CERTIFICATE PROGRAM

CT IMAGING CERTIFICATE

for the RADIOLOGICAL and/or NUCLEAR MEDICINE TECHNOLOGIST

CAMRT ACTRM

CANDIDATE HANDBOOK

2025

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Introduction

CT imaging is a vital diagnostic tool in medical imaging. It produces a volume of data that can be manipulated to clearly demonstrate bodily structures in various 3D representations.

With advances in image quality and reduction in scan times, CT experienced enormous growth in clinical use. These advances have led to increased utilization and in some cases the elimination of some previously performed x-ray procedures. CT Imaging has become routine in the digital world of medical imaging.

Candidates who successfully complete the didactic and clinical components from CAMRT are eligible to receive a Certificate in CT Imaging and can use the credential "CTIC". This certificate program is created with the intent to ensure that successful candidates are highly skilled in CT, are exceptional colleagues and caregivers, and provide exceptional patient care.

Individuals with questions about certificate programs are encouraged to contact us. **Email** is preferred for the quickest service; French assistance is available via email. Do not use postal mail to submit documents, questions or certificate-related printouts unless directly requested to do so.

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Web site: ***www.camrt.ca***

RECENT UPDATES

The CTIC program was significantly revised in 2021 to reflect changes to the entry-to-practice requirements and to ensure the programs continue to reflect current and emerging practice. The revisions ensure this certificate program continues to provide MRTs an opportunity to enhance their knowledge and to gain recognition for their clinical expertise in CT Imaging.

1. One of the key changes to the CTIC Program, effective 2021, is a mandatory **CT Anatomy Exam**:
    - This anatomy requirement is delivered in a self-directed format and is accompanied by a Study Guide, recommended textbooks and sample exam questions. Candidates can register for this exam online in the CAMRT CPD catalogue.
    - If you have not completed CT Imaging 2 and CT Imaging 3 prior to January 2021, you will be required to successfully complete the CT Anatomy exam as part of your CTIC didactic requirements.

2. Another significant opportunity is the chance to **fast-track into Thompson Rivers University's Bachelor of Health Science program** after completing an eligible CTIC program.
    - Thanks to a new five-year articulation agreement involving CAMRT's Computed Tomography Imaging Certificate (CTIC) and Thompson Rivers University's Bachelor of Health Science program, TRU will accept a recently completed CTIC certificate program for 10.5 credits towards your degree completion. We hope that you'll find it brings extra value to our members programming!
    - Visit the Transfer Opportunities page at Thompson Rivers University and select "Canadian Association of Medical Radiation Technologists" from the Partners list to see how you can apply for credit.
    - This is a pilot project and future agreements are not guaranteed. Older CTIC programs are not grandfathered through this agreement.

3. In 2024, for a 2025 release, updates to the foundational courses that make up the CTIC (CT Imaging 1-3) were made. Please note that these updates will be rolled out through 2025. Please note that you must follow the CTIC program as outlined in the year you register for the CTIC.

Purpose of the Program

The intent of the Certificate in CT Imaging is to provide a mechanism for radiological technology **and/or** nuclear medicine technologists (MRTs) to demonstrate knowledge and competence in CT Imaging, to promote standards of excellence within this clinical area, and to identify those who have met a nationally recognized standard.

This certificate is intended to:

- be dynamic and progressive in nature address the current and future challenges in CT Imaging
- provide a Canadian credential that is sought by MRTs
- provide a Canadian credential that is advocated by employers
- provide an opportunity for continuing professional development for continuing competence
- enhance safe and effective practice as described by the CAMRT Member Code of Ethics and Professional Conduct– see https://www.camrt.ca/mrt-profession/professional-resources/code-of-ethics/.

Program Eligibility

The CAMRT Certificate in CT Imaging is available to:

- Medical Radiation Technologists who have been certified by the CAMRT in the practice of radiological technology or nuclear medicine
- Internationally educated medical radiation technologists (IEMRTs) in the specialty of radiological technology or nuclear medicine who are graduates of medical radiation technology programs similar to Canadian accredited programs
    - Documentation required from IEMRTs*
        - **Original letter** from entry-level education program verifying length of program to include both didactic and clinical components of the program
        - **Notarized copy** of diploma/degree/certificate from entry-level education program
        - **Letter of Attestation – APPENDIX A**

Required documentation not received within 30 days of program registration will result in a program cancellation/partial refund. **CAMRT strongly recommends candidates obtain required documentation prior to program registration and send it electronically in a SINGLE SCAN or PDF within the required timeframe to CPD@camrt.ca or specialtycertificates@camrt.ca. Candidates may begin working on the Summary of Clinical Competence only upon confirmation and approval of received documentation from CAMRT.*

Contact specialtycertificates@camrt.ca for further information.

