DIAGNOSTIC MEDICAL SONOGRAPHY, ASSOCIATE OF APPLIED SCIENCE

Curriculum Code #2402

Effective May 2025

Division of Health and Wellness Sciences (http://catalog.loraincccc.edu/academic-programs/allied-health-nursing-health-physical-education-recreation/)

Diagnostic medical sonography is an imaging process used to assist physicians in gathering sonographic data necessary to reach diagnostic decisions. Sonographers are highly-skilled professionals qualified by technological education to provide patient services using diagnostic ultrasound under the supervision of a physician. American Heart Association Healthcare Provider certification is required upon entrance into the program. Lorain County Community College has articulation agreements with colleges and universities including programs offered by Lorain County Community College's University Partnership.

Note: *Students must have 10 credits of preadmission courses completed before a program application can be submitted.*

Preadmission Courses		Hours
ALHN 107	CAREER EXPLORATIONS IN DIAGNOSTIC MEDICAL SONOGRAPHY [1,2]	1
ALHN 112	INTRODUCTION TO MEDICAL TERMINOLOGY [1,9]	1
ALHN 113	INTRODUCTION TO PATIENT CARE [1,3]	1
BIOG 221	ANATOMY & PHYSIOLOGY I [1]	4
BIOG 222	ANATOMY AND PHYSIOLOGY II [1,2]	4
ENGL 161	COLLEGE COMPOSITION I	3
MTHM 168	STATISTICS [1]	3
PHYC 115	PHYSICS FOR THE ALLIED HEALTH SCIENCES [1,2]	4
SDEV 101	INTRODUCTION TO THE LCCC COMMUNITY [4]	1
	Hours	**22**
First Year		
Fall Semester		
ALHN 121	GENERAL PATHOLOGY [1,2]	2
BIOG 123	CROSS-SECTIONAL ANATOMY [1,2]	2
PEFT 151	LIFETIME FITNESS	1
SONO 111	ORIENTATION TO DIAGNOSTIC MEDICAL SONOGRAPHY [1,2,5]	1
SONO 122	IMAGING MODALITIES [1,2,6]	1
PSYH 151 or SOCY 151G	INTRODUCTION TO PSYCHOLOGY or INTRODUCTION TO SOCIOLOGY	3
	Hours	**10**
Spring Semester		
SONO 131	INTRODUCTION TO DIAGNOSTIC MEDICAL SONOGRAPHY [1,2]	7
SONO 221	ULTRASOUND PHYSICS AND INSTRUMENTATION I [1,2]	2
	Hours	**9**
Summer Semester		
SONO 215	DIAGNOSTIC MEDICAL SONOGRAPHY I [1,2,7,8]	7
	Hours	**7**
Second Year		
Fall Semester		
SONO 222	ULTRASOUND PHYSICS AND INSTRUMENT II [1,2]	2
SONO 223	DIAGNOSTIC MEDICAL SONOGRAPHY II [1,2,7,8]	8
	Hours	**10**
Spring Semester		
SONO 224	ADVANCED DIAGNOSTIC MEDICAL SONOGRAPHY STUDIES [1,2,7,8]	6
SONO 229	PROFESSIONAL ISSUES IN DIAGNOSTIC MEDICAL SONOGRAPHY [1,2]	1
	Hours	**7**
	Total Hours	**65**

1

Indicates that a grade of C (2.0) or better must be earned in order to continue in the sequence.

2

Indicates that this course has a prerequisite.

3

Indicates that credit is waived for ALHN 113 if one has STNA certification/license.

4

A student must register for the orientation course when enrolling for more than six credit hours per semester or any course that would result in an accumulation of 12 or more credit hours.

5

Indicates one must have admission into the diagnostic medical sonography program.

6

Indicates course is not required if one has American Registry Radiology Technology (ARRT) certification. Those who have ARRT certification will receive prior learning assessment credit (PLA) for SONO 122.

7

This course offers an opportunity for experiential learning.

8

Students will purchase Trajecsys clinical software access in LCCC bookstore. Software access rights are good for one year.

9

Students who have taken ALHN 110 or MDAS 113 are not required to take ALHN 112.

