Wisconsin Department of Safety and Professional Services
Division of Policy Development
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Tony Evers, Governor
Dan Hereth, Secretary

VIRTUAL/TELECONFERENCE
RADIOGRAPHY EXAMINING BOARD
Virtual, 4822 Madison Yards Way, Madison
Contact: Tom Ryan (608) 266-2112
July 9, 2025

The following agenda describes the issues that the Board plans to consider at the meeting. At the time of the meeting, items may be removed from the agenda. Please consult the meeting minutes for a description of the actions of the Board.

AGENDA

9:30 A.M.

OPEN SESSION – CALL TO ORDER – ROLL CALL

A. Adoption of Agenda (1-3)

B. Approval of Minutes of March 5, 2025 (4-7)

C. Introductions, Announcements, and Recognition

D. Reminders: Conflicts of Interest, Scheduling Concerns

E. Administrative Matters – Discussion and Consideration
1. Department, Staff and Board Updates
2. Board Members – Term Expiration Dates
   a. Berumen, Blas R. – 7/1/2028
   b. Borst, Donald A. – 7/1/2025
   c. Grebe, Paul J. – 7/1/2027
   d. Julson, Rachael S. – 7/1/2028
   e. Szcykutowicz, Timothy P. – 7/1/2024

F. 9:30 AM PUBLIC HEARING: Clearinghouse Rule CR 25-036 RAD 1, 2, and 4, relating to Definitions and Scope of Practice (8-9)

G. Administrative Rule Matters – Discussion and Consideration (10-65)
1. Discussion of public comments and Clearinghouse comments for RAD 1, 2, and 4 on Definitions and Scope of Practice
2. Rule drafting for RAD 1, 2, and 5 on License Requirements and Continuing Education
3. Pending or Possible Rulemaking Items

H. Application Forms – Review Updates (66-80)

I. Discussion and Consideration of Items Added After Preparation of Agenda
1. Introductions, Announcements and Recognition
2. Nominations, Elections, and Appointments

3. Administrative Matters
4. Election of Officers
5. Appointment of Liaisons and Alternates
6. Delegation of Authorities
7. Education and Examination Matters
8. Credentialing Matters
9. Practice Matters
10. Legislative and Policy Matters
11. Administrative Rule Matters
12. Liaison Reports
13. Public Health Emergencies
14. Board Liaison Training and Appointment of Mentors
15. Informational Items
16. Division of Legal Services and Compliance (DLSC) Matters
17. Presentations of Petitions for Summary Suspension
18. Petitions for Designation of Hearing Examiner
19. Presentation of Stipulations, Final Decisions and Orders
20. Presentation of Proposed Final Decisions and Orders
21. Presentation of Interim Orders
22. Petitions for Re-Hearing
23. Petitions for Assessments
24. Petitions to Vacate Orders
25. Requests for Disciplinary Proceeding Presentations
26. Motions
27. Petitions
28. Appearances from Requests Received or Renewed
29. Speaking Engagements, Travel, or Public Relation Requests, and Reports

J. Public Comments

CONVENE TO CLOSED SESSION to deliberate on cases following hearing (s. 19.85(1)(a), Stats.); to consider licensure or certification of individuals (s. 19.85(1)(b), Stats.); to consider closing disciplinary investigations with administrative warnings (ss. 19.85(1)(b), and 440.205, Stats.); to consider individual histories or disciplinary data (s. 19.85(1)(f), Stats.); and to confer with legal counsel (s. 19.85(1)(g), Stats.).

K. Deliberation on Division of Legal Services and Compliance Matters

1. Proposed Stipulations, Final Decisions and Orders

a. 24 RAD 0007 – Allyson R. Roehl **(81-87)**

2. Administrative Warnings

a. 24 RAD 0011 – A.A.F. **(88-89)**

L. Deliberation of Items Added After Preparation of the Agenda
Education and Examination Matters

1. Credentialing Matters
2. DLSC Matters
3. Monitoring Matters
4. Professional Assistance Procedure (PAP) Matters
5. Petitions for Summary Suspensions
6. Petitions for Designation of Hearing Examiner
7. Proposed Stipulations, Final Decisions and Orders
8. Proposed Interim Orders

9. Administrative Warnings
10. Review of Administrative Warnings
11. Case Closings
12. Proposed Final Decisions and Orders
13. Matters Relating to Costs/Orders Fixing Costs
14. Board Liaison Training
15. Petitions for Assessments and Evaluations
16. Petitions to Vacate Orders
17. Remedial Education Cases
18. Motions
19. Petitions for Re-Hearing
20. Appearances from Requests Received or Renewed

M. Consulting with Legal Counsel

RECONVENE TO OPEN SESSION IMMEDIATELY FOLLOWING CLOSED SESSION

N. Vote on Items Considered or Deliberated Upon in Closed Session, if Voting is Appropriate

O. Open Session Items Noticed Above Not Completed in the Initial Open Session

ADJOURNMENT

NEXT MEETING: DECEMBER 3, 2025

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MEETINGS AND HEARINGS ARE OPEN TO THE PUBLIC, AND MAY BE CANCELLED WITHOUT NOTICE.

Times listed for meeting items are approximate and depend on the length of discussion and voting. All meetings are held virtually unless otherwise indicated. In-person meetings are typically conducted at 4822 Madison Yards Way, Madison, Wisconsin, unless an alternative location is listed on the meeting notice. In order to confirm a meeting or to request a complete copy of the board's agenda, please visit the Department website at https:\\dsps.wi.gov. The board may also consider materials or items filed after the transmission of this notice. Times listed for the commencement of any agenda item may be changed by the board for the convenience of the parties. The person credentialed by the board has the right to demand that the meeting at which final action may be taken against the credential be held in open session. Requests for interpreters for the hard of hearing, or other accommodations, are considered upon request by contacting the Affirmative Action Officer or reach the Meeting Staff by calling 608-267-7213.

VIRTUAL/TELECONFERENCE
RADIOGRAPHY EXAMINING BOARD
MEETING MINUTES
MARCH 5, 2025

PRESENT: Blas Berumen, Donald Borst, Paul Grebe, Timothy Szczykutowicz

ABSENT: Rachael Julson

STAFF: Tom Ryan, Executive Director; Whitney DeVoe, Legal Counsel; Jacob Pelegrin, Administrative Rules Coordinator; Tracy Drinkwater, Board Administration Specialist; and other Department staff

CALL TO ORDER

Donald Borst, Chairperson, called the meeting to order at 9:30 a.m. A quorum of four (4) members was confirmed.

ADOPTION OF AGENDA

MOTION: Paul Grebe moved, seconded by Blas Berumen, to adopt the Agenda as published. Motion carried unanimously.

APPROVAL OF MINUTES OF DECEMBER 11, 2024

MOTION: Paul Grebe moved, seconded by Timothy Szczykutowicz, to approve the Minutes of December 11, 2024, as published. Motion carried unanimously.

ADMINISTRATIVE MATTERS

Election of Officers

Slate of Officers

NOMINATION: Paul Grebe nominated the 2024 slate of officers to continue in 2025. All officers accepted their nominations.

Tom Ryan, Executive Director, called for nominations three (3) times.

The Slate of Officers was elected by unanimous voice vote.

2025 ELECTION RESULTS	
Chairperson	Donald Borst
Vice Chairperson	Rachael Julson
Secretary	Timothy Szczykutowicz

Liaisons Appointments and Alternates

LIAISON APPOINTMENTS	
Credentialing Liaison(s)	Donald Borst *Alternate:* Timothy Szczykutowicz
Education and Examinations Liaison(s)	Donald Borst *Alternate:* Rachael Julson
Monitoring Liaison(s)	Donald Borst *Alternate:* Paul Grebe
Professional Assistance Procedure (PAP) Liaison(s)	Donald Borst *Alternate:* Paul Grebe
Legislative Liaison(s)	Donald Borst *Alternate:* Blas Berumen
Travel Authorization Liaison(s)	Donald Borst *Alternate:* Timothy Szczykutowicz
Practice Question Liaison(s)	Rachael Julson *Alternate:* Donald Borst
Website Liaison(s)	Donald Borst
Screening Panel	Donald Borst, Blas Berumen *Alternate:* Rachael Julson

Delegation of Authorities

Delegation to Department Attorneys to Approve Prior Discipline

MOTION: Donald Borst moved, seconded by Paul Grebe, to delegate authority to Department Attorneys to approve an applicant's prior professional discipline which resulted in a forfeiture/fine/other monetary penalty, remedial education, and/or reprimand, that is 10 years old or older, and the previously disciplined credential is currently in good standing. Motion carried unanimously.

Delegation to Handle Administrative Rule Matters

MOTION: Donald Borst moved, seconded by Timothy Szczykutowicz, to delegate authority to the Chairperson (or, in the absence of the Chairperson, the highest-ranking officer or longest serving Board member in that succession), to act on behalf of the Board regarding administrative rule matters between meetings. Motion carried unanimously.

Review and Approval of 2024 Delegations including new modifications

MOTION: Donald Borst moved, seconded by Blas Berumen, to reaffirm all delegation motions made in 2024, which were not otherwise modified or amended during the March 5, 2025, meeting. Motion carried unanimously.

ADMINISTRATIVE RULE MATTERS

Rule drafting for RAD 1, 2, and 4 for Definitions and Scope of Practice

MOTION: Paul Grebe moved, seconded by Blas Berumen, to authorize the Chair to approve the preliminary rule draft of rule RAD 1, 2, and 4 relating to Definitions and Scope of Practice for posting for Economic Impact Analysis comments and submittal to the Clearinghouse. Motion carried unanimously.

Rule drafting for RAD 1, 2, and 5 on License Requirements and Continuing Education

MOTION: Paul Grebe moved, seconded by Donald Borst, to authorize Timothy Szczykutowicz to work with DSPS staff on rule drafting for rule RAD 1, 2, and 5 relating to License Requirements and Continuing Education. Motion carried unanimously.

CLOSED SESSION

MOTION: Timothy Szczykutowicz moved, seconded by Paul Grebe, to convene to Closed Session to deliberate on cases following hearing (s. 19.85(1)(a), Stats.); to consider licensure or certification of individuals (s. 19.85(1)(b), Stats.); to consider closing disciplinary investigations with administrative warnings (s. 19.85(1)(b), and 440.205, Stats.); to consider individual histories or disciplinary data (s. 19.85(1)(f), Stats.); and to confer with legal counsel (s. 19.85(1)(g), Stats.). Donald Borst, Chairperson, read the language of the motion aloud for the record. The vote of each member was ascertained by voice vote. Roll Call Vote: Blas Berumen-yes; Donald Borst-yes; Paul Grebe-yes; and Timothy Szczykutowicz -yes. Motion carried unanimously.

The Board convened into Closed Session at 11:49 a.m.

DELIBERATION ON DIVISION OF LEGAL SERVICES AND COMPLIANCE MATTERS

Proposed Stipulation and Final Decision and Orders

MOTION: Blas Berumen moved, seconded by Timothy Szczykutowicz to adopt the Findings of Fact, Conclusions of Law and Order in the matter of disciplinary proceedings of the following cases:

1. 24 RAD 0005 – Kayla E. Olson
2. 24 RAD 0010 – Amy J. Kerr

Motion carried unanimously.

Administrative Warnings

24 RAD 0008 – J.G.J.

MOTION: Donald Borst moved, seconded by Paul Grebe, to issue an Administrative Warning in the matter of J.G.J., DLSC Case Number 24 RAD 0008. Motion carried unanimously.

RECONVENE TO OPEN SESSION

MOTION: Timothy Szczykutowicz moved, seconded by Paul Grebe, to reconvene in Open Session. Motion carried unanimously.

The Board reconvened in Open Session at 11:54 a.m.

VOTE ON ITEMS CONSIDERED OR DELIBERATED UPON IN CLOSED SESSION

MOTION: Timothy Szczykutowicz moved, seconded by Blas Berumen, to affirm all motions made and votes taken in Closed Session. Motion carried unanimously.

(Be advised that any recusals or abstentions reflected in the closed session motions stand for the purposes of the affirmation vote.)

ADJOURNMENT

MOTION: Paul Grebe moved, seconded by Blas Berumen, to adjourn the meeting. Motion carried unanimously.

The meeting adjourned at 11:55 a.m.

State of Wisconsin
Department of Safety & Professional Services

AGENDA REQUEST FORM

1) Name and title of person submitting the request:	2) Date when request submitted:
Jake Pelegrin **Administrative Rules Coordinator**	**6/19/25** Items will be considered late if submitted after 12:00 p.m. on the deadline date which is 8 business days before the meeting

3) Name of Board, Committee, Council, Sections:

Radiography Examining Board

4) Meeting Date:	5) Attachments:	6) How should the item be titled on the agenda page?
7/9/25	☒ Yes ☐ No	**9:30 AM Public Hearing on Rule CR 25-036, RAD 1, 2, and 4, relating to Definitions and Scope of Practice**

7) Place Item in:	8) Is an appearance before the Board being scheduled? *(If yes, please complete Appearance Request for Non-DSPS Staff)*	9) Name of Case Advisor(s), if required:
☒ Open Session ☐ Closed Session	☐ Yes ☒ No	**N/A**

10) **Describe the issue and action that should be addressed:** Attachments:

-Notice of Public Hearing

11) Authorization

Jake Pelegrin 6/19/25

Signature of person making this request **Date**

Supervisor (if required) **Date**

Executive Director signature (indicates approval to add post agenda deadline item to agenda) **Date**

Directions for including supporting documents:
1. This form should be attached to any documents submitted to the agenda.
2. Post Agenda Deadline items must be authorized by a Supervisor and the Policy Development Executive Director.
3. If necessary, provide original documents needing Board Chairperson signature to the Bureau Assistant prior to the start of a meeting.

Notice of Public Hearing

The Radiography Examining Board announces that it will hold a virtual public hearing on the rule revising RAD 1, 2, and 4, relating to Definitions and Scope of Practice, at the time and place shown below.

Hearing Information

Date: July 9, 2025

Time: 9:30 A.M.

Location: Information concerning the location of the hearing will be available at: https://dsps.wi.gov/Pages/BoardsCouncils/Radiography/Meetings.aspx

Appearances at the Hearing and Submittal of Written Comments

The rule may be reviewed and comments submitted at: http://docs.legis.wisconsin.gov/code/chr/hearings.

Comments may also be submitted to Jake Pelegrin, Administrative Rules Coordinator, Department of Safety and Professional Services, Division of Policy Development, P.O. Box 8366, Madison, WI 53708-8366, or by email to DSPSAdminRules@wisconsin.gov.

Comments must be received at or before the public hearing to be included in the record of rulemaking proceedings.

Initial Regulatory Flexibility Analysis

The proposed rule will is not expected to have an effect on small businesses, as defined under s. 227.114 (1), Stats.

Agency Small Business Regulatory Coordinator

The Department's Regulatory Review Coordinator may be contacted at Jennifer.Garrett@wisconsin.gov or by calling (608) 266-2112.

State of Wisconsin
Department of Safety & Professional Services

AGENDA REQUEST FORM

1) Name and title of person submitting the request:	2) Date when request submitted:
Jake Pelegrin **Administrative Rules Coordinator**	**6/19/25** **Items will be considered late if submitted after 12:00 p.m. on the deadline date which is 8 business days before the meeting**

3) Name of Board, Committee, Council, Sections:

Radiography Examining Board

4) Meeting Date:	5) Attachments:	6) How should the item be titled on the agenda page?
7/9/25	☒ Yes ☐ No	**Administrative Rule Matters – Discussion and Consideration** 1. Discussion of public comments and Clearinghouse comments for RAD 1, 2, and 4 on Definitions and Scope of Practice 2. Rule drafting for RAD 1, 2, and 5 on License Requirements and Continuing Education 3. Pending or possible rulemaking items

7) Place Item in:	8) Is an appearance before the Board being scheduled? *(If yes, please complete Appearance Request for Non-DSPS Staff)*	9) Name of Case Advisor(s), if required:
☒ Open Session ☐ Closed Session	☐ Yes ☒ No	**N/A**

10) **Describe the issue and action that should be addressed:** Attachments:

-Clearinghouse Report and final rule draft for RAD 1, 2, and 4
-Background materials and certification requirements for NMTCB and ARRT certifications

11) Authorization

Jake Pelegrin 6/19/25

Signature of person making this request **Date**

Supervisor (if required) **Date**

Executive Director signature (indicates approval to add post agenda deadline item to agenda) **Date**

Directions for including supporting documents:
1. This form should be attached to any documents submitted to the agenda.
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LCRC
FORM 2

Wisconsin Legislative Council

RULES CLEARINGHOUSE

Scott Grosz
Clearinghouse Director

Margit Kelley
Clearinghouse Assistant Director

Anne Sappenfield
Legislative Council Director

CLEARINGHOUSE REPORT TO AGENCY

[THIS REPORT HAS BEEN PREPARED PURSUANT TO S. 227.15, STATS. THIS IS A REPORT ON A RULE AS ORIGINALLY PROPOSED BY THE AGENCY; THE REPORT MAY NOT REFLECT THE FINAL CONTENT OF THE RULE IN FINAL DRAFT FORM AS IT WILL BE SUBMITTED TO THE LEGISLATURE. THIS REPORT CONSTITUTES A REVIEW OF, BUT NOT APPROVAL OR DISAPPROVAL OF, THE SUBSTANTIVE CONTENT AND TECHNICAL ACCURACY OF THE RULE.]

CLEARINGHOUSE RULE **25-036**

AN ORDER to create RAD 1.02 (3m), (13e), (13m), (13s), (15m), and (17), and 4.02 (3) and (4), relating to definitions and scope of practice.

Submitted by **RADIOGRAPHY EXAMINING BOARD**

05-09-2025 RECEIVED BY LEGISLATIVE COUNCIL.
06-04-2025 REPORT SENT TO AGENCY.

