use the principles of electricity and magnetism to solve problems.
- Use Kepler's laws to solve problems.
- Use Ohm's law to calculate voltage, current, and resistance.
- Explain the source of radioactive isotopes, their half-life, and their rate of decay.
- Explain Einstein's theory of relativity and how it impacted our understanding of various theories in physics.
- Explain quantum mechanics and uncertainty.
- Explain the principles of nanotechnology, current applications of nanotechnology, and the environmental and human health hazards associated with the release of nanoparticles.
- Explain dark matter and dark energy.

Introduction to Diagnostic Medical Sonography

Hours: 45–60

Sample learning objectives

- Describe the roles and responsibilities of the various health care team members.
- Define medical and sonographic terminology, including abbreviations, symbols, terms, and phrases.
- Describe the important components of effective communication with patients, including patients of different ages and education levels, patients with physical limitations or intellectual disabilities, patients who do not speak English, patients from various ethnic backgrounds, patients of various genders, and patients who are exhibiting behaviors associated with fear, anxiety, and stress.
- Describe key elements of the health care environment, such as the various types of short-term and long-term care facilities in which patients are treated (including hospitals, outpatient clinics, mental health facilities, hospice care, home health care, and telemedicine); payment and reimbursement systems; quality management protocols; and the administrative structure of patient care facilities.
- Explain the purpose of malpractice insurance and the role of sonography in reducing claims of medical malpractice.
- Describe the role of accreditation and credentialing organizations and state and federal regulatory bodies in providing safe and quality ultrasound and other imaging services. Discuss the requirements of the Centers for Medicare and Medicaid Services related to diagnostic medical sonography.
- Explain the federal and state laws that protect patient privacy, and the steps health care professionals must take to comply with those laws when managing patient records and sharing patient health information with the appropriate individuals or clinicians.

- Discuss the physics of ultrasound technology.
- Explain the importance of quality control in medical sonography, including the use of phantoms to test image quality.
- Describe the basic positions used to capture images based on the imaging studies ordered.
- Describe adaptive techniques and tools that are used to position patients during sonography.
- Describe the importance of informed consent and the responsible use of patient images in performing ethical medical research or case studies.

Patient Care and Safety in Medical Sonography

Hours: 20–30

Sample learning objectives

- Describe the key components of patient-sonographer interactions and demonstrate the ability to identify patients correctly, explain the procedure about to take place and proper positioning, provide accurate information about the duration of the procedure, and affirm that the appropriate licensed medical provider will communicate test results.
- Explain the relevance of patient directives and the sonographer's role to respond to those directives.
- Maintain a clean, adequately stocked, and safe sonography environment.
- Use proper body mechanics to move and position patients.
- Assess a patient's mobility accurately and use appropriate transfer tools and techniques to move patients from wheelchairs, stretchers, or beds to imaging equipment.
- Transport and transfer patients using medical equipment such as oxygen, intravenous lines and pumps, urinary catheters, draining tubes, etc.
- Ascertain patient status by taking vital signs, communicating, and reviewing patient care notes and laboratory results.
- Describe effective strategies for fall prevention.
- Demonstrate the ability to position or to assist patients in positioning themselves and utilize proper draping techniques to prepare patients for sonography procedures.
- Describe the types of infections most prevalent in in-patient and out-patient care facilities and among patients seeking care, as well as the techniques, equipment, and strategies used to reduce the risk of infection.
- Use aseptic and sterile techniques properly.
- Clean and disinfect imaging equipment, including transducer cleaning and disinfection, other accessories, and surrounds.
- Identify common medical emergencies (shock, allergic reaction, excessive bleeding, diabetic emergencies, respiratory and cardiac failure, airway obstruction, cerebral vascular accidents, fainting, and seizures) as well as the appropriate medical response to each.
- Accurately assess and respond to various patient medical emergencies.
- Describe the process of completing a proper incident report when necessary.

Imaging Procedures

Hours: 45–60

Sample learning objectives

- Explain the theory of ultrasound imaging and the kinds of tissues and anatomical structures that can be visualized.
- Explain the disease process and the application of sonographic imaging to identify and monitor the disease process.
- Describe sound production and the propagation of sound waves.
- Describe the interaction between sound and matter.
- Explain the physics of Doppler, the use of Doppler techniques, and the methods of flow analysis.
- Discuss the types of ultrasound instruments, modes of operation available, and the decision matrix used to select the appropriate ones.
- Discuss control options available to operators.
- Discuss the use of phantoms to test instrument function.
- Explain the hemodynamics of blood flow.
- Discuss the use of contrast-enhanced imaging and demonstrate the ability to collect these images.
- Discuss the challenges of acoustic artifacts and techniques for reducing or eliminating them.
- Explain how images are transmitted to other health care team members and preserved as medical records.
- Discuss the maximum safe exposure levels for patients and sonographers.
- Demonstrate appropriate knowledge of phlebotomy and the ability to perform venipuncture, insert an intravenous line, administer intravenous contrast agents, or other pharmacological agents related to the imaging procedure and as prescribed by a legally authorized health care provider.
- Demonstrate an understanding of the pharmacokinetics of intravenous contrast agents and other pharmacological agents commonly used in ultrasound procedures.

Relevant military experience

The US Navy and US Air Force provide training in diagnostic medical sonography at the Medical Education & Training Campus at Fort Sam Houston. Graduates of this program receive college credits from the Community College of the Air Force and are eligible to take national registry exams through the American Registry for the Diagnostic Medical Sonography. The following occupation codes are used to categorize this occupation.

US Air Force: Diagnostic Imaging Specialist 4R031

Navy: Ultrasound Technologist: 8447

The Army employs imaging specialists, which may include individuals trained in diagnostic medical sonography. US Army: Radiology Specialist: 68P

Occupational insights

Most diagnostic medical sonographers are female (78.4 percent) and white (76.7 percent). 11.6 percent are Hispanic or Latino, 5.9 percent are Black or African American, 7.4 percent are Asian, and 0.4 percent are American Indian or Alaska Native. Almost half of the individuals in this field have bachelor's degrees, and the type of degree a worker holds significantly impacts their earnings. As a result, it is not immediately evident whether wage differences among the various racial or ethnic groups are due to variations in average educational attainment levels. It's important to consider the potential impact of educational attainment levels when analyzing the differences in wages among different racial or ethnic groups within the field of diagnostic medical sonography (<https://datausa.io/profile/soc/diagnostic-medical-sonographers?ethnicity-gender=genderFemale>).

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