All courses listed prior to the first year fall semester must be completed prior to admission to the sonography program.

A minimum GPA of 3.0 is required in college-level coursework for admission into the program.

Program Contact(s):

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For information about admissions, enrollment, transfer, graduation and other general questions, please contact your advising team (https://www.lorainccc.edu/admissions-and-enrollment/advising-and-counseling/).

More program information can be found on our website. (https://www.lorainccc.edu/health/sonography/)

Admission Requirements for Diagnostic Medical Sonography

1. Official high school or GED and college/program transcripts (if applicable) on file in the LCCC Records office.
2. Program application form on file by February 5 of each year to be considered for program admission the following year.
3. Satisfactory completion with a grade of C or better of the pre-admission courses on the diagnostic medical sonography curriculum guide which includes the following college or post-secondary education coursework:
   - ALHN 107 CAREER EXPLORATIONS IN DIAGNOSTIC MEDICAL SONOGRAPHY
   - ALHN 112 INTRODUCTION TO MEDICAL TERMINOLOGY
   - ALHN 113 INTRODUCTION TO PATIENT CARE
   - BIOG 221 ANATOMY & PHYSIOLOGY I
   - BIOG 222 ANATOMY AND PHYSIOLOGY II
   - ENGL 161 COLLEGE COMPOSITION I
   - MTHM 168 STATISTICS
   - PHYC 115 PHYSICS FOR THE ALLIED HEALTH SCIENCES
4. Minimum GPA of 3.0 for college-level courses including transfer/transient work (excludes developmental education and more than two physical education courses).
5. The Ultrasound Student Assessment (USA) exam is a true aptitude test that is administered by Pegasus Lectures. An aptitude test is defined as a tool to assess if a person has specific skills necessary to perform in a particular field. The USA program is a true aptitude test and as such, there is no studying possible. This program tests innate abilities such as visualization, hand-eye coordination, ability to remain focused, problem solving, graph interpretation, visualization, logic and reasoning which impact the ability of an individual to master essential skills required to perform sonography. Study tools or practice exams are not available. The test consists of 65 -70 questions and there is no time limit. The USA must be completed in one sitting and can be taken at any time. Applicants are encouraged to take the USA exam once they are considering applying to the sonography program before taking the preadmission courses. The USA must be taken no less than 2 weeks prior to the application deadline. The USA scores do not expire. Applicants may take the USA test only once per application cycle. The USA may only be taken twice by any applicant to the diagnostic medical sonography program. The USA results will make up 25% of the sonography program selection process. Students may schedule a proctored exam at home. Please visit the Pegasus website (https://www.pegasuslectures.com/usa_program.php) for additional information.
6. Anatomy & Physiology course grades (BIOG 221 & BIOG 222) and number of attempts to pass with a grade of C or better are used in the acceptance process.

Allied health professionals: Applicants from a patient care related allied health/nursing background may transfer credit or receive credit through prior learning assessment for the following diagnostic medical sonography preadmission courses:

- ALHN 112 INTRODUCTION TO MEDICAL TERMINOLOGY
- ALHN 113 INTRODUCTION TO PATIENT CARE

This will be handled on a case-by-case basis with the program director.

Radiologic technologists who are graduates of an appropriately accredited college-based degree radiologic technology program would be eligible for receiving credit for all of the diagnostic medical sonography preadmission and support courses plus SONO 122 IMAGING MODALITIES. Graduates of a hospital-based certificate radiologic technology program may receive credit for:

- ALHN 112 INTRODUCTION TO MEDICAL TERMINOLOGY
- ALHN 113 INTRODUCTION TO PATIENT CARE
- PHYC 115 PHYSICS FOR THE ALLIED HEALTH SCIENCES
- SONO 122 IMAGING MODALITIES

STNA certification or licensure or successful completion of STNA 114 would receive waived credit for

- ALHN 113 INTRODUCTION TO PATIENT CARE

An application exception petition may be submitted by a potential applicant who has not fulfilled all preadmission requirements. If the request is approved, the applicant will be permitted to file a provisional application; and will be considered in the selection process for the next academic year. Program admission for provisional applicants will be contingent upon the successful fulfillment of all outstanding preadmission requirements. Students should consult with their academic advisor to determine eligibility and submit the exception for the outstanding requirements.