SG:PW

LEGISLATIVE COUNCIL RULES CLEARINGHOUSE REPORT

This rule has been reviewed by the Rules Clearinghouse. Based on that review, comments are reported as noted below:

1. STATUTORY AUTHORITY [s. 227.15 (2) (a)]

   Comment Attached YES ☐ NO ☑

2. FORM, STYLE AND PLACEMENT IN ADMINISTRATIVE CODE [s. 227.15 (2) (c)]

   Comment Attached YES ☑ NO ☐

3. CONFLICT WITH OR DUPLICATION OF EXISTING RULES [s. 227.15 (2) (d)]

   Comment Attached YES ☐ NO ☑

4. ADEQUACY OF REFERENCES TO RELATED STATUTES, RULES AND FORMS [s. 227.15 (2) (e)]

   Comment Attached YES ☐ NO ☑

5. CLARITY, GRAMMAR, PUNCTUATION AND USE OF PLAIN LANGUAGE [s. 227.15 (2) (f)]

   Comment Attached YES ☑ NO ☐

6. POTENTIAL CONFLICTS WITH, AND COMPARABILITY TO, RELATED FEDERAL REGULATIONS [s. 227.15 (2) (g)]

   Comment Attached YES ☐ NO ☑

7. COMPLIANCE WITH PERMIT ACTION DEADLINE REQUIREMENTS [s. 227.15 (2) (h)]

   Comment Attached YES ☐ NO ☑

Wisconsin Legislative Council
RULES CLEARINGHOUSE

Scott Grosz
Clearinghouse Director

Anne Sappenfield
Legislative Council Director

Margit Kelley
Clearinghouse Assistant Director

CLEARINGHOUSE RULE 25-036

Comments

[NOTE: All citations to "Manual" in the comments below are to the Administrative Rules Procedures Manual, prepared by the Legislative Council Staff and the Legislative Reference Bureau, dated November 2020.]

2. Form, Style and Placement in Administrative Code

a. In the rule summary's plain language analysis for the proposed rule, the proposed rule is described as adding "detail to the state's licensing requirements for the use of computed tomography and nuclear medicine". Would the proposed rule be better characterized as adding detail to the scopes of practice for a licensed radiographer and an LXMO permit holder rather than adding detail to the licensing requirements to become a radiographer or LXMO?

b. In s. RAD 4.02 (3), consider whether the second sentence should be included in the list of activities that are in the scope of practice of an LXMO in s. RAD 4.02 (2), rather than in its own subsection. It seems that the proposed s. RAD 4.02 (3) is intended to provide clarity about what is inside and outside the scope of LXMO practice with respect to computed tomography, but it only does so by reference to what activity requires a radiographer license. Do the activities described in the second sentence require an LXMO permit? If so, consider clarifying that requirement. For example, consider adding the following to s. RAD 4.02 (2): "Performing the aspects of computed tomography that do not involve applying x-rays to patients. The aspects of computed tomography that involve applying x-rays to patients are outside the scope of an LXMO". Also, if s. RAD 4.02 (3) is intended to expand the scope of radiographer practice, consider doing that more directly in s. RAD 4.01 (2).

c. The same questions in comment b., above, also apply to s. RAD 4.02 (4).

5. Clarity, Grammar, Punctuation and Use of Plain Language

a. In s. RAD 4.02 (3), consider changing "which" to "that" in both the first and second sentences. [s. 1.08 (1) (c), Manual.]

b. In s. RAD 4.02 (4), is the qualifier, "such as positron emission tomography", intended to expand this requirement to other examples of nuclear medicine? If so, consider whether it would be helpful to specifically list other items. If positron emission tomography is the sole example, consider removing this clause and instead creating a note highlighting that positron emission tomography, as defined in proposed s. RAD 1.02 (13s), qualifies for this provision.

STATE OF WISCONSIN
RADIOGRAPHY EXAMINING BOARD

IN THE MATTER OF RULEMAKING PROCEEDINGS BEFORE THE RADIOGRAPHY EXAMINING BOARD	:	PROPOSED ORDER OF THE RADIOGRAPHY EXAMINING BOARD ADOPTING RULES (CLEARINGHOUSE RULE 25-036)

PROPOSED ORDER

An order of the Radiography Examining Board to **create** RAD 1.02 (3m), (13e), (13m), (13s), (15m), and (17) and 4.02 (3) and (4) relating to Definitions and Scope of Practice.

Analysis prepared by the Department of Safety and Professional Services.

ANALYSIS

Statutes interpreted:

Section 462.06 (2), Stats.

Statutory authority:

Sections 15.08 (5) (b), 227.11 (2) (a), and 462.06 (2), Stats.

Explanation of agency authority:

Section 15.08 (5) (b), Stats., provides that each examining board "[s]hall promulgate rules for its own guidance and for the guidance of the trade or profession to which it pertains, and define and enforce professional conduct and unethical practices not inconsistent with the law relating to the particular trade or profession."

Section 227.11 (2) (a), Stats., provides that "Each agency may promulgate rules interpreting the provisions of any statute enforced or administered by the agency, if the agency considers it necessary to effectuate the purpose of the statute, but a rule is not valid if the rule exceeds the bounds of correct interpretation."

Section 462.06 (2), Stats.: "The board may promulgate rules that establish a code of ethics for persons who hold a license or limited X-ray machine operator permit under s. 462.03."

Related statute or rule:

None.

Plain language analysis:

The objective of the proposed rule is to clarify and add detail to the regulations on when a radiographer license is required for the use of various medical imaging technologies. Chapter RAD 1, Wis. Admin. Code, contains definitions for the radiography code, and chapter RAD 4 contains regulations on scope of practice for radiographers and limited X-ray machine operators. The proposed rule creates new definitions in chapter RAD 1 for various medical imaging technologies and technical terms in the field. In chapter RAD 4, the proposed rule creates new regulations that clarify and add detail to ~~the state's licensing requirements~~ a licensed radiographer's and limited x-ray machine operator's scope of practice ~~for~~ regarding the use of computed tomography and nuclear medicine. Performing the aspects of computed tomography which involve applying x-rays to patients requires a radiographer license. Performing nuclear medicine does not require a radiographer license if x-rays are applied only for the purpose of attenuation correction. A radiographer license is required if x-rays are applied for a purpose other than attenuation correction.

Summary of, and comparison with, existing or proposed federal regulation:

None.

Summary of public comments received on statement of scope and a description of how and to what extent those comments and feedback were taken into account in drafting the proposed rule:

None.

Comparison with rules in adjacent states:

Illinois:

Rules of the Illinois Emergency Management Agency provide for credentialling in the use of medical radiation technology in Illinois [32 Ill. Admin. Code 401]. These rules require the credentialling of any person who applies ionizing radiation to humans or who otherwise uses medical radiation technology, unless specifically exempted by their statutes and rules. This is a broad requirement and includes the disciplines of medical radiography, nuclear medicine ~~radiography, nuclear medicine~~ technology, radiation therapy technology, and chiropractic radiography. Their code is extremely comprehensive on this topic and provides definitions and regulations on these medical roles and many more. It also provides definitions and regulations on the different types of medical imaging technologies. Applicants can be credentialled in one or more of the following categories: Medical Radiography, Nuclear Medicine Technology, Radiation Therapy Technology, Chiropractic Radiography, Limited Diagnostic Radiography, Radiologist Assistant, and Nuclear Medicine Advanced Associate.

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Iowa:

641 IAC 42 requires credentialling of individuals who operate or use ionizing radiation producing machines or administer radioactive materials on or to human patients or human research subjects for diagnostic or therapeutic purposes. The code does provide exemptions for

licensed medical practitioners. Similar to Illinois, the code provides definitions for the various related medical imaging technologies and medical roles, such as computed tomography, nuclear medicine procedure, nuclear medicine technologist, PET/CT, radiation therapist, and others. It provides comprehensive regulations for licensees in the following categories: general radiologic technologist, general nuclear medicine technologist, radiation therapist, radiologist assistant, limited radiologic technologist, and X-ray equipment operator, and others.

Michigan:

The State of Michigan does not license operators of x-ray machines, nor does it have any requirements relative to the licensure or credentialing of x-ray machine operators except for operators of mammography machines (Mich Admin Code, R 333.5630) and CT machines (Mich Admin Code, R 325.5705). Mammographic examinations must be performed by a radiologic technologist who meets the requirements of 21 C.F.R. 900.12 (a) (2), "Radiologic technologists" (2000). CT examinations must be performed by a radiologic technologist who meets the Michigan code's licensing requirements or by a licensed physician or osteopathic physician.

Minnesota:

The Minnesota Statutes, Section 144.121 regulate the use of x-ray systems on living humans. To operate an X-ray system, individuals must have passed a national or state examination. These include the American Registry of Radiologic Technologists (ARRT) radiography examination, the American Chiropractic Registry of Radiologic Technologists examination, the ARRT radiation therapy examination, the Minnesota examination for limited scope x-ray operators, the Minnesota examination for bone densitometry equipment operators, or others. Cardiovascular technologists must be credentialed by Cardiovascular Credentialing International. Nuclear medicine technologists must be credentialed by the Nuclear Medicine Technology Certification Board, the ARRT for nuclear medicine technology, or the American Society of Clinical Pathologists. Minnesota also provides credentialling exemptions for licensed dental health practitioners and other health care practitioners.

Summary of factual data and analytical methodologies:

The proposed rules were developed by the Radiography Examining Board reviewing the current statutes and codes that regulate the use of medical imaging technologies and determining where more clarity and updates are needed in the code.

Analysis and supporting documents used to determine effect on small business or in preparation of economic impact analysis:

The proposed rules were posted for a period of 14 days to solicit public comment on the economic impact of the proposed rule, including how this proposed rule may affect businesses, local government units, and individuals. No comments were received.

Fiscal Estimate and Economic Impact Analysis:

The Fiscal Estimate and Economic Impact Analysis are attached.

Effect on small business:

These proposed rules are not expected to have an economic impact on small businesses, as defined in s. 227.114 (1), Stats. The Department's Regulatory Review Coordinator may be contacted at Jennifer.Garrett@wisconsin.gov or (608) 266-2112.

Agency contact person:

Jake Pelegrin, Administrative Rules Coordinator, Department of Safety and Professional Services, Division of Policy Development, P.O. Box 8366, Madison, Wisconsin 53708-8366; telephone 608-267-0989; email at DSPSAdminRules@wisconsin.gov.

Place where comments are to be submitted and deadline for submission:

Comments may be submitted to Jake Pelegrin, Administrative Rules Coordinator, Department of Safety and Professional Services, Division of Policy Development, 4822 Madison Yards Way, P.O. Box 8366, Madison, WI 53708-8366, or by email to DSPSAdminRules@wisconsin.gov. Comments must be received at or before the public hearing, scheduled for July 9, 2025, to be included in the record of rule-making proceedings.

TEXT OF RULE

SECTION 1. RAD 1.02 (3m) is created to read:

RAD 1.02 (3m) "Computed tomography" means the production of images by the acquisition and computer processing of x-ray transmission data.

SECTION 2. RAD 1.02 (13e) is created to read:

RAD 1.02 (13e) "Nuclear medicine" means the administration and detection of radiopharmaceuticals for diagnostic and therapeutic purposes.

SECTION 3. RAD 1.02 (13m) is created to read:

RAD 1.02 (13m) "PET-CT" means a hybrid nuclear medicine imaging technique that combines the use of positron emission tomography and attenuation correction.

SECTION 4. RAD 1.02 (13s) is created to read:

RAD 1.02 (13s) "Positron emission tomography" means a nuclear medicine imaging technique that produces a two-dimensional or three-dimensional image of functional processes in the body by detecting pairs of gamma rays emitted indirectly by a positron-emitting radionuclide.

SECTION 5. RAD 1.02 (15m) is created to read:

RAD 1.02 (15m) "SPECT-CT" means a hybrid nuclear medicine imaging technique that combines the use of single-photon emission tomography and attenuation correction.

SECTION 6. RAD 1.02 (17) is created to read:

RAD 1.02 (17) "X-ray" means a type of electromagnetic radiation with wavelengths shorter than those of ultraviolet rays and longer than those of gamma rays.

SECTION 7. RAD 4.02 (3) and (4) are created to read:

RAD 4.02 (3) COMPUTED TOMOGRAPHY. Performing the aspects of computed tomography ~~which~~ that involve applying x-rays to patients requires a radiographer license or LXMO permit. Performing the aspects of computed tomography ~~which~~ that do not involve applying x-rays to patients does not require a radiographer license or LXMO permit.

RAD 4.02 (4) NUCLEAR MEDICINE. **(a)** Performing nuclear medicine without the use of x-rays, such as positron emission tomography, does not require a radiographer license or LXMO permit.

Note: Positron emission tomography is an example of a nuclear medicine procedure that does not use x-rays.

Clearinghouse comment #5b. Are there other examples of nuclear medicine procedures that do not use x-rays? If not, we should probably delete the "such as positron emission tomography" above and keep the note, which basically says the same thing.

(b) Performing PET-CT or SPECT-CT does not require a radiographer license or LXMO permit if x-rays are applied only for the purpose of attenuation correction. A radiographer license or LXMO permit is required if x-rays are applied for a purpose other than attenuation correction.

(c) Performing nuclear medicine does not require a radiographer license or LXMO permit if x-rays are applied only for the purpose of attenuation correction. A radiographer license or LXMO permit is required if x-rays are applied for a purpose other than attenuation correction.

SECTION 8. EFFECTIVE DATE. The rules adopted in this order shall take effect on the first day of the month following publication in the Wisconsin Administrative Register, pursuant to s. 227.22 (2) (intro.), Stats.

(END OF TEXT OF RULE)

This Proposed Order of the Radiography Examining Board is approved for submission to the Governor and Legislature.

Dated Agency

Chairperson

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Overall guidance for the board as we look into these materials:

The biggest thing that stands out to me about the NMTCB is that they take their certifications very seriously, and have a lot of rigorous requirements that certificants have to meet. The certifications they offer are:

- **CNMT - Certified Nuclear Medicine Technologist Certification**
- **NMTCB(CT) – Computed Tomography Certification**
- **NMTCB(RS) – Radiation Safety Certification**
- **NCT – Nuclear Cardiology Technologist Certification**
- **PET – Positron Emission Technology Certification**
- **NMAA – Nuclear Medicine Advanced Associate Certification**

It looks like the CNMT is the "core certification", as a Certified Nuclear Medicine Technologist, and you need to have this certification to get the additional (CT) or (RS) certification.

For our purposes, it looks to me like the NMTCB(RS) (Radiation Safety) certification is the one that could come closest to covering the scope of practice of a radiographer for Wisconsin. This is the main question the board has to answer: do you think any of these certifications provide adequate education and training to cover the scope of practice of a radiographer here in Wisconsin? This is a slightly different question than asking if the NMTCB certification is equivalent to the ARRT certification. However, answering the second question can definitely be helpful for the board in answering the first question. Tim and I have provided materials as such, outlined below:

1 – Background information from the NMTCB website on the CNMT certification (core certification), additional Radiation Safety certification, and additional CT certification. Nuclear Medicine Technology Certification Board | NMTCB (www.nmtcb.org)

2 – An exam outline for the CNMT Certification Examination (core certification)

3 - An exam outline for the additional Radiation Safety certification

4 – The attestation form for Radiation Safety tasks practical experience

5 – Background information from the ARRT website on the ARRT certification requirements

6 – An exam outline for the ARRT Radiographer exam

7 – Excerpts from Wisconsin Radiography code - the scope of practice of a radiographer and LXMO

NMTCB offers multiple professional certification programs for technologists to enter and advance in the nuclear medicine and molecular imaging professions. Individuals who successfully pass the NMTCB's certification examination and maintain an active certification may use the abbreviations below to indicate their specific credential(s):

CNMT - Certified Nuclear Medicine Technologist Certification
NMTCB(CT) – Computed Tomography Certification
NMTCB(RS) – Radiation Safety Certification
NCT – Nuclear Cardiology Technologist Certification
PET – Positron Emission Technology Certification
NMAA – Nuclear Medicine Advanced Associate Certification

All eligibility standards required to sit for the entry-level examination must be completed within the 5 year period immediately after the candidate's program completion. A candidate must show documented evidence of having completed ONE of the following in the previous five years:

Completion of a NMTCB recognized nuclear medicine technology program (https://www.nmtcb.org/exams/nuclear-medicine/schools)

Completion of an accredited nuclear medicine technology program culminating in a Certificate, Associate, Baccalaureate, or Master's degree. Educational programs must have structured clinical training sufficient to provide clinical competency in radiation safety, instrumentation, clinical procedures, and radiopharmacy.

The NMTCB currently recognizes the following organizations responsible for programmatic oversight:

Joint Review Committee on Educational Programs in Nuclear Medicine Technology (JRCNMT)
Armed Forces Military Training Commands

Canadian Association of Medical Radiation Technologists (CAMRT)
Australian and New Zealand Society of Nuclear Medicine (ANZSNM)

Why should I consider becoming certified?

Certification demonstrates mastery of a body of knowledge. That body of knowledge includes the concepts that allow technologist to evaluate, adapt and identify problems, and solve them. Obtaining your certification is the final step to becoming a nuclear medicine technologist who is recognized as having the knowledge necessary to perform all routine tasks and patient care in the nuclear medicine department with insight and understanding. NMTCB's nuclear medicine certification exam is written by experts in the field for that specific purpose. NMTCB's entry level examination is a national standard recognized by the States, employers, insurance companies, those agencies that certify advanced medical imaging services (such as the IAC, ACR and The Joint Commission), professional organizations, and others as a valid, high-quality certification exam. Many states already require certification and/or licensure for nuclear medicine technologists. In many other states certification is optional, but it is likely that certification will eventually become mandatory. Employment opportunities as a technologist may be jeopardized by not obtaining and maintaining Active certification status.