Learn more about Allied Health program requirements (http://catalog.lorainccc.edu/academic-information/allied-health-nursing-admissions/)

Credit for Prior Learning (PLA) options may be available for your program. For more information, please visit our website: www.lorainccc.edu/PLA (http://www.lorainccc.edu/PLA/)

Goals of the Diagnostic Medical Sonography Program

- To prepare competent entry-level sonographers in the cognitive (knowledge), psychomotor (skills), and affective (behavior) learning domains for the abdominal sonography – extended, and the obstetrics and gynecologic sonography concentrations.
- Produce competent, entry-level sonographers who are compassionate, patient-focused members of the healthcare team.
- Develop the students' communication and critical thinking skills necessary in performing quality sonographic exams.
- Provide an educational experience to support and comply with the Code of Ethics for the Profession of Diagnostic Medical Ultrasound

and the Scope of Practice for the Diagnostic Ultrasound Professional as developed by the Society of Diagnostic Medical Sonographers.

- Provide students with the knowledge, clinical skills, problem-solving abilities and interpersonal skills to practice in the profession of sonography.
- Graduate competent, caring sonography professionals who are prepared to pass the ARDMS certification exams in sonographic principles & instrumentation, abdomen and obstetrics & gynecology specialties.
- Emphasize to students the importance of continued improvement through professional life-long learning.

Program Learning Outcomes

Graduates of the Lorain County Community College Diagnostic Medical Sonography Program should:

1. Apply principles of ultrasound physics to patient examinations to obtain diagnostic information.
2. Be a productive team-player.
3. Be an efficient, cost-effective member of the health care team.
4. Be prepared to take and pass the ARDMS registry examinations in sonographic principles & instrumentation, abdomen and obstetrics & gynecology.
5. Correlate clinical history, patient symptoms, and laboratory test results with sonographic findings.
6. Demonstrate competence and proficiency in performing abdominal – extended (extremity, non-vascular, infant hips, neck, neonatal/infant head, neonatal/infant spine, penis, prostate, scrotum and superficial soft-tissue structures), obstetrics, and gynecologic ultrasound examinations.
7. Identify common pathologic diseases and differential diagnoses through correlation of sonographic appearances, clinical symptoms and laboratory test results.
8. Practice and apply the ALARA principle in performance of diagnostic ultrasound examinations.
9. Practice lifelong learning by staying current in sonography through continuing education, achieving certifications in additional specialties and achieving advanced degrees.
10. Provide basic patient care, comfort and nursing skills.
11. Recognize the importance of the multidisciplinary health care team.

EXIT COMPETENCIES

Prior to graduation, all Diagnostic Medical Sonography students must satisfactorily have met and completed all course, classroom and clinical objectives. In addition, we endorse and have incorporated into the appropriate courses, the terminal competencies mandated by the Joint Review Committee of Education in Diagnostic Medical Sonography (JRCDMS). The terminal competencies of the JRCDMS are listed below.

The graduate shall be able to:

a. Demonstrate knowledge and application of ergonomic techniques.

1) Industry standards and OSHA guidelines

2) Types of work-related musculoskeletal disorders

3) Role of Administration in the prevention of MSI

4) Role of Sonographer in the prevention of MSI

5) Best practices for prevention

a) Daily exercises in the workplace

b) Neutral posture

c) Patient transfer and assistance

d) Patient positioning

e) Equipment and accessories

f) Supports, tools, and devices

g) Transducer grip and pressure

h) Schedules/Workload

i) Workstation/work area(s)

b. Demonstrate knowledge and application of types and methods of infection control.

1) Personal and patient

a) Standard precautions

b) Isolation procedures

c) Aseptic and sterile technique

2) Environment

a) Equipment

b) Transducer cleaning and disinfection

c) Accessories

c. Demonstrate knowledge and application of patient care.

1) Compliance with program and clinical education facility policies and procedures

2) Patient Care Partnership

3) Patient directives

4) Anticipate and be able to respond to the needs of the patient

a) Demonstrate age-related and cultural competency

b) Demonstrate appropriate patient care in settings outside of the sonography department.