A NMTCB certified technologist must do three things in order to maintain an active certification once they have passed the examination:
(1) Complete an annual renewal statement that includes answering required ethics questions.
(2) Comply with the NMTCB Continuing Competence policy, including by not limited to, obtaining 24 hours of acceptable Continuing Education credits every two years.
(3) Pay an Annual Renewal Fee.

Examinations

NMTCB offers multiple professional certification programs for technologists to enter and advance in the nuclear medicine and molecular imaging professions. Individuals who successfully pass the NMTCB's certification examination and maintain an active certification may use the abbreviations below to indicate their specific credential(s):

- **CNMT** - Certified Nuclear Medicine Technologist Certification
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- **NCT** – Nuclear Cardiology Technologist Certification
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- **NMAA** – Nuclear Medicine Advanced Associate Certification

Nuclear Medicine Exam

- Online Application & Instructions for Program Graduates
- Pre-Application Review Process
- Exam Preparation
    - Sample Exam Questions
    - Components of Preparedness 2024 - In effect September 1, 2024
    - CNMT Job Task Analysis Report 2017
    - CNMT Job Task Analysis Report 2023
- Computer Adaptive Tests
- Nuclear Medicine Schools
- Didactic Education Definitions
- Didactic Education Resources
- Nuclear Medicine Exam Annual Reports

Radiation Safety Exam

- Radiation Safety Exam Information
- Radiation Safety Content Outline

CT Exam

- CT Exam Information
- Exam Preparation
    - CT Exam Content Outline
    - NMTCB(CT) Job Task Analysis Report 2020
- CT Didactic Resources
- CT Exam Annual Reports
- CT Exam Application (Online Only)

PET Specialty Exam

- PET Exam Information
- PET Content Outline 2023 - In effect December 1, 2023
- PET Didactic Resources

NCT Specialty Exam

- NCT Exam Information
- NCT Content Outline 2023 - In effect October 1, 2023

NMAA Exam

- NMAA Exam Information and Application

Program Graduate Application Instructions - Nuclear Medicine - Exams | NMTCB

A candidate for the NMTCB's Radiation Safety examination must show documented evidence of having:

1. An active nuclear medicine technology certification (NMTCB, ARRT(N), CAMRT(N)) or an active CAMRT(RT),CAMRT(RTT), ARRT(R) or ARRT(T) certification for a minimum of two (2) years.
2. Documented experience performing tasks directly associated with radiation safety over a minimum period of 1 calendar year. **Applicant must download and complete the NMTCB(RS) Radiation Safety Tasks Attestation Form.**

Nuclear Medicine Technology Certification Board

CNMT Certification Examination Content Outline

Components of Preparedness

Domain I: Radiation Physics & Detection – 7%
Domain II: Radiation Safety & Regulations – 13%
Domain III: Pharmaceutical & Radiopharmaceutical Agents – 25%
Domain IV: Instrument Operations & Quality Control – 15%
Domain V: Clinical Procedures – 40%

I. Radiation Physics and Detection 7%

A. Understand the fundamentals of radiation physics and detection

1. Physical properties
   a. Radioactive materials
      i. Isotopes and their properties (e.g., half-life, energy)
      ii. Modes of decay (e.g., gamma emitters, beta emitters, alpha emitters, positron emitters)
   b. X-ray production
      i. Bremsstrahlung
      ii. Characteristic x-ray
2. Decay calculations and Counting statistics
3. Interactions of radiation with matter
   a. Compton scatter
   b. Photoelectric effect
4. Radiation detector types and basic principles
   a. NaI well
   b. Ion chamber
   c. Solid state detector
   d. GM meter

II. Radiation Safety and Regulations 13%

A. Identify biological effects of radiation exposure

1. Deterministic (e.g., due to amount, radiation burns)
2. Stochastic (e.g., cancer)
3. Exposure
   a. Patient (e.g., imaging, treatment, diagnostic)
   b. Technologist (e.g., imaging, treatment, diagnostic)
4. Short-term vs Long-term effects of radiation
5. Radiosensitivity (e.g., effects on the cell)

B. Recognize protection techniques and calculations

1. ALARA
   a. Time
   b. Distance (inverse square law)
   c. Shielding (shielding equations)

C. Perform survey protocols and requirements (e.g., timing and frequency)

1. Radiation surveys (area monitoring) including:
   a. Survey meters and well counters
   b. Choice of radiation detection devices (e.g., Geiger Counters, sodium iodide detectors)
   c. Frequency of surveys
   d. Trigger limits of surveys
2. Personal monitoring devices
   a. Types (e.g., ring badge vs collar badge)
   b. Dosimeter report
   c. Declaration of pregnancy
3. Personal protective equipment (e.g., lab coat, gloves, syringe shields)
4. Effective dose equivalent limits for:
   a. Radiation workers
   b. Declared pregnant radiation workers
   c. General public

D. Comply with Nuclear Regulatory Commission (NRC) Regulations

1. Posted warnings and informational signs delineating restricted and unrestricted areas
2. Surveying and inventorying radioactive materials
3. Adverse event response
   a. Trigger levels and monitoring methods
   b. Radiation exposure
   c. Radiation spills (e.g., major vs minor)
   d. Protection during adverse events
   e. Personnel, patient and/or public decontamination
   f. Area/equipment decontamination
   g. Recordable and reportable events
4. Adherence to radioactive waste storage requirements
5. Radioactive material disposal (e.g., liquids, solids, gasses, contaminated materials)
6. Record maintenance
   a. Receipt, storage, and disposal of radioactive materials
   b. Radiation monitoring and reporting
   c. Equipment calibration and maintenance
   d. Staff, patient, occupational and public exposure
   e. Nuclear medicine diagnostic and therapeutic procedures
   f. Leak test
7. Written directives
8. Shipping and Packaging Regulations
   a. Department of Transportation (DOT)
   b. Types of shielding containers

c. Label requirements (e.g., transportation index, name, concentration, expiration date/time, total activity, assay date/time, limits)
d. Types of packages (e.g., exempt, non-exempt)
e. Package monitoring/receiving/returning

E. Comply with Other Regulations and Guidelines

1. Environmental Protection Agency (EPA)
2. Occupational Safety and Health Administration (OSHA)
3. Health and Human Services (HHS)/Health Insurance Portability and Accountability Act (HIPAA)
   a. Protecting patient rights and privacy
   b. Maintaining patient records
   c. Releasing information to authorized parties
4. Food and Drug Administration (FDA)
5. United States Pharmacopeia (USP)
   a. USP<797>
   b. USP<825>
6. Institutional and Departmental Accreditation Organizations (e.g., SOP documents)

III. Pharmaceutical and Radiopharmaceutical Agents 25%

A. Elute radionuclide generator, perform, and evaluate quality control tests

1. Types of generators (e.g., 99Mo/99mTc, 82Sr/82Rb)
   a. Transient and secular
   b. Eluate
   c. Generator yield – volume and activity
   d. Quality control procedures
      i. Radionuclidic breakthrough (e.g., 99Mo breakthrough)
      ii. Chemical (e.g., Al+3 breakthrough)
2. Dose calibrator operation /units of radioactivity

B. Prepare radiopharmaceutical kits, perform quality control, and evaluate results

1. Radiopharmaceutical kits
   a. Preparation techniques
   b. Activity and volume limitations
   c. Activity calculations
   d. Particle size and number (e.g., MAA kit)
2. Radiopharmaceutical quality control
   a. Visual inspection - color and clarity
   b. Radiochemical purity (e.g., ITLC)
3. Labeling kits
4. Storage of kits before and after reconstitution
   a. Expiration
   b. Temperature requirements

C. Understand the characteristics (i.e., mechanism of localization), indications, contraindications, and administration of diagnostic radiopharmaceuticals

1. Tc-99m labeled radiopharmaceuticals
   a. Tc-99m sodium pertechnetate

b. Tc-99m oxidronate/HDP
c. Tc-99m medronate/MDP
d. Tc-99m pentetate/DTPA
e. Tc-99m macroaggregated albumin/MAA
f. Tc-99m sulfur colloid (e.g., filtered, unfiltered)
g. Tc-99m mebrofenin (Choletec®)
h. Tc-99m mertiatide/MAG3®
i. Tc-99m pyrophosphate/PYP
j. Tc-99m sestamibi/MIBI (Cardiolite®)
k. Tc-99m tetrofosmin (Myoview®)
l. Tc-99m succimer/DMSA (Nephroscan®)
m. Tc-99m exametazime/HMPAO (Ceretec®)
n. Tc-99m bicisate/ECD (Neurolite®)
o. Tc-99m labeled RBCs (UltraTag®/PYP)
p. Tc-99m HMPAO tagged WBCs
q. Tc-99m tilmanocept (Lymphoseek®)

2. Iodine labeled radiopharmaceuticals
   a. I-123 sodium iodide
   b. I-131 sodium iodide
   c. I-123 Iobenguane (MIBG) (AdreView®)
   d. I-123 Ioflupane (DaTscan®)
3. Indium labeled radiopharmaceuticals
   a. In-111 chloride
   b. In-111 oxine labeled WBCs
   c. In-111 pentetate (DTPA)
   d. In-111 pentetreotide (Octreoscan®)
4. Miscellaneous diagnostic radiopharmaceuticals
   a. Ga-67 gallium citrate
   b. Tl-201 thallous chloride
   c. Xe-133 gas
5. Positron Emission Tomography
   a. Cu-64 Dotatate (Detectnet®)
   b. F-18 FDG
   c. F-18 Florbetaben (Neuraceq®)
   d. F-18 Florbetapir (Amyvid®)
   e. F-18 Flutemetamol (Vizamyl®)
   f. F-18 Sodium Fluoride (NaF)
   g. F-18 Fluciclovine (Axumin®)
   h. F-18 Flortaucipir (Tauvid®)
   i. F-18 Piflufolastat (Pylarify®)
   j. F-18 Fluorodopa
   k. F-18 Fluoroestradiol (Cerianna®)
   l. Ga-68 Dotatate (Netspot®)
   m. Ga-68 Dotatoc
   n. Ga-68 Gozetotide (Illuccix®, Locametz®)

o. N-13 ammonia
p. Rb-82 chloride (Rubyfill®, Cardiogen®)

D. Understand the characteristics (i.e., mechanism of localization), indications, contraindications, and administration of therapeutic radiopharmaceuticals

1. I-131 sodium iodide
2. Lu-177 dotatate (Lutathera®)
3. Lu-177 Vipivotide tetraxetan (Pluvicto®)
4. Ra-223 Radium dichloride (Xofigo®)
5. Sr-89 chloride (Metastron®)
6. Y-90 microspheres (SIR-Spheres®, TheraSphere®)

E. Understand the indications, contraindications, and administration of interventional and adjunct pharmaceutical agents used in conjunction with nuclear medicine procedures

1. Dipyridamole (Persantine®)
2. Adenosine
3. Dobutamine
4. Aminophylline
5. Regadenoson (Lexiscan®)
6. Captopril
7. Enalaprilat
8. Furosemide (Lasix®)
9. Insulin
10. Acetazolamide (Diamox®)
11. Cholecystokinin/ sincalide/CCK
12. Morphine
13. Cimetidine/famotidine
14. ACD solution
15. Heparin
16. Contrast media (oral and IV)
17. Lugol's solution/SSKI
18. Thyroid Stimulating Hormone (TSH)
19. Lidocaine
20. Lidocaine (EMLA®) cream
21. Atropine
22. Recombinant human TSH (Thyrogen®)
23. Amino acids (e.g., lys-arg)
24. Zofran/Emend
25. Beta blockers (e.g., Metoprolol)
26. Boost®/Ensure®

F. Radiolabel blood components with radiopharmaceutical according to protocol

1. Labeling procedures
   a. Required lab equipment and supplies
   b. Anticoagulants and other additives
   c. Chemical reactions
   d. Cell washing
   e. Required radiopharmaceuticals

f. Method (e.g., in vivo, in vitro)

2. Calculation of labeling efficiency and administered dosage
3. Reinjection patient and sample verification

G. Administer radiopharmaceuticals and non-radioactive agents

1. Administration routes (e.g., IV, oral, intrathecal)
2. Administration techniques (e.g., bolus, infusion, aseptic)

IV. Instrument Operations and Quality Control 15%

A. Operate Non-imaging equipment and components

1. Quality control and calibration for well counters and probes
   a. Quality control and calibration for the sodium iodide scintillation detector
   b. Gamma ray spectra and pulse height analysis
   c. Formulas (e.g., energy resolution, sensitivity, Chi-square statistics)
2. Operational status of survey meter
   a. Survey meter operations and components
   b. Survey meter quality control and calibration
3. Dose calibrator constancy, accuracy, linearity, and geometry tests

B. Operate Imaging equipment and components

1. Gamma Camera quality control
   a. Uniformity
   b. Spatial resolution and linearity
   c. Visual image quality
   d. Phantoms
   e. Artifacts
   f. System sensitivity
   g. Pulse height analysis
2. SPECT and SPECT/CT imaging system
   a. Attenuation correction
   b. SPECT camera quality control
      i. Center of rotation
      ii. Field uniformity requirements
      iii. Pixel calibration
      iv. 3-D uniformity and resolution (e.g., Jaszczak phantom)
      v. Artifacts
3. PET and PET/CT imaging systems
   a. Application of attenuation corrections
   b. PET quality control (e.g., daily blank scan, normalization scan, 2-D/3- D well counter, artifacts)
4. CT imaging systems
   a. Co-registration of images
   b. CT quality control (e.g., contrast and spatial resolution, noise, uniformity, artifacts)
   c. Safety alerts (e.g., pre-scan notification)
5. Computer equipment (e.g., monitors, matrix sizes, printers)
6. Networking and information systems (e.g., PACS and RIS)

C. Operate Auxiliary equipment

1. Laboratory equipment (e.g., pipette, fume hoods)
2. Patient care equipment
   a. Intravenous infusion pump
   b. ECG monitor
   c. Pulse oximeter
   d. Defibrillator
   e. Glucose meter
   f. Blood pressure equipment
   g. Oxygen delivery equipment
   h. Patient lifts
   i. Lateral transfer equipment
3. Non-imaging equipment
   a. Xenon delivery system and trap
   b. Aerosol delivery system
   c. Treadmill
   d. Liquid scintillation counter
   e. Rb delivery system (e.g. Rubyfill®, Cardiogen®)

V. Clinical Procedures and Therapies 40%

A. Perform nuclear medicine procedures

1. Pulmonary
   a. Radioaerosol ventilation
   b. Gas ventilation
   c. Perfusion
      i. SPECT
      ii. SPECT/CT
   d. Perfusion/Ventilation quantitation
2. Bone/Musculoskeletal scans
   a. Limited
   b. Whole-body
   c. 3-phase
   d. 4-phase
   e. SPECT
   f. SPECT/CT
   g. NaF PET
3. Oncology
   a. Ga-67 tumor imaging, planar and/or SPECT
   b. SPECT/CT
   c. Peptide imaging
   d. Molecular breast imaging
   e. Lymphoscintigraphy/sentinel lymph node localization
   f. Tumor imaging, PET
      i. Melanoma (e.g., whole body)
      ii. PSMA

iii. Neuroendocrine
iv. Neurology
v. General (e.g., skull-base to mid-thigh)

g. Neuroendocrine tumor imaging

4. Infection
   a. Ga-67 infection imaging
   b. Tagged WBC imaging
5. Renal/Genitourinary
   a. Cystogram, direct
   b. Effective renal plasma flow (ERPF)
   c. Glomerular filtration rate (GFR) imaging
   d. Glomerular filtration rate (GFR) non-imaging
   e. Renal anatomy, planar, SPECT (e.g., DMSA)
   f. Renal flow
   g. Renogram (Lasix®)
   h. Renogram with ACE inhibitors
6. Endocrine
   a. Adrenal imaging
   b. Parathyroid imaging, planar and SPECT
   c. SPECT/CT
   d. Thyroid imaging
   e. Thyroid uptake
   f. Whole body survey for thyroid metastases
7. Hematopoietic
   a. Bone marrow imaging
8. Cardiovascular
   a. Myocardial perfusion, planar
   b. Myocardial perfusion (gated and non-gated)
      i. SPECT (e.g., supine, prone)
      ii. SPECT/CT
      iii. CT attenuation
      iv. PET
   c. Cardiac sarcoidosis
      i. PET
   d. First pass for EF and wall motion
   e. Gated cardiac blood pool, rest
   f. Gated cardiac blood pool, stress
   g. Gated cardiac blood pool, SPECT
   h. Cardiac shunt
   i. Cardiac Amyloidosis
   j. MIBG
   k. Myocardial viability
      i. Thallium
      ii. FDG
9. Gastrointestinal

a. Gastric emptying (liquid/solid)
b. Gastroesophageal reflux
c. Gastrointestinal bleeding
d. Hemangioma
e. Hepatobiliary with and without GBEF
f. Liver-lung shunt mapping (arterial)
g. Liver-spleen imaging, planar and SPECT
h. SPECT/CT
i. Meckel's diverticulum

10. Central Nervous System
a. Brain flow, brain death
b. Brain imaging, planar and SPECT
i. Brain perfusion SPECT (Acetazolamide)
ii. Viability SPECT
iii. Tumor SPECT
c. SPECT/CT
d. Dopamine transporter DaTscan®
e. Cisternogram
f. CSF leak
g. CSF shunt patency
h. Amyloid
i. Ictal and interictal (e.g., SPECT/planar, PET)

11. Radionuclide Therapy
a. I-131 sodium iodide for ablation
b. I-131 sodium iodide for hyperthyroid
c. Lu-177 Dotatate (Lutathera®)
d. Lu-177 PSMA (Pluvicto®)
e. Ra-223 Dichloride (Xofigo®)
f. Sr-89 Chloride (Metastron®)
g. Y-90 labeled microspheres