5) Transport and transfer of patients with support equipment

a) Oxygen

b) Intravenous lines/pumps

c) Urinary catheters

d) Drainage tubes

6) Vital signs

7) Color

8) Skin integrity

9) Clinical history

10) Proper patient positioning and draping

11) Comfort

12) Privacy

13) IV insertion and injection with use of contrast-enhanced imaging

14) Basic pharmacology as related to the concentration

15) Post interventional procedure care and discharge

16) Life-threatening situations and implement emergency care as permitted by institutional policy, including the following:

a) Pertinent patient care procedures

b) Principles of psychological support

c) Emergency conditions and procedures

d) First aid and resuscitation techniques

17) Reporting and documentation of incidents and/or adverse reactions

d. Demonstrate knowledge of the roles and responsibilities of healthcare professions to effectively communicate and collaborate in the healthcare environment.

1) Team development

2) Conflict resolution

3) Interprofessional communication and education

e. Demonstrate knowledge of medical ethics and law.

1) Patient's right to privacy based on applicable legal and regulatory standards

2) HIPAA

3) Electronic documentation and transmission

4) Terminology related to ethics, values, and morals

5) Types of law

6) Risk management

7) Medical malpractice liability coverage

8) Informed consent

9) Documentation of clinical incidents

10) Professional scope of practice and clinical standards

11) Professional code of ethics

f. Demonstrate knowledge of medical and sonographic terminology.

1) Definitions, abbreviations, symbols, terms, and phrases

2) Correlating diagnostic and imaging procedures

3) Sonographic appearances

g. Obtain, evaluate, document, and communicate relevant information related to sonographic examinations.

1) Clinical information and historical facts from the patient and the medical records, which may impact the diagnostic examination.

a) Clinical signs and symptoms

b) Laboratory tests

c) Imaging and diagnostic procedures

d) Oral and/or written summary of sonographic findings.

2) Deviation from practice parameters for the sonographic examination as required by patient history or initial findings

3) Changes from a previous examination

4) Examination findings that require an immediate clinical response and notify the interpreting physician.

h. Identify and evaluate anatomic structures.

1) Sectional anatomy

2) Relational anatomy

3) Normal sonographic appearances of organs, muscles, tissue, vascular and skeletal structures

4) Differentiation of normal from abnormal sonographic findings

i. Demonstrate knowledge of disease processes with application to sonographic and Doppler patterns.

1) Iatrogenic

2) Degenerative

3) Inflammatory

4) Traumatic

5) Neoplastic

6) Infectious

7) Obstructive

8) Congenital

9) Metabolic

10) Immunologic

j. Demonstrate knowledge and application of image production and optimization.

1) Sound production and propagation

2) Interaction of sound and matter

3) Instrument options and transducer selection

4) Principles of ultrasound instruments and modes of operation

5) Operator control options

6) Physics of Doppler

7) Principles of Doppler techniques

8) Methods of Doppler flow analysis

9) Hemodynamics of blood flow

10) Contrast-enhanced imaging

11) Acoustic artifacts

12) Emerging technologies

13) Image storage devices

k. Demonstrate knowledge and application of biological effects.

1) In-vitro and in-vivo ultrasound effects

2) Exposure/equipment display indices

3) Generally accepted maximum safe exposure levels

4) ALARA principle

a) Mechanisms that affect the mechanical and thermal indices

b) Techniques to decrease the mechanical and thermal indices

l. Demonstrate knowledge of a quality control and improvement program.

1) Lab accreditation

2) Credentialing organizations

3) Equipment operation and maintenance

a) Phantom testing

b) Records maintenance

m. Demonstrate awareness of resources for professional development.

1) Professional organizations and resources

2) Professional journals and on-line resources

3) Continuing education conferences

4) Clinical conferences, lectures, and in-house educational offerings

5) Recent developments in sonography

6) Research statistics and design

n. Demonstrate achievement of clinical competency through the performance of the requirements to provide quality patient care and optimal examination outcome. Clinical competencies must include evaluation and documentation of:

1) Use of proper ergonomics

2) Safety and infection control

3) Obtain clinical history and utilize information appropriately

4) Oral and written communication

5) Image optimization techniques

6) ALARA

7) Professionalism

8) Document sonographic findings for communication with interpreting physician

9) Finalize examination for permanent storage

10) Process for reporting of critical findings

The above competencies may be embedded within the learning concentration clinical competencies.