12. CT Imaging Procedures
a. Attenuation correction
b. Anatomical localization
c. Diagnostic vs non-diagnostic

B. Schedule patient studies

1. Camera duration
2. Multiple radionuclide procedures for a single patient
3. Same-day multiple modality procedures for a single patient

C. Procure supply of radiopharmaceuticals

1. License parameters and limits (i.e., Institutional)
2. Reconciliation of schedule with radiopharmaceutical/adjunct pharmaceutical procurement

D. Educate patient, family, and personnel

1. Procedures
2. Precautions

3. Restrictions
4. Release criteria (e.g., inpatient, travel, therapy)
5. Consent (e.g., written and verbal)

E. Obtain patient information and provide patient care

1. Patient information and privacy (e.g., Healthcare Insurance Portability and Accountability Act (HIPAA))
2. Basic patient care (e.g., vital signs, basic first aid, infection control)
3. Patient transferring techniques
4. Patient support devices (e.g., Foley catheter and drainage bag)
5. Patient identification (e.g., armband, verbal, scan)
6. Orders for study
7. Pre-examination screening
   a. Patient preparations and contraindications
   b. Medical history
   c. Current medications
   d. Allergic and adverse reaction history
   e. Review relevant lab values
8. Informed consent
9. Disposal of supplies and biohazardous material
10. Emergency procedures (e.g., fainting, seizure, cardiopulmonary arrest)
11. Post-procedure assessment

F. Select and administer prescribed radiopharmaceuticals

1. Patient/ radiopharmaceutical reconciliation
2. Calculation of appropriate volume to deliver prescribed dosage when needed
3. Radiopharmaceutical administration using appropriate route and technique

G. Prepare equipment and perform examinations

1. Patient positioning (e.g., anatomical markers, immobilization techniques)
2. Imaging parameters for data acquisition

H. Evaluate image quality

1. Normal and abnormal scan patterns
2. Artifacts and causes
3. Co-registration of images (SPECT/CT and PET/CT)
4. Study repetition and additional views

I. Perform image processing

1. Data storage, transfer, and retrieval
2. Image formation (e.g., static, dynamic, gating, list mode)
3. Image reconstruction (e.g., SPECT, PET/CT)
4. Image enhancement (e.g., filters, matrix, intensity)
5. Quantitative analysis
   a. Regions of interest and quantification
   b. Curve generation and analysis
   c. Image normalization and subtraction
6. Display formatting (image size, number of images, intensity adjustments)

J. Prepare/perform stress testing

1. Basic electrocardiography (ECG) (e.g., cardiac monitoring)

a. Cardiac conduction system
b. Components of a normal ECG wave form
c. Recognizing and responding to changes on a resting or stress ECG

2. ECG lead placements
3. Treadmill stress techniques (e.g., Bruce and modified Bruce) and bicycle stress techniques
   a. Contraindications
   b. Duration/termination parameters
4. Pharmacological stress protocols
   a. Contraindications
   b. Timing of pharmacological stress agent
   c. Timing of radiopharmaceutical injection
   d. Duration/termination parameters
   e. Drug side-effects and appropriate treatment
   f. Reversal agents and techniques

K. Obtain samples and/or data for non-imaging studies

1. Data specimen collection techniques, including timing, methods, containers, and storage
2. Background correction
3. External counting techniques

L. Evaluate the results of non-imaging studies

1. Error analysis
2. Calculations

M. Administer radiopharmaceutical therapies

1. Isolation room requirements
2. Surveys
3. Inpatient vs outpatient
4. Storage and waste disposal
5. Documentation and record keeping
6. Post-therapy scanning
7. Dosimetry

NMTCB RADIATION SAFETY
CERTIFICATION EXAMINATION
CONTENT OUTLINE

I. Content Pertaining to a RAM License: **(Expertise Area)**

A. Radiation physics and instrumentation

1. Basic radiation physics

   - atomic structure
   - definitions – radiation, radioactivity, half life
   - modes of radioactive decay
   - units and quantities of radioactivity
   - decay calculations
   - interactions of radiation with matter

2. Radiation detection and measurement
   - detector types and uses (survey meters, dose calibrator, well counters, probes, gamma camera, PET Scanner)
   - Detector / Instrument Selection
     - Detection efficiency
     - Energy Response
   - statistics of counting
   - detector use, calibration, quality control requirements and regulations

3. Production of Radionuclides
   - reactors (basic principles and radionuclides)
   - accelerators (basic principles and radionuclides)
   - generators (column breakthrough limits, shielding, proper disposal)
     - ^{99}Mo/^{99m}Tc generator (LEU & HEU)
     - ^{82}Sr/^{82}Rb generator
     - ^{68}Ge/^{68}Ga generator
     - Others

4. Production of x-rays

B. Radiation dosimetry

1. Units of radiation exposure and dose – US and SI (definitions and conversions)
2. Personal monitoring devices
3. Bioassays

4. Area monitoring – room surveys
5. Effluent Monitoring
   - Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage
6. Sealed source monitoring
7. Basic concept of MIRD

C. Radiation protection and ALARA

1. Time, distance and shielding
2. Regulations – personnel and the general public
3. Dose and exposure Limits
   - Radiation workers
   - Pregnant radiation workers
   - The public
4. Personnel monitoring and records
   - Periodic review and annual reports
   - Employer responsibilities
   - Action limits and notifications level
   - Lead apron inspection and inventory
   - Dosimeter badge types (assigned badge position, electronic dosimeters, EDE1, EDE2, Webster, etc)
   - SDE, DDE, LDE, TEDE, Extremities
5. Restricted and unrestricted areas (definitions and sign posting)
6. Work place rules – best practices
7. ALARA philosophy
8. Patient radiation safety & instructions
   - Factors affecting patient dose
   - Pregnancy and breast feeding
   - Patient release rule and underlying theory

D. Mathematics pertaining to the use and measurement of radioactivity

1. Decay equation & tables
2. Counter efficiency / cpm to dpm
3. Exposure calculations based on time, distance and shielding
   - Time
   - Distance – inverse square law
   - HVL definition, concept and calculation
4. Effective Half Life
5. Dose calibrator tests
   - Accuracy Test (percentage error calculations)

- Geometry
- Constancy
- Linearity
- Measurement of betas

Energy resolution calculation and window setting

E. Radiation biology

F. Security and control of radioactive materials

1. Room security and access
2. Signs & Sign Posting
3. Proper storage and shielding
4. Inventory and record keeping
5. Security of a “spill area”

G. Shipping & receiving of radioactive materials *(air and ground)*

1. Related radiation surveys and records
2. Regulations
3. Package labeling
4. Internal Transport of Radiation within the facility

H. Disposal of byproduct material (and all required records)

1. General trash
2. Sewer
3. Biohazard trash
4. Decay in storage
5. Return to the manufacturer
6. Shipment for offsite disposal

I. Administrative controls to avoid a medical event

J. Emergency procedures

1. Major and minor spill – definitions and procedures
2. Lost or stolen radioactive source
3. Medical event – definitions and procedures
4. Radio-iodine therapy patient (or other therapy patient) requiring emergency care
5. Death of therapy patient (soon after therapy)
6. Community radiation emergency response.

K. Regulations & resources

1. License requirements, applications and amendments
   - Facility design shielding requirements
   - Broad scope / limited scope
2. Agreement and non-agreement states
3. Authorized user, training / experience requirements
4. NRC Regulations:

-NRC Title **10CFR19** Notices, Instructions and Reports to Workers)
-NRC Title **10CFR20** (Standards for Protection Against Radiation)
-NRC Title **10CFR35** (Medical Use of Byproduct Material)
-NRC Title **10CFR71** (Transportation of Radioactive Materials)

5. Department of Transportation Regulations

-Title 49CFR170 (Hazardous Materials)
-Training requirements for medical licenses
-White I, Yellow II, Yellow III, UN2910, UN2908, TI
-Exempt quantities and limited quantities

6. Other agencies

-Environmental Protection Agency (EPA)
-FDA CDRH

L. Radionuclide therapy best practices

1. Radio-iodine therapy
   - Handling of doses
   - Patients receiving less than 33 mCi
     - Inpatients – instructions for patients and nursing staff
     - Outpatients – instructions for patients and family members
   - Patients receiving more than 33 mCi
     - Regulatory requirements for hospitalization and release from the hospital
     - Room preparation and cleanup for hospitalized patients
     - Inpatients – instructions for patients and nursing staff
     - Outpatients – instructions for patients and family members
   - Storage and disposal of radio-iodine waste
2. Emergency care of radio-iodine therapy patients
3. Other radionuclide therapy (with P-32, Sr-89, Sm153, Ra-223, Lu-177)
4. Brachytherapy

M. Reference Documents: NUREG 1556 – Volume 9 and 10 CFR Part 37

II. Content Pertaining to CT: **(Expertise Area)**

A. CT Basics and Physics

1. Production of x-rays
2. X-ray detection
3. Shielding of poly-energetic beams
4. Scan Mode
   - Helical
   - Axial
5. MDCT/Single slice/CBCT

6. AEC Tube current modulation
7. CT scatter iso-dose map application
8. Reconstruction methods- filter back projection, iterative

B. CT Dose Metrics
   1. CTDI
   2. DLP
   3. Effective Dose
   4. SSDE Size Specific Dose Estimate

C. CTDI Diagnostic Reference Levels
   1. ACR values
      - Adult
      - Pediatric
   2. NCRP Report 172
   3. CRCPD NEXT Data
   4. CTDI Phantom size

D. Dose optimization
   - Protocol review
   - With or without contrast use

E. Radiation Dose Management
   1. Equipment Factors
      - kVp
      - mA
        - Fixed mAs
        - Tube current modulated mAs
      - Rotation time
      - Slice thickness
      - Pitch
      - Beam collimation
      - Resolution settings
      - Scan lengths
      - Bolus tracking
      - Delayed scans
      - Repeat scans

   2. Patient Factors
      - Body Habitus
      - Centering
      - Motion
      - General patient positioning
      - Increased attenuation

   3. Other Factors
      - Patient Shielding

- Holding patients
- Facility Shielding
- PPE for staff
- CT Fluoro

F. Deterministic vs. Stochastic Effects

G. High Radiation Dose CT Settings
   - CT Brain Perfusion, CT Fluoro, Bolus tracking

III. Content Pertaining to X-ray & Fluoroscopy (Competence but not expertise)

A. X-ray and Fluoroscopy Physics
   1. Production of X-rays
   2. Detection of X-rays
   3. Fluoroscopy Units
      - Fixed
      - C-Arm, Cone beam CT with fluoro, Mini
      - Bi-Plane

B. Fluoroscopy Dose Metric
   1. Fluoroscopy time
   2. Air kerma at the reference point (Ka,r)
   3. Dose Area Product (P_{KA})
   4. Peak skin dose (Dskin,max)

C. Patient risk factors for hypersensitivity to radiation exposure

D. High dose fluoroscopically guided intervention
   - Interventional Radiology
   - Cardiac Catheterization Lab
   - Operating Room

E. Radiation Dose Management
   1. ALARA
      - Time
      - Distance
      - Shielding
        - Types
          - Patient
          - Staff
        - Equipment
        - Thickness
        - Storage
        - Inspections
      - ALARA action levels

- Room Shielding
- Reporting requirements

2. Equipment Factors
    - kVp
    - mA
    - Time
    - Field size
    - Quality control frequency
    - Equipment Geometry
        - X-ray tube position
        - Image receptor
        - Table height
    - Grids
    - Magnification
    - Collimation
    - Filtration
        - inherent vs. added
    - last Image Hold
    - Pulse fluoroscopy
    - Cine Mode
        - fluoroscopy frames rates
    - Low verses normal detail mode
    - Beam angle
3. Patient Factors
    - Body habitus
    - Scatter
    - Entrance versus exit exposure ratios
    - Dose notifications levels
        - Fluoroscopy time
        - Air kerma at the reference point (Ka,r)
        - DAP (P_{KA})
4. Staff Factors
    - Position, training, apparel, PPE

F. Deterministic Exposure Levels
    - Substantial radiation dose level (SRDL) and time to onset
        - Erythema
            - Early transient
            - Main erythema
            - Late erythema
        - Epilation
        - Dermal Atrophy
        - Dermal Necrosis
        - Secondary Ulceration
    - Patient follow up after a Substantial radiation dose level (SRDL)

IV. Content Pertaining to MRI Safety: (Competence, but not expertise)

A. Magnetic field units of measure
- Gauss
- Tesla

B. Magnet types in MRI
- Superconducting, Permanent, Resistive
- Magnetic Susceptibility (Diamagnetic, Paramagnetic, Superparamagnetic, Ferromagnetic)

C. Magnetic Fields
- Static magnetic fields
- Static magnetic field issues: Site Access Restriction Zoning
- Gradient magnetic fields
- Slew Rate
- Spatial Gradient
- Active vs. Passive Shielding
- Fringe Field (Importance of 5 Gauss line)

D. MRI Safety
- Ferromagnetic objects/detectors
- Codes in a MRI environment
- Emergency responders (fire, police)
- Define Zones I, II, III, & IV.
- Personnel training levels
- Screening (Patient, Staff, Equipment)
- Appropriate MRI labeling (MR safe vs. MR conditional vs. MR unsafe)
- MRI Quenching
- Hazards associated with liquid Helium
  -Thermal Hazards
  -Fire Hazards
  -Asphyxiation Hazards
- Hazards associated with strong radio frequency fields
  -(SAR)
  -Burns caused by Loops
  -Operating modes for MR systems
- Sequences looping
- Padding
- Coils
- Acoustic noise
- Explosive decompression

E. Contrast Agent Safety

V. Optimizing Radiation Exposure / Other Topics

A. Appropriateness Criteria
B. Image Wisely
C. Image Gently
D. Protocols
E. Considerations for pregnant and/or pediatric patient
   - Alternative exams
   - Benefit vs. risk
F. Regulations around Brachytherapy
   HDR, LDR, permanent
G. Microspheres
H. Mammography
I. DEXA / Bone density
J. Research with Radioactive Materials
K. Radioactive Seed Localization
L. Linac – linear accelerator
M. Blood irradiator

Related Guidelines & References:

- AAHP/HPS Qualifications for Health Care Facility Radiation Safety Officer (Jan 2003)
- National Council on Radiation Protection and Measurements (NCRP) - Publications
- ACR – Disaster Preparedness for Radiology Professionals
- NRC: 10 CFR Part 35, "Medical Use Licenses"
- AAPM Report No. 124 - A Guide for Establishing a Credentialing and Privileging Program for Users of Fluoroscopic Equipment in Healthcare Organizations (2012)
- AAPM Report No. 160 - Radiation Safety Officer Qualifications for Medical Facilities: Report of Task Group 160;
- AAPM Report No. 204- Size-Specific Dose Estimates (SSDE) in Pediatric and Adult Body CT Examinations
- ACR-SPR Practice Parameter For Imaging Pregnant or Potentially Pregnant Adolescent and Women with Ionizing Radiation
- ACR Guidance Document on MR Safety Practices: 2013. Journal of Magnetic Resonance Imaging 37:501–530 (2013) Authors: E. Kanal, AJ Barkovich, C Bell et al.
- Image Gently® - The Alliance for Radiation Safety in Pediatric Imaging
- Image Wisely® - Radiation Safety in Adult Medical Imaging

NMTCB(RS) Radiation Safety Tasks Attestation Form

The Nuclear Medicine Technology Certification Board

Section I. Applicant Information (*To be completed by applicant)*

Applicant Name: _____ **NMTCB Certification Number**: _____

Other Organization(s) Certification Number: _____

Mailing Address: _____ **Primary Phone:** _____

_____ **Primary E-mail**: _____

Section II. Authorized Representative Review and Verification

The **Applicant** named above has applied for admission to the Nuclear Medicine Technology Certification Board's NMTCB(RS) Examination. As part of the NMTCB's pre-examination qualifying procedure, we require written confirmation of the candidate's experience performing tasks directly associated with radiation safety over a minimum period of 1 calendar year.

Instructions: Below are examples of tasks related to radiation safety that may be considered as suitable for an applicant's documented experience. *Please mark all that apply to the Applicant that have been performed, at a minimum, of one year or longer.*

- 0 Management of the radiation safety program for your facility.
- 0 Maintenance and audit of radiation safety records, including those associated with the shipping, receiving, administration, and disposal of radioactive materials (RAM).
- 0 Assist or perform the maintenance, renewal, and or amendments of the RAM license for the facility.
- 0 Management of the personnel exposure monitoring including dosimeter badge ordering, reviewing prior exposure history, declared pregnant radiation workers, and/or reviewing dosimeter reports.
- 0 Management of radiation safety action levels for continued appropriateness to ensure compliance of personnel exposure investigation levels (ALARA I or II), area surveys dose rate and contamination levels, bioassays, and or radioactive effluent concentrations.
- 0 Management of Form 5 dosimetry annual and/or termination reporting.
- 0 Participation with your facilities Radiation Safety Committee.
- 0 Management and review of minor and major spills. Providing and/or managing the radiation safety training of nurses and/or other non-radiation workers.
- 0 Performing and/or managing the radioactive inventory and leak testing of sealed sources.
- 0 Performance or managing the testing of ancillary equipment such as the dose calibrator including linearity, accuracy, and/or geometrical variation.
- 0 Providing or managing training for fluoroscopy or MR safety.
- 0 Maintain records for radionuclide therapy administration.

TASKS CONTINUED ON PAGE 2

Applicant Name: _____

- 0 Participate in patient room preparation and monitoring after radionuclide therapy administration.
- 0 Participate in providing education to patients or staff for radionuclide therapy
- 0 Using and performing checks for proper operation of instruments used to determine the dose activity, survey meters, and instruments used to measure radionuclides.
- 0 Participate and or review 5 gauss line on new MRI installations
- 0 Perform MR safety screening for patients or staff
- 0 Assist in management of MR safety training for staff
- 0 Participate with identifying MR safe, conditional, and not safe materials
- 0 Participate and or review structural shielding testing for new x-ray, fluoroscopic, CT, and or PET rooms.
- 0 Participate in CT protocol review within your facility.
- 0 Manage and or investigate CT exams that exceed the established radiation dose alert levels.
- 0 Manage and or investigate fluoroscopy procedures that exceed the established radiation dose alert levels.
- 0 Investigate, document, and report medical events.
- 0 Investigate fluoroscopy interventions that meet sentinel event criteria.
- 0 Assist with the management and disposal of radioactive waste.
- 0 Other: _____

Authorized Representative Attestation: Applicant's Supervisor or Radiation Safety Officer.

Attestation Representative

I attest that the information contained herein is true and accurate. I am an authorized representative and may sign this verification submission on behalf of the following institution: _____
(Name of Institution/Facility)

_____ _____
Signature of Authorized Representative **Date Signed**

_____ _____
Printed Name of Authorized Representative **Telephone**

_____ _____
Title **Email**

Return completed form to NMTCB by mail, fax, or email:

NMTCB – Examinations Manager
3558 Habersham at Northlake, Building I
Tucker, GA 30084
Fax: (404) 315-6502 **Email:** exam.manager@nmtcb.org

Please confirm both pages are included in your transmission.

ARRT

EDUCATION REQUIREMENT

In order to meet the education requirement for the primary pathway, you must have:

- Earned an associate's degree or higher
- Completed an ARRT-approved educational program in the same discipline as the credential you are pursuing

EDUCATION REQUIREMENTS— PRIMARY ELIGIBILITY PATHWAY

Education is one of three components in ARRT's equation for excellence. It also provides the foundation of knowledge and experience that you'll need to become a Registered Technologist (R.T.) and take an ARRT exam. In order to meet the education requirement for the primary pathway, you must have earned an associates degree and have completed an ARRT-approved educational program.

AN ASSOCIATE'S DEGREE IS REQUIRED

If you're using our primary pathway to seek a credential, you must earn an associate (or more advanced) degree to be eligible to apply for ARRT certification and registration. Your degree must come from an institution accredited by an agency that ARRT recognizes. View a list of ARRT-Recognized Accreditation Agencies.

The degree doesn't have to be in the radiologic sciences, and you can earn it before or after graduating from your radiological sciences educational program. You must receive the degree, however, before you take your ARRT examination.

If you're seeking additional credentials using the postprimary pathway, the degree requirement doesn't apply to you.

YOU'LL ALSO NEED TO COMPLETE AN EDUCATIONAL PROGRAM

You must complete an educational program in the same discipline as the credential you are pursuing. As part of the program, you must demonstrate competencies in didactic coursework and clinical procedures.

At the end of your program, your Program Director will let us know whether you've met the requirements. You'll have three years after completing your program to establish eligibility and apply for ARRT certification and registration (known as the three-year rule).

Find an educational program - Recognized Educational Programs - ARRT

OTHER EDUCATIONAL OPTIONS

- U.S. military Educational Programs

THE ARRT EXAM

The final step on your way to becoming certified and registered with ARRT is to take an examination in your discipline. Our exams measure your knowledge of the daily tasks that an entry-level technologist performs. Our exams are challenging, yet fair. They're created with help from industry experts around the country, including Registered Technologists (R.T.s) in your desired discipline.

Examination Content Specifications - ARRT

EXAMINATION CONTENT SPECIFICATIONS

The primary purpose of ARRT examinations is to assess the knowledge and cognitive skills that entry-level technologists typically need to perform their jobs. Our content specifications identify the topics our exams cover. We only include topics in our content specifications if they're directly related to one or more activities on the task inventory.

Our most recent content specifications:

- Bone Densitometry
- Breast Sonography
- Cardiac Interventional Radiography
- Computed Tomography

- Magnetic Resonance Imaging

- Mammography—through August 31, 2025
- Mammography—effective September 1, 2025
- Nuclear Medicine Technology

- Radiation Therapy

- Radiography

- Registered Radiologist Assistant (R.R.A.)
- Sonography

- Vascular Interventional Radiography

- Vascular Sonography

For state licensing only:

- California Radiography Supervisor and Operator
- Bone Densitometry Equipment Operator
- Fluoroscopy
- Limited Scope of Practice in Radiography

Radiography

The purpose of the exam is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of the staff technologist at entry into the profession. The tasks typically performed were determined by administering a comprehensive practice analysis survey to a nationwide sample of radiographers.[1] An advisory committee then determined the knowledge and cognitive skills needed to perform the tasks on the task inventory and these are organized into the content categories within this document. Every content category can be linked to one or more tasks on the task inventory. The document is used to develop the examination. The *Task Inventory for Radiography* may be found on the ARRT's website (www.arrt.org).

The ARRT avoids content when there are multiple resources with conflicting perspectives. Educational programs accredited by a mechanism acceptable to ARRT offer education and experience beyond the minimum requirements specified in the content specifications and clinical competency requirements documents.

This document is not intended to serve as a curriculum guide. Although ARRT programs for certification and registration and educational programs may have related purposes, their functions are clearly different. Educational programs are generally broader in scope and address the subject matter that is included in these content specifications, but do not limit themselves to only this content.

The table below presents the major content categories and subcategories covered on the examination. The number of test questions in each category are listed in bold and the number of test questions in each subcategory in parentheses. Specific topics within each category are addressed in the content outline, which makes up the remaining pages of this document.

Content Category	**Number of Scored Questions[2]**
Patient Care	**33**
Patient Interactions and Management (33)	
Safety	**50**
Radiation Physics and Radiobiology[3] (21)	
Radiation Protection (29)	
Image Production	**51**
Image Acquisition and Evaluation (26)	
Equipment Operation and Quality Assurance (25)	
Procedures	**66**
Head, Spine and Pelvis Procedures (18)	
Thorax and Abdomen Procedures (20)	
Extremity Procedures (28)	
Total	**200**

[1] A special debt of gratitude is due to the hundreds of professionals participating in this project as committee members, survey respondents, and reviewers.
[2] Each exam includes an additional 30 unscored (pilot) questions.
[3] SI units are the primary (principle) units of radiation measurement used on the radiography examination.

Patient Care

1. Patient Interactions and Management

A. Ethical and Legal Aspects
   1. patients' rights
      a. consent (*e.g., informed, oral, implied)
      b. confidentiality (HIPAA)
      c. American Hospital Association (AHA) Patient Care Partnership (Patients' Bill of Rights)
         1. privacy
         2. extent of care (e.g., DNR)
         3. access to information
         4. living will, health care proxy, advanced directives
         5. research participation
   2. legal issues
      a. verification (e.g., patient identification, compare order to clinical indication)
      b. common terminology (e.g., battery, negligence, malpractice, beneficence)
      c. legal doctrines (e.g., respondeat superior, res ipsa loquitur)
      d. restraints versus positioning aids used to eliminate motion artifact
      e. manipulation of electronic data (e.g., exposure indicator, processing algorithm, brightness and contrast, cropping or masking off anatomy)
      f. documentation (e.g., changes to order, medical event)
   3. ARRT Standards of Ethics

B. Interpersonal Communication
   1. modes of communication
      a. verbal/written
      b. nonverbal (e.g., eye contact, touching)
   2. challenges in communication
      a. interactions with others
         1. language barriers
         2. cultural and social factors
         3. physical, sensory, or cognitive impairments
         4. age
         5. emotional status, acceptance of condition (e.g., stage of grief)
      b. explanation of medical terms
      c. strategies to improve understanding
   3. patient education
      a. explanation of current procedure (e.g., purpose, length of time, radiation dose)
      b. pre- and post-examination instructions (e.g., preparation, diet, medications and discharge instructions)
      c. respond to inquiries about other imaging modalities (e.g., dose differences, types of radiation, patient preps)

C. Ergonomics and Monitoring
   1. body mechanics (e.g., balance, alignment, movement)
      a. patient transfer techniques
      b. safe patient handling devices (e.g., transfer board, Hoyer lift, gait belt)
   2. assisting patients with medical equipment
      a. infusion catheters and pumps
      b. oxygen delivery systems
      c. other (e.g., nasogastric tubes, urinary catheters, tracheostomy tubes)
   3. patient monitoring and documentation
      a. vital signs
      b. physical signs and symptoms (e.g., motor control, severity of injury)
      c. fall prevention

D. Medical Emergencies
   1. non-contrast allergic reactions (e.g., latex)
   2. cardiac/respiratory arrest (e.g., CPR, AED)
   3. physical injury or trauma
   4. other medical disorders (e.g., seizures, diabetic reactions)

*The abbreviation "e.g.," is used to indicate that examples are listed in parentheses, but that it is not a complete list of all possibilities.

(Patient Care continues on the following page.)

Patient Care (continued)

E. Infection Control
   1. chain of infection (cycle of infection)
      a. pathogen
      b. reservoir
      c. portal of exit
      d. mode of transmission
         1. direct
            a. droplet
            b. direct contact
         2. indirect
            a. airborne
            b. vehicle borne (fomite)
            c. vector borne (mechanical or biological)
      e. portal of entry
      f. susceptible host
   2. asepsis
      a. equipment disinfection
      b. equipment sterilization
      c. medical aseptic technique
      d. sterile technique
   3. CDC Standard Precautions
      a. hand hygiene
      b. use of personal protective equipment (e.g., gloves, gowns, masks)
      c. safe handling of contaminated equipment/surfaces
      d. disposal of contaminated materials
         1. linens
         2. needles
         3. patient supplies
         4. blood and body fluids
      e. safe injection practices
   4. transmission-based precautions
      a. contact
      b. droplet
      c. airborne
   5. additional precautions
      a. neutropenic precautions (reverse isolation)
      b. healthcare-associated (nosocomial) infections

F. Handling and Disposal of Toxic or Hazardous Material
   1. types of materials
      a. chemicals
      b. chemotherapy
   2. safety data sheet (material safety data sheet)

G. Pharmacology
   1. patient history
      a. medication reconciliation (current medications)
      b. premedications
      c. contraindications
      d. scheduling and sequencing examinations
   2. administration
      a. routes (e.g., IV, oral)
      b. supplies (e.g., enema kits, needles)
      c. procedural technique (e.g., venipuncture)
      d. contrast media dose calculation
   3. contrast media types and properties (e.g., iodinated, water soluble, barium, ionic versus non-ionic)
   4. appropriateness of contrast media to examination
      a. patient condition (e.g., perforated bowel)
      b. patient age and weight
      c. laboratory values (e.g., BUN, creatinine, eGFR)
   5. complications/reactions
      a. local effects (e.g., extravasation/infiltration, phlebitis)
      b. systemic effects
         1. mild
         2. moderate
         3. severe
      c. emergency medications
      d. radiographer's response and documentation

Safety

1. Radiation Physics and Radiobiology

A. Principles of Radiation Physics
   1. x-ray production
      a. source of free electrons (e.g., thermionic emission)
      b. acceleration of electrons
      c. focusing of electrons
      d. deceleration of electrons
   2. target interactions
      a. bremsstrahlung
      b. characteristic
   3. x-ray beam
      a. frequency and wavelength
      b. beam characteristics
         1. quality
         2. quantity
         3. primary versus remnant (exit)
      c. inverse square law
      d. fundamental properties (e.g., travel in straight lines, ionize matter)
   4. photon interactions with matter
      a. photoelectric
      b. Compton
      c. coherent (classical)
      d. attenuation by various tissues
         1. thickness of body part
         2. type of tissue (atomic number)

B. Biological Effects of Radiation
   1. SI units of measurement (NCRP #160)
      a. absorbed dose (Gy)
      b. dose equivalent (Sv)
      c. exposure (C/kg)
      d. effective dose (Sv)
      e. air kerma (Gy)
   2. radiosensitivity
      a. dose-response relationships
      b. relative tissue radiosensitivities (e.g., LET, RBE)
      c. cell survival and recovery (LD_{50})
      d. oxygen effect
   3. somatic effects
      a. cells
      b. tissue (e.g., eye, thyroid, breast, skin, marrow, gonad)
      c. embryo and fetus
      d. carcinogenesis
      e. early versus late or acute versus chronic
      f. deterministic (tissue reactions) versus stochastic
      g. short-term versus long-term exposure
      h. acute radiation syndromes
         1. hemopoietic
         2. gastrointestinal (GI)
         3. central nervous system (CNS)

(Safety continues on the following page.)

Safety (continued)

2. Radiation Protection

A. Minimizing Patient Exposure
   1. exposure factors
      a. kVp
      b. mAs
      c. automatic exposure control (AEC)
   2. beam restriction
      a. purpose of primary beam restriction
      b. types (e.g., collimators)
   3. patient considerations
      a. positioning
      b. communication
      c. pediatric
      d. morbid obesity
   4. filtration
      a. effect on skin and organ exposure
      b. effect on average beam energy
      c. NCRP recommendations (NCRP #102, minimum filtration in useful beam)
   5. radiographic dose documentation
   6. image receptors
   7. grids
   8. fluoroscopy
      a. pulsed
      b. exposure factors
      c. grids
      d. positioning
      e. fluoroscopy time
      f. automatic brightness control (ABC) or automatic exposure rate control (AERC)
      g. receptor positioning
      h. magnification mode
      i. air kerma display
      j. last image hold
      k. dose or time documentation
      l. minimum source-to-skin distance (21 CFR)
   9. dose area product (DAP) meter

B. Personnel Protection (ALARA)*
   1. sources of radiation exposure
      a. primary x-ray beam
      b. secondary radiation
         1. scatter
         2. leakage
      c. patient as source
   2. basic methods of protection
      a. time
      b. distance
      c. shielding
   3. protective devices
      a. types (e.g., aprons, barriers)
      b. attenuation properties
      c. minimum lead equivalent (NCRP #102)
   4. special considerations
      a. mobile units
      b. fluoroscopy
         1. protective drapes
         2. protective Bucky slot cover
         3. cumulative timer
         4. remote-controlled fluoroscopy
      c. guidelines for fluoroscopy and mobile units (NCRP #102, 21 CFR)
         1. fluoroscopy exposure rates (normal and high-level control)
         2. exposure switch guidelines
   5. radiation exposure and monitoring
      a. dosimeters
         1. types
         2. proper use
      b. NCRP recommendations for personnel monitoring (NCRP #116)
         1. occupational exposure
         2. public exposure
         3. embryo/fetus exposure
         4. dose equivalent limits
         5. evaluation and maintenance of personnel dosimetry records
   6. handling and disposal of radioactive material

* (August 24, 2016) Note: Although it is the radiographer's responsibility to apply radiation protection principles to minimize bioeffects for both patients and personnel, the ALARA concept is specific to personnel protection and is listed only for that section.

Image Production

1. Image Acquisition and Evaluation

A. Factors Affecting Radiographic Quality
(X indicates topics covered on the examination.)

	1. Receptor Exposure	2. Spatial Resolution	3. Distortion
a. mAs	X		
b. kVp	X		
c. OID		X	X
d. SID	X	X	X
e. focal spot size		X	
f. grids*	X		
g. tube filtration	X		
h. beam restriction	X		
i. motion		X	
j. anode heel effect	X		
k. patient factors (size, pathology)	X	X	X
l. angle (tube, part, or receptor)		X	X

* Includes conversion factors for grids

B. Technique Charts
   1. anatomically programmed technique
   2. fixed versus variable kVp
   3. special considerations
      a. casts
      b. pathologic factors
      c. age (e.g., pediatric, geriatric)
      d. body mass index (BMI)
      e. contrast media
      f. grids
      g. OID

C. Automatic Exposure Control (AEC)
   1. effects of changing exposure factors on radiographic quality
   2. detector selection
   3. anatomic alignment
   4. exposure adjustment (e.g., density, +1 or –1)

D. Digital Imaging Characteristics
   1. spatial resolution
      a. pixel characteristics (e.g., size, pitch)
      b. detector element (DEL) (e.g., size, pitch, fill factor) CCD, CMOS (e.g., size, pitch)
      c. sampling frequency (CR)
      d. matrix size
      e. modulation transfer function (MTF)
   2. contrast resolution
      a. bit depth
      b. detective quantum efficiency (DQE)
      c. grids
   3. image signal
      a. dynamic range
      b. quantum noise (quantum mottle)
      c. signal to noise ratio (SNR)

E. Image Identification
   1. methods (e.g., radiographic, electronic)
   2. legal considerations (e.g., patient data, examination data)

F. Criteria for Image Evaluation
   1. exposure indicator
   2. quantum noise (quantum mottle)
   3. gross exposure error (e.g., loss of contrast, saturation)
   4. contrast
   5. spatial resolution
   6. distortion (e.g., size, shape)
   7. identification markers (e.g., anatomical side, patient, date)
   8. image artifacts
   9. radiation fog (CR)

Image Production (continued)

2. Equipment Operation and Quality Assurance

A. Imaging Equipment
1. x-ray generator, transformers and rectification system
   a. basic principles
   b. phase, pulse and frequency
   c. tube loading
2. components of radiographic unit (fixed or mobile)
   a. operating console
   b. x-ray tube construction
      1. electron source
      2. target materials
      3. induction motor
      4. filtration
   c. automatic exposure control (AEC)
      1. radiation detectors
      2. back-up timer
      3. exposure adjustment (e.g., density, +1 or -1)
      4. minimum response time
   d. manual exposure controls
   e. image receptors
      1. computed radiography (CR)
         a. plate (e.g., photo-stimulable phosphor (PSP))
         b. plate reader
      2. digital radiography (DR)
         a. direct conversion
         b. indirect conversion
            1. amorphous silicon (a-Si)
            2. charge coupled device (CCD)
            3. complementary metal oxide semiconductor (CMOS)
   f. beam restriction
3. components of fluoroscopic unit (fixed or mobile)
   a. image receptors
      1. image intensifier
      2. flat panel
   b. viewing systems
   c. recording systems
   d. automatic brightness control (ABC) or automatic exposure rate control (AERC)
   e. magnification mode
   f. table
4. accessories
   a. stationary grids
   b. Bucky assembly
   c. compensating filters

B. Image Processing and Display
1. raw data (pre-processing)
   a. analog-to-digital converter (ADC)
   b. quantization
   c. corrections (e.g., rescaling, flat fielding, dead pixel correction)
   d. histogram
2. corrected data for processing
   a. grayscale
   b. edge enhancement
   c. equalization
   d. smoothing
3. data for display
   a. values of interest (VOI)
   b. look-up table (LUT)
4. post-processing
   a. brightness
   b. contrast
   c. region of interest (ROI)
   d. electronic cropping or masking
   e. stitching
5. display monitors
   a. viewing conditions (e.g., viewing angle, ambient lighting)
   b. spatial resolution (e.g., pixel size, pixel pitch)
   c. brightness and contrast
6. imaging informatics
   a. information systems, (e.g., HIS, RIS, EMR, EHR)
   b. networking
      1. PACS
      2. DICOM
   c. downtime procedures

Image Production (continued)

C. Quality Control of Imaging Equipment and Accessories
   1. beam restriction
      a. light field to radiation field alignment
      b. central ray alignment
   2. recognition and reporting of malfunctions
   3. digital imaging receptor systems
      a. maintenance (e.g., detector calibration, plate reader calibration)
      b. QC tests (e.g., erasure thoroughness, plate uniformity, spatial resolution)
      c. display monitor quality assurance (e.g., grayscale standard display function, luminance)
   4. shielding accessories (e.g., testing lead apron, gloves)

Procedures

This section addresses imaging procedures for the anatomic regions listed below. Questions will cover the following topics:

1. Positioning (e.g., topographic landmarks, body positions, path of central ray, positioning aids, respiration).
2. Anatomy (e.g., including physiology, basic pathology, related medical terminology).
3. Procedure adaptation (e.g., body habitus, body mass index, trauma, pathology, age, limited mobility).
4. Evaluation of displayed anatomical structures (e.g., patient positioning, tube-part-image receptor alignment).