Learning Competencies for the Abdominal Sonography - Extended Concentration

a. Identify anatomy, relational anatomy, anatomic variants, and sonographic appearances of normal anatomical structures.

1) Abdominal

a) Abdominal wall

b) Adrenal glands

c) Aorta and branches

d) Biliary system

e) Gastrointestinal tract

f) Great vessels and branches

g) Liver

h) Lung/pleura

i) Lymphatic system

j) Pancreas

k) Peritoneal and retroperitoneal cavities

l) Spleen

m) Urinary tract

2) Extended

a) Extremity non-vascular

b) Infant hips

c) Neck

d) Neonatal/infant head

e) Neonatal/infant spine

f) Penis

g) Prostate

h) Scrotum

i) Superficial soft-tissue structures

b. Demonstrate knowledge of the physiology, pathophysiology, sonographic technique, measurements, sonographic appearances,

and Doppler patterns, where applicable, in both normal and abnormal structures.

1) Abdominal
    a) Abdominal wall
    b) Adrenal glands
    c) Aorta and branches
    d) Biliary system
    e) Gastrointestinal tract
    f) Great vessels and branches
    g) Liver
    h) Lung/pleura
    i) Lymphatic system
    j) Pancreas
    k) Peritoneal and retroperitoneal cavities
    l) Spleen
    m) Urinary tract
2) Extended
    a) Extremity non-vascular
    b) Infant hips
    c) Neck
    d) Neonatal/infant head
    e) Neonatal/infant spine
    f) Penis
    g) Prostate
    h) Scrotum
    i) Superficial soft-tissue structures

c. Demonstrate knowledge in sonographic guided procedures.

1) Role of sonographer
2) Clinical information
3) Informed consent
4) Procedural time out
5) Transducer guidance
6) Sterile setup
7) Pre-and post-procedural documentation

d. Evaluate scanning protocol and modification(s) based on the sonographic findings and the differential diagnoses.

1) Indications and contraindications
2) History and physical examination
3) Related imaging, laboratory, and functional testing procedures
4) Clinical differential diagnosis
5) Contrast-enhanced imaging
6) Role of sonography in patient management

e. Document proficiency in the scanning technique and application for:

1) Abdominal vascular Doppler assessment
    a) Hepatic
    b) Mesenteric
    c) Renal
2) Gastrointestinal tract assessment

The above proficiencies may be demonstrated in a clinical setting or in a simulated environment.

f. Demonstrate achievement of clinical competency through the performance of sonographic examinations of the abdomen and superficial structures, according to practice parameters established by national professional organizations and the protocol of the clinical affiliate. Clinical competencies must include evaluation and documentation of:

1) Identification of anatomical and relational structures
2) Differentiation of normal from pathological/disease process
3) Image optimization techniques in grayscale
4) Image optimization techniques in Doppler (where applicable)
5) Measurement techniques
6) Abdominal competencies
    a) Complete abdominal examination
    b) Limited abdominal examination
        (1) Aorta/IVC
        (2) Biliary system
        (3) Liver
        (4) Pancreas
        (5) Spleen
        (6) Kidneys
        (7) Bladder
        (8) Pleural space
        (9) Sonographic guided procedure (assistance)
7) Superficial Structures

a) Thyroid

b) Scrotum

The above structures listed under limited abdominal examination may be completed as individual clinical competencies or may be incorporated with other structures/techniques as part of a limited or complete examination.

Learning Competencies for the Obstetrics and Gynecology Sonography Concentration

a. Identify anatomy, anatomic variants, and sonographic appearances of normal structures of the female pelvis.

1) Pelvic muscles

2) Pelvic vasculature

3) Peritoneal spaces

4) Reproductive organs

5) Suspensory ligaments

b. Identify anatomy, anatomic variants, and sonographic appearances of normal maternal, embryonic, and fetal anatomic structures during the first, second, and third trimesters.