The specific radiographic positions and projections within each anatomic region that may be covered on the examination are listed in *Attachment A*. A guide to positioning terminology appears in *Attachment B*.

---

1. Head, Spine and Pelvis Procedures

A. Head
   1. skull
   2. facial bones
   3. mandible
   4. temporomandibular joints
   5. nasal bones
   6. orbits
   7. paranasal sinuses

B. Spine and Pelvis
   1. cervical spine
   2. thoracic spine
   3. scoliosis series
   4. lumbar spine
   5. sacrum and coccyx
   6. myelography
   7. sacroiliac joints
   8. pelvis and hip

2. Thorax and Abdomen Procedures

A. Thorax
   1. chest
   2. ribs
   3. sternum
   4. soft tissue neck
   5. sternoclavicular joints

B. Abdomen and GI Studies
   1. abdomen
   2. esophagus
   3. swallowing dysfunction study
   4. upper GI series, single or double contrast
   5. small bowel series
   6. contrast enema, single or double contrast
   7. surgical cholangiography
   8. ERCP

C. GU Studies
   1. cystography
   2. cystourethrography
   3. intravenous urography
   4. retrograde urography
   5. hysterosalpingography

3. Extremity Procedures

A. Upper Extremities
   1. fingers
   2. hand
   3. wrist
   4. forearm
   5. elbow
   6. humerus
   7. shoulder
   8. scapula
   9. clavicle
   10. acromioclavicular joints

B. Lower Extremities
   1. toes
   2. foot
   3. calcaneus
   4. ankle
   5. tibia/fibula
   6. knee/patella
   7. femur
   8. long bone measurement

C. Other
   1. bone age
   2. bone survey (e.g., metastatic, non-accidental trauma)
   3. arthrography

Attachment A

Radiographic Positions and Projections

1. Head, Spine and Pelvis

A. Head

1. Skull
   a. AP axial (Towne)
   b. lateral
   c. PA axial (Caldwell)
   d. PA
   e. submentovertex (full basal)
   f. trauma cross-table (horizontal beam) lateral
   g. trauma AP axial (reverse Caldwell)
   h. trauma AP
   i. trauma AP axial (Towne)
2. Facial Bones
   a. lateral
   b. parietoacanthial (Waters)
   c. PA axial (Caldwell)
   d. modified parietoacanthial (modified Waters)
3. Mandible
   a. axiolateral oblique
   b. PA
   c. AP axial (Towne)
   d. PA axial
   e. PA (modified Waters)
   f. submentovertex (full basal)
4. Temporomandibular Joints
   a. axiolateral oblique (modified Law)
   b. axiolateral (modified Schuller)
   c. AP axial (modified Towne)
5. Nasal Bones
   a. parietoacanthial (Waters)
   b. lateral
   c. PA axial (Caldwell)
6. Orbits
   a. parietoacanthial (Waters)
   b. lateral
   c. PA axial (Caldwell)
   d. modified parietoacanthial (modified Waters)
7. Paranasal Sinuses
   a. lateral, horizontal beam
   b. PA axial (Caldwell), horizontal beam
   c. parietoacanthial (Waters), horizontal beam
   d. submentovertex (full basal), horizontal beam

B. Spine and Pelvis

1. Cervical Spine
   a. AP axial
   b. AP open mouth
   c. lateral
   d. cross-table (horizontal beam) lateral
   e. PA axial obliques
   f. AP axial obliques
   g. lateral swimmers
   h. lateral flexion and extension
   i. AP dens (Fuchs)
2. Thoracic Spine
   a. AP
   b. lateral, breathing
   c. lateral, expiration
3. Scoliosis Series
   a. AP or PA
   b. lateral
4. Lumbar Spine
   a. AP
   b. PA
   c. lateral
   d. L5-S1 lateral spot
   e. posterior oblique
   f. anterior oblique
   g. AP axial L5-S1
   h. AP right and left bending
   i. lateral flexion and extension
5. Sacrum and Coccyx
   a. AP axial sacrum
   b. AP axial coccyx
   c. lateral sacrum and coccyx, combined
   d. lateral sacrum or coccyx, separate
6. Myelography
7. Sacroiliac Joints
   a. AP axial
   b. posterior oblique
   c. anterior oblique
8. Pelvis and Hip
   a. AP hip only
   b. cross-table (horizontal beam) lateral hip
   c. unilateral frog-leg, non-trauma
   d. axiolateral inferosuperior, trauma (Clements-Nakayama)
   e. AP pelvis
   f. AP pelvis, bilateral frog-leg
   g. AP pelvis, axial anterior pelvic bones (inlet, outlet)
   h. posterior oblique pelvis, acetabulum (Judet)

2. Thorax and Abdomen

A. Thorax

1. Chest
   a. PA or AP upright
   b. lateral upright
   c. AP lordotic
   d. AP supine
   e. lateral decubitus
2. Ribs
   a. AP and PA, above and below diaphragm
   b. anterior and posterior obliques
3. Sternum
   a. lateral
   b. RAO
4. Soft Tissue Neck
   a. AP upper airway
   b. lateral upper airway
5. Sternoclavicular joints
   a. PA
   b. LAO and RAO

B. Abdomen and GI Studies

1. Abdomen
   a. AP supine
   b. AP upright
   c. lateral decubitus
   d. dorsal decubitus
2. Esophagus
   a. RAO
   b. left lateral
   c. AP
   d. PA
   e. LAO
3. Swallowing Dysfunction Study
4. Upper GI series*
   a. AP or PA scout
   b. RAO
   c. PA
   d. right lateral
   e. LPO
   f. AP
5. Small Bowel Series
   a. PA scout
   b. PA (follow through)
   c. ileocecal spots
6. Contrast Enema*
   a. left lateral rectum
   b. left lateral decubitus
   c. right lateral decubitus
   d. LPO and RPO
   e. PA
   f. RAO and LAO
   g. AP axial (sigmoid)
   h. PA axial (sigmoid)
   i. PA or AP post-evacuation
7. Surgical Cholangiography
8. ERCP

*single or double contrast

C. GU Studies
1. Cystography
   a. AP
   b. LPO and RPO
   c. lateral
   d. AP axial
2. Cystourethrography
   a. AP voiding cystourethrogram female
   b. RPO voiding cystourethrogram male
3. Intravenous Urography
   a. AP, scout, and series
   b. RPO and LPO
   c. post-void
4. Retrograde Urography
   a. AP scout
   b. AP pyelogram
   c. AP ureterogram
5. Hysterosalpingography

3. Extremities

A. Upper Extremities

I. Fingers
   a. PA entire hand
   b. PA finger only
   c. lateral
   d. medial and/or lateral oblique
   e. AP thumb
   f. medial oblique thumb
   g. lateral thumb
2. Hand
   a. PA
   b. lateral
   c. lateral oblique
3. Wrist
   a. PA
   b. lateral oblique
   c. lateral
   d. PA–ulnar deviation
   e. PA axial (Stecher)
   f. tangential carpal canal (Gaynor-Hart)
4. Forearm
   a. AP
   b. lateral
5. Elbow
   a. AP
   b. lateral
   c. lateral oblique
   d. medial oblique
   e. AP partial flexion
   f. trauma axial laterals (Coyle)
6. Humerus
   a. AP
   b. lateral
   c. neutral
   d. transthoracic lateral
7. Shoulder
   a. AP internal and external rotation
   b. inferosuperior axial (Lawrence)
   c. posterior oblique (Grashey)
   d. AP neutral
   e. PA oblique (scapular Y)
   f. supraspinatus outlet (Neer)
8. Scapula
   a. AP
   b. lateral
9. Clavicle
   a. AP or PA
   b. AP axial
   c. PA axial
10. Acromioclavicular Joints – AP bilateral with and without weights

B. Lower Extremities

1. Toes
   a. AP, entire forefoot
   b. AP or AP axial toe
   c. oblique toe
   d. lateral toe
   e. sesamoids, tangential
2. Foot
   a. AP axial
   b. medial oblique
   c. lateral oblique
   d. lateral
   e. AP axial weight bearing
   f. lateral weight bearing
3. Calcaneus
   a. lateral
   b. plantodorsal, axial
   c. dorsoplantar, axial
4. Ankle
   a. AP
   b. mortise
   c. lateral
   d. medial oblique
   e. AP stress
   f. AP weight bearing
   g. lateral weight bearing
5. Tibia/Fibula
   a. AP
   b. lateral
6. Knee/patella
   a. AP
   b. lateral
   c. AP weight bearing
   d. lateral oblique
   e. medial oblique
   f. PA axial–intercondylar fossa (Holmblad)
   g. PA axial–intercondylar fossa (Camp Coventry)
   h. AP axial–intercondylar fossa (Béclère)
   i. PA patella
   j. tangential (Merchant)
   k. tangential (Settegast)
7. Femur
   a. AP
   b. lateral
8. Long Bone Measurement

C. Other
1. Bone Age
2. Bone Survey
3. Arthrography

Attachment B

Standard Terminology for Positioning and Projection

Radiographic View: Describes the body part as seen by the image receptor. Restricted to the discussion of a *radiograph* or *image*.

Radiographic Position: Refers to a specific body position, such as supine, prone, recumbent, erect or Trendelenburg. Restricted to the discussion of the *patient's physical position*.

Radiographic Projection: Restricted to the discussion of the *path of the central ray*.

POSITIONING TERMINOLOGY

A. Lying Down

1. *supine* – lying on the back
2. *prone* – lying face downward
3. *decubitus* – lying down with a horizontal x-ray beam
4. *recumbent* – lying down in any position

B. Erect or Upright

1. *anterior position* – facing the image receptor
2. *posterior position* – facing the radiographic tube

C. Either Upright or Recumbent

1. oblique torso positions

   a. anterior oblique (facing the image receptor)

      i. *left anterior oblique (LAO)* — body rotated with the left anterior portion closest to the image receptor

      ii. *right anterior oblique (RAO)* — body rotated with the right anterior portion closest to the image receptor

   b. posterior oblique (facing the radiographic tube)

      i. *left posterior oblique (LPO)* — body rotated with the left posterior portion closest to the image receptor

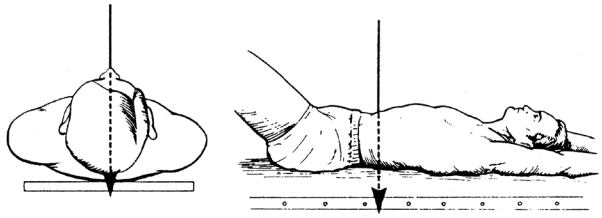
      ii. *right posterior oblique (RPO)* — body rotated with the right posterior portion closest to the image receptor

2. oblique extremity positions

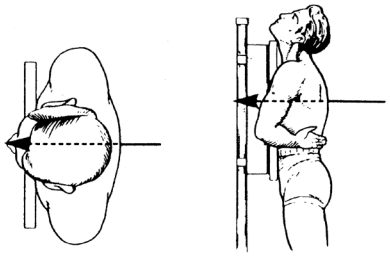
   a. lateral (external) rotation — from either prone or supine, outward rotation of the extremity

   b. medial (internal) rotation — from either prone or supine, inward rotation of the extremity

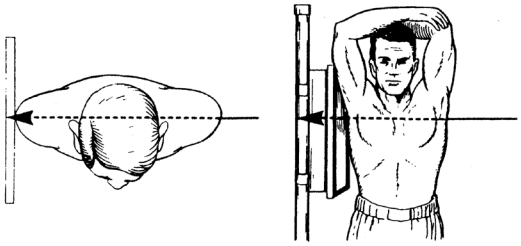
Anteroposterior Projection



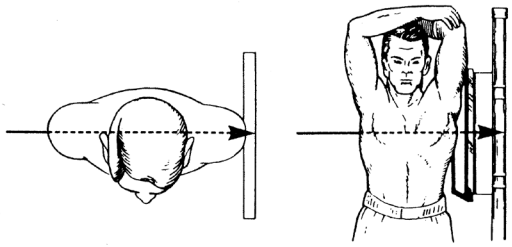
Posteroanterior Projection



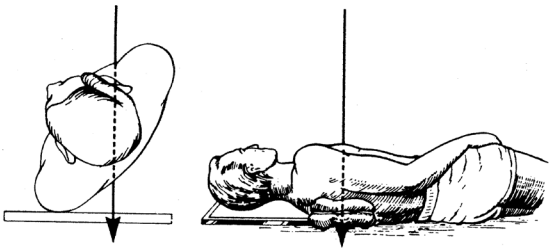
Right Lateral Position



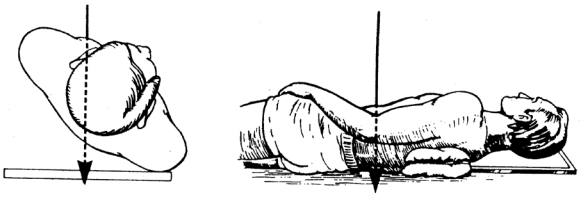
Left Lateral Position



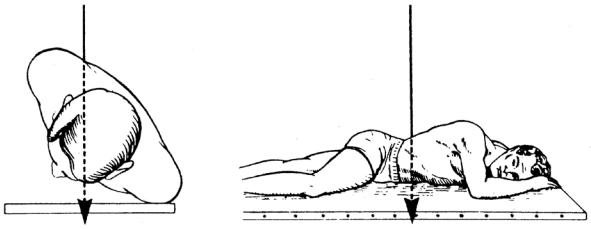
Left Posterior Oblique Position



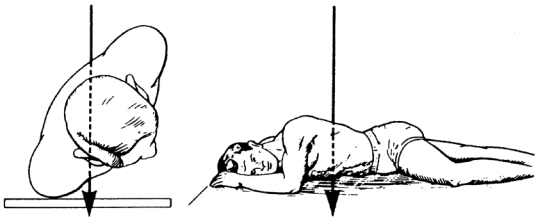
Right Posterior Oblique Position



Left Anterior Oblique Position



Right Anterior Oblique Position



RAD 4.01 Radiographer scope of practice.

(1) General scope of practice. The practice of a radiographer involves the performance of radiography and radiographic procedures and related techniques to produce images for the interpretation by, or at the request of, a licensed practitioner. Radiographers perform the radiographic examination to create the images needed for medical diagnosis and apply scientific knowledge, technical skills, patient interaction, and care necessary to obtain diagnostic information. Radiographers may apply radiation to any part of the human body and may administer contrast agents and related substances for diagnostic purposes.

(2) Applicable standards. The scope of practice of a licensed radiographer includes all of the following, as defined in the ASRT Practice Standards for Medical Imaging and Radiation Therapy, 2019 American Society of Radiologic Technologists:

(a) Administering medications parenterally through new or existing vascular access, enterally or through other appropriate routes as prescribed by a licensed practitioner.

(b) Administering medications with an infusion pump or power injector as prescribed by a licensed practitioner.

(c) Applying principles of ALARA to minimize exposure to patient, self, and others.

(d) Applying principles of patient safety during all aspects of patient care.

(e) Assisting in maintaining medical records, respecting confidentiality and established policy.

(f) Corroborating a patient's clinical history with procedure and ensuring information is documented and available for use by a licensed practitioner.

(g) Educating and monitoring students and other health care providers.

(h) Evaluating images for proper positioning and determining if additional images will improve the procedure or treatment outcome.

(i) Evaluating images for technical quality and ensuring proper identification is recorded.

(j) Identifying and responding to emergency situations.

(k) Identifying, preparing, and administering medications as prescribed by a licensed practitioner.

(L) Performing ongoing quality assurance activities.

(m) Performing venipuncture as prescribed by a licensed practitioner.

(n) Postprocessing data.

(o) Preparing patients for procedures.

(p) Providing education.

(q) Providing optimal patient care.

(r) Receiving, relaying, and documenting verbal, written, and electronic orders in the patient's medical record.

(s) Selecting the appropriate protocol and optimizing technical factors while maximizing patient safety.

(t) Starting, maintaining, and removing intravenous access as prescribed by a licensed practitioner.

(u) Verifying archival storage of data.

(v) Verifying informed consent for applicable procedures.

(w) Assisting the licensed practitioner with fluoroscopic and specialized radiologic procedures.

(x) Performing diagnostic radiographic and noninterpretive fluoroscopic procedures as prescribed by a licensed practitioner.

Note: The standard is available from the American Society of Radiologic Technologists' website at www.asrt.org.

RAD 4.02 Limited X-ray machine operator scope of practice.

(1) General scope of practice. The LXMO performs radiographic procedures and related techniques within the practice of radiography under the supervision of a licensed radiographer or other health care provider, consistent with the LXMO's limited scope education, training, and examination.

(2) Applicable standards. The scope of practice of an LXMO includes all of the following, as defined in the ASRT Practice Standards for Medical Imaging and Radiation Therapy, 2019 American Society of Radiologic Technologists:

(a) Applying principles of ALARA to minimize exposure to patient, self, and others.

(b) Applying principles of patient safety during all aspects of patient care.

(c) Assisting in maintaining medical records, respecting confidentiality and established policy.

(d) Corroborating a patient's clinical history with procedure and ensuring information is documented and available for use by a licensed practitioner.

(e) Evaluating images for proper positioning and determining if additional images will improve the procedure or treatment outcome.

(f) Evaluating images for technical quality and ensuring proper identification is recorded.

(g) Identifying and responding to emergency situations.

(h) Performing ongoing quality assurance activities.

(i) Postprocessing data.

(j) Preparing patients for procedures.

(k) Providing education.

(L) Providing optimal patient care.

(m) Selecting the appropriate protocol and optimizing technical factors while maximizing patient safety.

(n) Verifying archival storage of data.

(o) Assisting a licensed practitioner or radiographer during static radiographic procedures.

(p) Performing diagnostic radiographic procedures, as prescribed by a licensed practitioner, of a specific area of anatomical interest based on limited education, training, and licensure or certification within the individual's scope of practice.

Note: The standard is available from the American Society of Radiologic Technologists' website at www.asrt.org.

State of Wisconsin
Department of Safety & Professional Services

AGENDA REQUEST FORM

1) Name and Title of Person Submitting the Request:	2) Date When Request Submitted:
Jameson Whitney, Board Counsel	**6/26/2025** Items will be considered late if submitted after 12:00 p.m. on the deadline date which is 8 business days before the meeting

3) Name of Board, Committee, Council, Sections:
Radiography Examining Board

4) Meeting Date:	5) Attachments:	6) How should the item be titled on the agenda page?
7/09/2025	☒ Yes ☐ No	Application Forms – Review Updates

7) Place Item in:	8) Is an appearance before the Board being scheduled?	9) Name of Case Advisor(s), if required:
☒ Open Session ☐ Closed Session	☐ Yes (Fill out Board Appearance Request) ☒ No	

10) Describe the issue and action that should be addressed:

The Board will review updates to form 2908 and 2990.

11) Authorization

Signature of person making this request **Date 6/26/2025**
Jameson Whitney

Supervisor (if required) **Date**

Executive Director signature (indicates approval to add post agenda deadline item to agenda) **Date**

Directions for including supporting documents:
1. This form should be attached to any documents submitted to the agenda.
2. Post Agenda Deadline items must be authorized by a Supervisor and the Policy Development Executive Director.
3. If necessary, provide original documents needing Board Chairperson signature to the Bureau Assistant prior to the start of a meeting.

Revised 12/2016

Wisconsin Department of Safety and Professional Services

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Website: http://dsps.wi.gov

RADIOGRAPHY EXAMINING BOARD

CREDENTIALING INFORMATION FOR RADIOGRAPHER APPLICANTS

INSTRUCTIONS FOR COMPLETING THE APPLICATION:

Applicant must:

- Be at least 18 years of age.
- Per Wis. Stat. § 462.03(1)(b), hold a high school diploma or its equivalent, as determined by the Board.
- Per Wis. Stat. § 462.03(1)(c), subject to Wis. Stat. §§ 111.321, 111.322, and 111.335, the person does not have an arrest or conviction record.
- Submit the following:

American Registry of Radiologic Technologists (AART) Certified Applicants:

- **Application :** Complete application and pay applicable fee(s) online via LicensE.
- **Submission of ARRT Certification Number:** Provide current copy of your ARRT pocket card. Please note you may start the application process prior to receipt of ARRT certification (e.g., students or recent graduates).
- **ARRT Examination Registration:** If you have not taken the ARRT examination or received your ARRT certification, you must register online with ARRT at www.arrt.org and pay the appropriate fee directly to ARRT. Please note you may start the application process prior to receipt of ARRT (e.g., students or recent graduates).
- **Verification of Credential:** If you are certified/registered/licensed in another state or jurisdiction please contact the state(s) or jurisdiction(s) in which you are/were credentialed to request a verification of your credential. This verification must be forwarded directly to the Department by the credentialing authority.

APPLICATION IS NOT COMPLETE UNTIL ALL OF THE FOLLOWING DOCUMENTS HAVE BEEN RECEIVED:

- ☐ Complete application and pay applicable fee(s) online via LicensE
- ☐ ARRT Certification (**must provide a current copy of your ARRT pocket card**)
- ☐ Letters from all State Boards where licensed, active and inactive
- ☐ Radiography Examination Registration and Fee (**If you have not taken the ARRT examination, or received your ARRT certification, you must register online at** www.arrt.org **and pay the appropriate fee directly to ARRT.**)
- ☐ Convictions and Pending Charges (**Form #2252**), if applicable
- ☐ ARRT Ethics Review letter, if applicable
- ☐ Malpractice Suits or Claims (**Form #2829**) and copies of malpractice suit, court documents with allegations and settlement, if applicable
- ☐ Is name on all credentials the same? If not, submit certified copy of marriage certificate, divorce decree, etc.

Wisconsin Department of Safety and Professional Services

Mail To: P.O. Box 8935
Madison, WI 53708-8935
Fax #: (608) 251-3036
Phone #: (608) 266-2112

Office Location: 4822 Madison Yards Way
Madison, WI 53705
E-Mail: dsps@wisconsin.gov
Website: http://dsps.wi.gov

RADIOGRAPHY EXAMINING BOARD

CREDENTIALING INFORMATION FOR RADIOGRAPHER APPLICANTS

INSTRUCTIONS FOR COMPLETING THE APPLICATION:

Applicant must:

- Be at least 18 years of age.
- Per Wis. Stat. § 462.03(1)(b), hold a high school diploma or its equivalent, as determined by the Board.
- Per Wis. Stat. § 462.03(1)(c), subject to Wis. Stat. §§ 111.321, 111.322, and 111.335, the person does not have an arrest or conviction record.
- Submit the following:

American Registry of Radiologic Technologists (AART) Certified Applicants:

- **Application :** Complete application and pay applicable fee(s) online via LicensE.
- **Submission of ARRT Certification Number:** Upload or submit an electronic Verification of Certification and Registration, available on the ARRT website. Please note you may start the application process prior to receipt of ARRT certification (e.g., students or recent graduates).
- **ARRT Examination Registration:** If you have not taken the ARRT examination or received your ARRT certification, you must register online with ARRT at www.arrt.org and pay the appropriate fee directly to ARRT. Please note you may start the application process prior to receipt of ARRT (e.g., students or recent graduates).
- **Verification of Credential:** If you are certified/registered/licensed in another state or jurisdiction please contact the state(s) or jurisdiction(s) in which you are/were credentialed to request a verification of your credential. This verification must be forwarded directly to the Department by the credentialing authority.

APPLICATION IS NOT COMPLETE UNTIL ALL OF THE FOLLOWING DOCUMENTS HAVE BEEN RECEIVED:

- ☐ Complete application and pay applicable fee(s) online via LicensE
- ☐ ARRT Certification (**must upload or submit an electronic Verification of Certification and Registration**)
- ☐ Letters from all State Boards where licensed, active and inactive
- ☐ Radiography Examination Registration and Fee (**If you have not taken the ARRT examination, or received your ARRT certification, you must register online at** www.arrt.org **and pay the appropriate fee directly to ARRT.**)
- ☐ Convictions and Pending Charges (**Form #2252**), if applicable
- ☐ ARRT Ethics Review letter, if applicable
- ☐ Malpractice Suits or Claims (**Form #2829**) and copies of malpractice suit, court documents with allegations and settlement, if applicable
- ☐ Is name on all credentials the same? If not, submit certified copy of marriage certificate, divorce decree, etc.

Wisconsin Department of Safety and Professional Services

Office Location: 4822 Madison Yards Way
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Website: http://dsps.wi.gov

RADIOGRAPHY EXAMINING BOARD

LIMITED X-RAY MACHINE OPERATOR (LXMO) PROGRAM CURRICULUM

APPLICANT: Complete this section and submit to certifying school for completion. Form must be returned directly from the school to the Department.

Last Name	**First Name**	**MI**	**Former / Maiden Name(s)**

Address (number/street)	(city)	(state)	(zip code)

Mailing Address (if different) (number/street)	(city)	(state)	(zip code)

Date of Birth	**Social Security Number** (voluntary-for use by school to locate your records)	**Date of Graduation** (Anticipated dates of graduation will not be accepted.)
__/__/____	___-___-____	__/__/____

Application Number	**Daytime Phone Number**
	___-___-____ **Ext** _____

ATTESTATION OF APPLICANT: I declare that I am the person referred to on this form and that all information required to be completed by me (the applicant for a credential), is complete and accurate to the best of my knowledge and belief. Furthermore, I declare that after completing the information that was required by me (and only that information) the form was forwarded to the relevant third-party for completion of the information asked of them. I also declare that to the best of my knowledge the completed form was provided to the Department of Safety and Professional Services by the relevant third-party (and not by me, the applicant). Finally, I declare that I understand that failure to provide the requested information, making any materially false statement and/or giving any materially false information in connection with my application for a credential may result in credential application processing delays; denial, revocation, suspension, or limitation of my credential; or any combination thereof; or such other penalties as may be provided by law. By signing below, I am signifying that I have read and understand the above declarations.

	__/__/____
Applicant Signature	**Date**

(If unable to provide a digital signature, please print and sign form.)

CERTIFYING SCHOOL: Complete this section for the above-named applicant and return directly to the Department using the LicensE Third-Party* Upload Portal at license.wi.gov. You will need the application number shown above. (*For form completion purposes, the term "Third-Party" refers to any non-applicant or non-DSPS individual or entity submitting required documentation in support of a credential application.)

Enter the number of classroom hours of study the applicant has completed in the eight (8) areas that are listed below. The total must be between the range of 384 - 432 hours or more.*

COURSE CONFIGURATION: (hours and credits)

Required Hours	**Course Title**	**Minimum Required Credits**
48	Introduction to Radiography (48 required)	3
48	Radiographic Imaging 1 (48 required)	3
48	Radiographic Imaging 2 (48 required)	3
32-80	Radiographic Procedures 1 (32-80 required)	2-5
48	Imaging Equipment Operation (48 required)	3
48	Radiation Protection and Biology (48 required)	3
16	Radiographic Pathology (16 required)	1
96-340	Radiography Clinical (96-340 required)	3-6
384-432	**Total Program Hours***	**Total Credits 21-27**

Continued on next page.

Wisconsin Department of Safety and Professional Services

Name of School

Address of School (number/street)

(city, state, zip code)

This school was accredited by

Was this school JRCERT approved at the time the applicant completed the required 384-432 hours of classroom study? ☐ **Yes** ☐ **No**

Number of Hours Completed _____ **Date Completed** __/__/____

ATTESTATION AND AFFIDAVIT OF THIRD-PARTY PROVIDING INFORMATION RELATED TO APPLICANT: I declare, on behalf of the third-party asked to provide information related to the applicant identified on this form, that the information provided is true and correct to the best of my knowledge and belief. I further declare that after completing the form I, or other third-party staff, will provide the completed form directly to the Wisconsin Department of Safety and Professional Services for review. By signing below, I am signifying that I have read, understand, and have complied with the above declarations. **I attest to the fact that the above named applicant completed 384-432 hours of classroom study in a training program in limited x-ray machine operator (LXMO) listed above.**

Signature of Dean or Department Head
(If unable to provide a digital signature, please print and sign form.)

Date __/__/____

Printed Name

Phone ___-___-____ Ext_____

Title

Description:

LXMO curriculum prepares individuals for a career in diagnostic imaging. The LXMO produces images of limited area of the human body to aid physicians in the diagnosis of injuries and diseases. Applicants for a LXMO permit meeting all of the curricular requirements would be eligible to take the State of Wisconsin certification examination administered by the American Registry of Radiography Technologists (ARRT). Upon successful completion, individuals may obtain employment in x-ray departments associated with medical clinics, veterinary clinics, and private offices.

The LXMO curriculum focuses on theoretical and applied radiography and includes a clinical experience in an imaging department. Applicants should have learned to use x-ray imaging machines to demonstrate body parts on x-ray films for diagnostic purposes and minimizing.

External Requirements

Curriculum Outcomes

A. Carryout the production and evaluation of radiographic images

Direct Measures: Clinical Evaluation

Criteria:

1. Position patient for specified examination
2. Select appropriate image production exposure factors and make exposure
3. Evaluate final images for acceptable exposure quality, anatomical presentation, and
4. patient identifying information

B. Apply computer skills in the radiographic clinical setting

Direct Measures: Clinical Evaluation

Criteria:

1. Orient and annotate image
2. Prepare and send images to archive or PACS

C. Practice radiation safety principles

Direct Measures: Clinical Evaluation

Criteria:

1. Use proper collimation
2. Shield patient and others
3. Wear personal dosimeter
4. Practice cardinal principles of radiation protections: time, distance, and shielding

D. Provide quality patient care

Direct Measures: Clinical Evaluation

Criteria:

1. Identify correct patient and procedure to perform
2. Assess patient condition and respond accordingly
3. Obtain and document accurate patient history
4. Explain exam and give clear instructions
5. Communicate/interact with patients as appropriate

E. Model professional and ethical behavior consistent with the State of Wisconsin LXMO Code of Ethics

Direct Measures: Clinical Evaluation

Criteria

1. Maintain confidentiality
2. Interact professionally with healthcare professionals, patients, and family
3. Respect diversity

F. Apply critical thinking and problem solving skills in the practice of diagnostic radiography

Direct Measures: Clinical Evaluation

Criteria:

1. Adapt procedures to patient condition
2. Adapt exposure techniques to patient's physical and pathological conditions
3. Evaluate image for diagnostic quality and implement corrective action if necessary
4. Use logic and judgement in performing procedure efficiently

COURSE CONFIGURATION: (hours and credits):

Required Hours	Course Title	Minimum Required Credits
48	Introduction to Radiography (48 required)	3
48	Radiographic Imaging 1 (48 required)	3
48	Radiographic Imaging 2 (48 required)	3
32-80	Radiographic Procedures 1 (32-80 required)	2-5
48	Imaging Equipment Operation (48 required)	3
48	Radiation Protection and Biology (48 required)	3
16	Radiographic Pathology (16 required)	1
96-340	Radiography Clinical (96-340 required)	3-6
384-432	**Total Program Hours***	**Total Credits** **21-27**

Program Course Detail:

Introduction to Radiography

Credits 3

Course Description Introduces students to the role of radiography in health care. Students apply medical terminology, legal and ethical considerations to patient care and pharmacology in the radiologic sciences.

Program Outcomes
Practice radiation safety principles
Provide quality patient care
Model professional and ethical behavior consistent with the A.R.R.T. Code of Ethics
Apply critical thinking and problem solving skills in the practice of diagnostic radiography

Radiographic Imaging

Credits 3

Course Description Introduces radiography students to the process and components of analog imaging. Students determine the factors that affect image quality including contrast, density, detail, and distortion.

Program Outcomes
Carryout the production and evaluation of radiographic images
Model professional and ethical behavior consistent with the A.R.R.T. Code of Ethics
Apply critical thinking and problem solving skills in the practice of diagnostic radiography

Radiographic Imaging

Credits 3

Course Description Explores film processing components as well as the principles and operation of digital imaging systems found in diagnostic radiology. Factors that impact image acquisition, display, archiving, and retrieval are discussed. Guidelines for selecting exposure factors and evaluating images within analog and digital systems. Principles of digital system quality assurance and maintenance are presented.

Program Outcomes
Carryout the production and evaluation of radiographic images
Model professional and ethical behavior consistent with the A.R.R.T. Code of Ethics
Apply critical thinking and problem solving skills in the practice of diagnostic radiography

Radiographic Procedures 1

Credits 2-5

Course Description Prepares radiography students to perform routine radiologic procedures on various parts of the body including the upper body, hip, pelvis, and ankle. Students apply knowledge of human anatomy to position the patient correctly to achieve the desired result.

Program Outcomes
Carryout the production and evaluation of radiographic images
Practice radiation safety principles

Radiation Protection and Biology

Credits 3

Course Description Prepares radiography students to protect themselves and others from exposure to radioactivity. Students examine the characteristics of radiation and how radiation affects cell biology. Students apply standards and guidelines for radiation exposure.