1) First-trimester structures

a) Gestational sac

b) Embryonic pole

c) Yolk sac

d) Early placenta

e) Fetal cardiac activity

f) Uterus

g) Cervix

h) Adnexa

i) Pelvic spaces

j) Multiple gestations

2) Second- and Third-trimester fetal and maternal structures

a) Intracranial anatomy

b) Face

c) Thoracic cavity

d) Heart

(1) Position and size

(2) Four-chamber view

(3) LVOT and RVOT views

(4) Three-vessel and three-vessel tracheal views

e) Abdomen and pelvis

f) Abdominal wall

g) Spine

h) Extremities

i) External genitalia

j) Amniotic fluid

k) Placenta

l) Umbilical cord

m) Fetal cardiac activity

n) Maternal cervix

o) Maternal adnexa

p) Multiple gestations

c. Demonstrate knowledge of pathology, physiology, pathophysiology, sonographic technique, measurements, sonographic appearances, and Doppler patterns in gynecologic disease processes.

1) Inflammatory processes

2) Congenital anomalies

3) Benign uterine/adnexal masses

4) Malignant uterine/adnexal masses

5) Contraceptive devices

6) Infertility procedures

7) Post-partum

d. Demonstrate knowledge of pathology, physiology, pathophysiology, sonographic technique, sonographic appearance, measurements, and Doppler patterns in obstetric abnormalities.

1) First trimester complications

2) Congenital anomalies

3) Genetic syndromes

4) Growth abnormalities

5) Multiple gestation complications

6) Viability

7) Amniotic fluid

8) Placenta

9) Umbilical cord

10) Fetal monitoring

11) Effects of maternal conditions

e. Demonstrate knowledge and understanding of the role of the sonographer in performing interventional/invasive/advanced procedures.

1) Infertility procedures

2) Amniocentesis

3) Chorionic villus sampling

4) Fetal therapy

5) Nuchal translucency

6) Sonohysterography

7) Three-dimensional obstetric and gynecologic sonography

f. Evaluate scanning protocol and modification(s) based on the sonographic findings and the differential diagnoses.

1) Indications and contraindications

2) History and physical examination

3) Related imaging, laboratory, and functional testing procedures

4) Clinical differential diagnosis

5) Role of sonography in patient management

g. Demonstrate achievement of clinical competency through the performance of sonographic examinations of the gravid and non-gravid pelvis with both transabdominal and endocavitary transducers, and Doppler/M-mode display modes, according to practice parameters established by national professional organizations and the protocol of the clinical affiliate. Clinical competencies must include evaluation and documentation of:

1) Identification of anatomical and related structures

2) Differentiation of normal from pathological/disease process

3) Image optimization techniques in grayscale

4) Image optimization techniques in Doppler and M-mode (where applicable)

5) Knowledge and application of ALARA

6) Measurements as applicable

7) Gynecology competencies

a) Complete pelvic sonogram

b) Vagina/cervix/uterus

c) Posterior and anterior cul-de-sac

d) Adnexa, including ovaries and fallopian tubes

8) Obstetrical competencies

a) First-trimester obstetric structures:

(1) Gestational sac

(2) Embryonic pole

(3) Yolk sac

(4) Fetal cardiac activity

(5) Placenta

(6) Uterus

(7) Cervix

(8) Adnexa

(9) Pelvic spaces

b) Second- and Third-trimester fetal and maternal structures

(1) Intracranial anatomy

(2) Face

(3) Thoracic cavity

(4) Heart

(a) Position and size

(b) Four-chamber view

(c) LVOT and RVOT views

(d) Three-vessel and three-vessel tracheal views

(5) Abdomen

(6) Abdominal wall

(7) Spine

(8) Extremities

(9) Amniotic fluid

(10) Placenta

(11) Umbilical cord

(12) Fetal cardiac activity

(13) Maternal cervical length

(14) Maternal adnexa

c) Biophysical profile

The above may be completed as individual clinical competencies or may be incorporated with other structures/techniques as part of a limited or complete examination.