Program Outcomes
Practice radiation safety principles
Provide quality patient care

Radiographic Pathology	
Credits	1
Course Description	Prepares radiography students to determine the basic radiographic manifestations of pathological conditions. Students classify trauma related to site, complications, and prognosis and locate the radiographic appearance of pathologies.
Program Outcomes	Carryout the production and evaluation of radiographic images Apply critical thinking and problem solving skills in the practice of diagnostic radiography Model professional and ethical behavior consistent with the A.R.R.T. Code of Ethics
Radiography Clinical	
Credits	3-6
Category	Technical Studies
Course Description	This beginning level clinical course prepares radiography students to perform radiologic procedures on patients with extensive supervision and direction. Students apply radiation protection and standard precautions in the production of radiographs in a health care setting while adhering to legal and ethical guidelines. An emphasis of the course is the development of communication and critical thinking skills appropriate to the clinical setting.
Program Outcomes	Carryout the production and evaluation of radiographic images Practice radiation safety principles Provide quality patient care Apply computer skills in the radiographic clinical setting Model professional and ethical behavior consistent with the A.R.R.T. Code of Ethics Apply critical thinking and problem solving skills in the practice of diagnostic radiography

Standards:

B. Clinical Practice:	**F. Human Structure and Function:**
B.I. Clinical Practice	F.I. Anatomical Nomenclature
B.II. Procedural Performance	F.II. Chemical Composition
B.III. Clinical Competency	F.III. Cell Structure and Genetic Control
	F.IV. Metabolism
C. Digital Image Acquisition and Display:	F.V. Tissues
C.I. Basic Principles of Digital Radiography	F.VI. Skeletal System
C.II. Image Acquisition	F.VII. Muscular System
C.III. Image Acquisition Errors	F.VIII. Cardiovascular System
C.IV. Software (Default) Image Processing	F.IX. Respiratory System
C.V. Fundamental Principles of Exposure	F.X. Reproductive System
C.VI. Image Evaluation	
C.VII. Quality Assurance and Maintenance Issues	**G. Image Analysis:**
C.VIII. Display	G.I. Imaging Standards
	G.II. Image Appearance Characteristics
D. Ethics and Law in the Radiologic Sciences:	G.III. Procedural Factors
D.I. Ethics and Ethical Behavior	G.IV. Corrective Action
D.II. Ethical Issues in Health Care	
D.III. Legal Issues	**H. Imaging Equipment:**
D.IV. Patient Consent	H.I. X-ray Circuit
	H.II. Radiographic Equipment
E. Fundamentals of Radiologic Science and Health Care:	H.III. Diagnostic X-Ray Tubes
E.I. The Health Science Professions	H.VI. Quality Management
E.II. The Health Care Environment	
E.III. Regulatory Agencies	**I. Medical Terminology:**
E.IV. Radiology Organization	I.I. The Word-Building Process
E.V. Professional Credentialing	I.II. Medical Abbreviations and Symbols
E.VI. Professional Organizations	I.III. Radiologic Technology Procedures and Terminology
E.VII. Professional Development and Advancement	I.IV. Understanding Orders, Requests and Diagnostic Reports

Standards:

J. Patient Care in Radiologic Sciences:	**O. Radiographic Pathology:**
J.I. Radiographer and Health Care Team	O.I. Definitions/Terminology
J.II. Attitudes and Communication in Patient Care	O.II. Classifications (Definition, Examples, Sites, Complications, Prognosis)
J.III. Patient/Radiographer Interactions	O.III. Causes of Disease (Process, Examples)
J.IV. Safety and Transfer Positioning	O.IV. Radiologic Pathology (Definitions, Etiology, Examples, Sites, Complications, Prognosis, Radiographic Appearance, Procedural and
J.V. Evaluating Physical Needs	Technique Considerations, Appropriate Imaging Modality)
J.VI. Infection Control	
J.VII. Medical Emergencies	**P. Radiographic Procedures:**
J.VIII. Unique Situations and Trauma	P.I. Standard Terminology for Positioning and Projection
J.X. Tubes, Catheters, Lines and Collection Devices	P.II. General Considerations
	P.III. Patient Considerations
L. Radiation Biology:	P.IV. Positioning Considerations for Routine Radiographic Procedures
L.I. Introduction	P.V. Procedural Considerations for Contrast Studies
L.I.a. Molecular bonds	
L.I.b. Review of cell biology	**R. Film-Screen Image Acquisition and Processing:**
L.I.c. Types of ionizing radiation	R.I. Image Appearance Standards
L.I.d. Sources of medical radiation exposure	R.II. Optical Density
L.II. Biophysical Events	R.III. Contrast
L.III. Radiation Effects	R.IV. Recorded Detail/Spatial Resolution
L.IV. Radio sensitivity and Response	R.V. Distortion
	R.VI. Exposure Latitude
M. Radiation Production and Characteristics:	R.VII. Beam-limiting Devices
M.I. Structure of the Atom	R.VIII. Beam Filtration
M.II. Nature of Radiation	R.IX. Scattered and Secondary Radiation
M.III. X-Ray Production	R.X. Control of Remnant Beam/Exit Beam
M.IV. Interaction of Photons with Matter	R.XI. Exposure Factor Formulation
	R.XII. Exposure Factors
N. Radiation Protection:	R.XIII. Darkroom/Storage Environment
N.I. Introduction	R.XIV. Characteristics of Image Receptors
	R.XV. Image Receptor Holders and Intensifying Screens
	R.XVI. Automatic Processing
	R.XVII. Artifacts
	R.XVIII. Silver Recovery

Wisconsin Department of Safety and Professional Services

Office Location: 4822 Madison Yards Way
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RADIOGRAPHY EXAMINING BOARD

LIMITED X-RAY MACHINE OPERATOR (LXMO) PROGRAM CURRICULUM

APPLICANT: Complete this section and submit to certifying school for completion. Form must be returned directly from the school to the Department.

Last Name	**First Name**	**MI**	**Former / Maiden Name(s)**

Address (number/street)	(city)	(state)	(zip code)

Mailing Address (if different) (number/street)	(city)	(state)	(zip code)

Date of Birth	**Social Security Number** (voluntary-for use by school to locate your records)	**Date of Graduation** (Anticipated dates of graduation will not be accepted.)
__/__/____	___-___-____	__/__/____

Application Number	**Daytime Phone Number**
	___-___-____ **Ext** _____

ATTESTATION OF APPLICANT: I declare that I am the person referred to on this form and that all information required to be completed by me (the applicant for a credential), is complete and accurate to the best of my knowledge and belief. Furthermore, I declare that after completing the information that was required by me (and only that information) the form was forwarded to the relevant third-party for completion of the information asked of them. I also declare that to the best of my knowledge the completed form was provided to the Department of Safety and Professional Services by the relevant third-party (and not by me, the applicant). Finally, I declare that I understand that failure to provide the requested information, making any materially false statement and/or giving any materially false information in connection with my application for a credential may result in credential application processing delays; denial, revocation, suspension, or limitation of my credential; or any combination thereof; or such other penalties as may be provided by law. By signing below, I am signifying that I have read and understand the above declarations.

	__/__/____
Applicant Signature	**Date**

(If unable to provide a digital signature, please print and sign form.)

CERTIFYING SCHOOL: Complete this section for the above-named applicant and return directly to the Department using the LicensE Third-Party* Upload Portal at license.wi.gov. You will need the application number shown above. (*For form completion purposes, the term "Third-Party" refers to any non-applicant or non-DSPS individual or entity submitting required documentation in support of a credential application.)

Enter the number of classroom hours of study the applicant has completed in the eight (8) areas that are listed below. The total must be between the range of 384 - 432 hours or more.*

COURSE CONFIGURATION: (hours and credits)

Required Hours	Course Title	Minimum Required Credits
48	Introduction to Radiography (48 required)	3
48	Radiographic Imaging 1 (48 required)	3
48	Radiographic Imaging 2 (48 required)	3
32-80	Radiographic Procedures 1 (32-80 required)	2-5
48	Imaging Equipment Operation (48 required)	3
48	Radiation Protection and Biology (48 required)	3
16	Radiographic Pathology (16 required)	1
96-340	Radiography Clinical (96-340 required)	3-6
384-432	**Total Program Hours***	**Total Credits 21-27**

Continued on next page.

Wisconsin Department of Safety and Professional Services

Name of School

Address of School (number/street)

(city, state, zip code)

This school was accredited by

Was this school JRCERT approved at the time the applicant completed the required 384-432 hours of classroom study? ☐ **Yes** ☐ **No**

Number of Hours Completed _____ **Date Completed** __/__/____

ATTESTATION AND AFFIDAVIT OF THIRD-PARTY PROVIDING INFORMATION RELATED TO APPLICANT: I declare, on behalf of the third-party asked to provide information related to the applicant identified on this form, that the information provided is true and correct to the best of my knowledge and belief. I further declare that after completing the form I, or other third-party staff, will provide the completed form directly to the Wisconsin Department of Safety and Professional Services for review. By signing below, I am signifying that I have read, understand, and have complied with the above declarations. **I attest to the fact that the above named applicant completed 384-432 hours of classroom study in a training program in limited x-ray machine operator (LXMO) listed above.**

Signature of Dean or Department Head
(If unable to provide a digital signature, please print and sign form.)

Date __/__/____

Printed Name

Phone ___-___-____ Ext_____

Title

Description:

LXMO curriculum prepares individuals for a career in diagnostic imaging. The LXMO produces images of limited area of the human body to aid physicians in the diagnosis of injuries and diseases. Applicants for a LXMO permit meeting all of the curricular requirements would be eligible to take the State of Wisconsin certification examination administered by the American Registry of Radiography Technologists (ARRT). Upon completion, individuals may obtain employment in x-ray departments associated with medical clinics, veterinary clinics, and private offices. The LXMO curriculum focuses on theoretical and applied radiography and includes a clinical experience in an imaging department. Applicants are expected to learn to use x-ray imaging machines to demonstrate body parts on imaging receptors for diagnostic purposes and minimizing patient radiation dose.

External Requirements

Curriculum Outcomes

A. Carryout the production and evaluation of radiographic images

Direct Measures: Clinical Evaluation
Criteria:

1. Position patient for specified examination
2. Select appropriate image production exposure factors and make exposure
3. Evaluate final images for acceptable exposure quality, anatomical presentation, and
4. patient identifying information

B. Apply computer skills in the radiographic clinical setting

Direct Measures: Clinical Evaluation
Criteria:

1. Orient and annotate image
2. Prepare and send images to archive or PACS

C. Practice radiation safety principles

Direct Measures: Clinical Evaluation
Criteria:

1. Use proper collimation
2. Shield patient and others
3. Wear personal dosimeter
4. Practice cardinal principles of radiation protections: time, distance, and shielding

D. Provide quality patient care

Direct Measures: Clinical Evaluation
Criteria:

1. Identify correct patient and procedure to perform
2. Assess patient condition and respond accordingly
3. Obtain and document accurate patient history
4. Explain exam and give clear instructions
5. Communicate/interact with patients as appropriate

E. Model professional and ethical behavior consistent with the State of Wisconsin LXMO Code of Ethics

Direct Measures: Clinical Evaluation
Criteria

1. Maintain confidentiality
2. Interact professionally with healthcare professionals, patients, and family
3. Respect diversity

F. Apply critical thinking and problem solving skills in the practice of diagnostic radiography

Direct Measures: Clinical Evaluation
Criteria:

1. Adapt procedures to patient condition
2. Adapt exposure techniques to patient's physical and pathological conditions
3. Evaluate image for diagnostic quality and implement corrective action if necessary
4. Use logic and judgement in performing procedure efficiently

COURSE CONFIGURATION: (hours and credits):

Required Hours	Course Title	Minimum Required Credits
48	Introduction to Radiography (48 required)	3
48	Radiographic Imaging 1 (48 required)	3
48	Radiographic Imaging 2 (48 required)	3
32-80	Radiographic Procedures 1 (32-80 required)	2-5
48	Imaging Equipment Operation (48 required)	3
48	Radiation Protection and Biology (48 required)	3
16	Radiographic Pathology (16 required)	1
96-340	Radiography Clinical (96-340 required)	3-6
384-432	**Total Program Hours***	**Total Credits** **21-27**

Program Course Detail:

Introduction to Radiography

Credits 3

Course Description Introduces students to the role of radiography in health care. Students apply medical terminology, legal and ethical considerations to patient care and pharmacology in the radiologic sciences.

Program Outcomes
Practice radiation safety principles
Provide quality patient care
Model professional and ethical behavior consistent with the A.R.R.T. Code of Ethics
Apply critical thinking and problem solving skills in the practice of diagnostic radiography

Radiographic Imaging

Credits 3

Course Description Introduces radiography students to the process and components of analog imaging. Students determine the factors that affect image quality including contrast, density, detail, and distortion.

Program Outcomes
Carryout the production and evaluation of radiographic images
Model professional and ethical behavior consistent with the A.R.R.T. Code of Ethics
Apply critical thinking and problem solving skills in the practice of diagnostic radiography

Radiographic Imaging

Credits 3

Course Description Explores film processing components as well as the principles and operation of digital imaging systems found in diagnostic radiology. Factors that impact image acquisition, display, archiving, and retrieval are discussed. Guidelines for selecting exposure factors and evaluating images within analog and digital systems. Principles of digital system quality assurance and maintenance are presented.

Program Outcomes
Carryout the production and evaluation of radiographic images
Model professional and ethical behavior consistent with the A.R.R.T. Code of Ethics
Apply critical thinking and problem solving skills in the practice of diagnostic radiography

Radiographic Procedures 1

Credits 2-5

Course Description Prepares radiography students to perform routine radiologic procedures on various parts of the body including the upper body, hip, pelvis, and ankle. Students apply knowledge of human anatomy to position the patient correctly to achieve the desired result.

Program Outcomes
Carryout the production and evaluation of radiographic images
Practice radiation safety principles

Radiation Protection and Biology

Credits 3

Course Description Prepares radiography students to protect themselves and others from exposure to radioactivity. Students examine the characteristics of radiation and how radiation affects cell biology. Students apply standards and guidelines for radiation exposure.

Program Outcomes
Practice radiation safety principles
Provide quality patient care

Radiographic Pathology	
Credits	1
Course Description	Prepares radiography students to determine the basic radiographic manifestations of pathological conditions. Students classify trauma related to site, complications, and prognosis and locate the radiographic appearance of pathologies.
Program Outcomes	Carryout the production and evaluation of radiographic images Apply critical thinking and problem solving skills in the practice of diagnostic radiography Model professional and ethical behavior consistent with the A.R.R.T. Code of Ethics
Radiography Clinical	
Credits	3-6
Category	Technical Studies
Course Description	This beginning level clinical course prepares radiography students to perform radiologic procedures on patients with extensive supervision and direction. Students apply radiation protection and standard precautions in the production of radiographs in a health care setting while adhering to legal and ethical guidelines. An emphasis of the course is the development of communication and critical thinking skills appropriate to the clinical setting.
Program Outcomes	Carryout the production and evaluation of radiographic images Practice radiation safety principles Provide quality patient care Apply computer skills in the radiographic clinical setting Model professional and ethical behavior consistent with the A.R.R.T. Code of Ethics Apply critical thinking and problem solving skills in the practice of diagnostic radiography

Standards:

B. Clinical Practice:	**F. Human Structure and Function:**
B.I. Clinical Practice	F.I. Anatomical Nomenclature
B.II. Procedural Performance	F.II. Chemical Composition
B.III. Clinical Competency	F.III. Cell Structure and Genetic Control
	F.IV. Metabolism
C. Digital Image Acquisition and Display:	F.V. Tissues
C.I. Basic Principles of Digital Radiography	F.VI. Skeletal System
C.II. Image Acquisition	F.VII. Muscular System
C.III. Image Acquisition Errors	F.VIII. Cardiovascular System
C.IV. Software (Default) Image Processing	F.IX. Respiratory System
C.V. Fundamental Principles of Exposure	F.X. Reproductive System
C.VI. Image Evaluation	
C.VII. Quality Assurance and Maintenance Issues	**G. Image Analysis:**
C.VIII. Display	G.I. Imaging Standards
	G.II. Image Appearance Characteristics
D. Ethics and Law in the Radiologic Sciences:	G.III. Procedural Factors
D.I. Ethics and Ethical Behavior	G.IV. Corrective Action
D.II. Ethical Issues in Health Care	
D.III. Legal Issues	**H. Imaging Equipment:**
D.IV. Patient Consent	H.I. X-ray Circuit
	H.II. Radiographic Equipment
E. Fundamentals of Radiologic Science and Health Care:	H.III. Diagnostic X-Ray Tubes
E.I. The Health Science Professions	H.VI. Quality Management
E.II. The Health Care Environment	
E.III. Regulatory Agencies	**I. Medical Terminology:**
E.IV. Radiology Organization	I.I. The Word-Building Process
E.V. Professional Credentialing	I.II. Medical Abbreviations and Symbols
E.VI. Professional Organizations	I.III. Radiologic Technology Procedures and Terminology
E.VII. Professional Development and Advancement	I.IV. Understanding Orders, Requests and Diagnostic Reports

Standards:

J. Patient Care in Radiologic Sciences:	**O. Radiographic Pathology:**
J.I. Radiographer and Health Care Team	O.I. Definitions/Terminology
J.II. Attitudes and Communication in Patient Care	O.II. Classifications (Definition, Examples, Sites, Complications, Prognosis)
J.III. Patient/Radiographer Interactions	O.III. Causes of Disease (Process, Examples)
J.IV. Safety and Transfer Positioning	O.IV. Radiologic Pathology (Definitions, Etiology, Examples, Sites, Complications, Prognosis, Radiographic Appearance, Procedural and
J.V. Evaluating Physical Needs	Technique Considerations, Appropriate Imaging Modality)
J.VI. Infection Control	
J.VII. Medical Emergencies	**P. Radiographic Procedures:**
J.VIII. Unique Situations and Trauma	P.I. Standard Terminology for Positioning and Projection
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