Program Registration

Registration for the Certificate in CT Imaging (CTIC) program is done through the CAMRT website. Completion of courses eligible for the program does not register you for the certificate program – **you must register yourself once you have met the pre-requisite requirements**.

The prerequisite for this Certificate Program is the successful completion **or** Prior Learning Assessment and Recognition* (PLAR) of CAMRT's CT Imaging (CTI) 1 exam or first eligible course from the CT series. A **minimum final exam mark of 75% is required**.

The Summary of Clinical Competence for the CT program will be made available in the candidate's personal profile on the CAMRT website at the time of program confirmation. **Competencies performed before registration into the certificate program will not be considered for this program.**

Required documentation for IEMRTs not received within 30 days of program registration will result in a program cancellation/partial refund.

See APPENDIX B for PLAR eligibility criteria

Program Overview

The CTIC program has both didactic and clinical components. You must register in each course individually (didactic components) *and* into the certificate program to access the Summary of Clinical Competence (clinical component) **after** meeting any prerequisite requirements.

The CTIC program must be completed within 5 years of the successful completion of the first eligible CT course in the series – usually, this is your pre-requisite course.

After review and approval of all components by the CT Imaging Committee, the Certificate in CT Imaging is granted to the technologist. The credential granted is **CTIC**.

It is the intent that those who earn the CTIC credential will continue their professional development. Ongoing continuing education is recommended to remain current in the dynamic field of CT Imaging.

NOTE: CAMRT both advises and expects that the candidate will hold sufficient personal liability coverage and any other employer required insurance coverage (ex: WSIB, AD & D) and receive the required permissions needed to complete the clinical requirements as outlined in

the SCC. It is the candidate's responsibility to ensure they have the appropriate insurance coverage and permissions from their employer to complete this certificate program.

Didactic Component

The didactic/coursework component consists of:

- CAMRT CT Imaging 1 (or PLAR)*
- CAMRT CT Anatomy Exam**
- CAMRT CT Imaging 2***
- CAMRT CT Imaging 3***
- (1) Quick Self Study from the following choices:
    - *CT Colonography, Cardiac CT or Stroke* and *CT Perfusion*
        - *Must be completed within the five years prior to SCC submission.*

Candidates must pass the courses and achieve a minimum score of **75%** on the final examinations**** of each course applied to the CTIC.

Full course policies are available on our website, by request and upon registration, and include information on registering, failure of exams/quizzes, access, academic integrity rewrites, and fees. You, as a candidate, are bound by these policies – please review them carefully and ask CAMRT if you have questions.

Candidates who feel that they have the essential knowledge gained through relevant work experience and professional development may **challenge** the final exams for each of the three CT courses. A minimum mark of 75% must be achieved on any challenge exam. Rewrites are **not** allowed for challenge exams for the CT courses.

The Summary of Clinical Competence **may not be submitted until all didactic courses are complete**. All components must be complete within the five-year timeframe.

**See APPENDIX B for PLAR criteria*
***This CT Anatomy exam is a **mandatory** requirement for ANY candidate who did not successfully complete CT Imaging 2 and CT Imaging 3 as of January 2021 and wishes to proceed to the CTIC. Individuals have the option of enrolling in Sectional Anatomy 1 and Sectional Anatomy 2 full-length courses in lieu of the sectional anatomy exam, if they are not comfortable with the self-directed/self-study format or feel they need additional support and guidance in learning sectional anatomy.*
****See APPENDIX C for course objectives.*
***** See APPENDIX D for exam blueprints.*

Clinical Component

The **Summary of Clinical Competence (SCC)** is a list of procedures and associated competencies that must be assessed by a clinical advisor and/or delegated assessors. This represents the clinical component of the certificate program. **Only competencies performed *after* program registration will be accepted in the SCC.** The clinical component is a practicum that requires the candidate to practice in CT and complete competencies under the following conditions:

- Practice under the supervision of an eligible Clinical Advisor (CA) – at least one is required per site. They and all Delegated Assessors (DA) should review the roles & responsibilities of the CA and DA, and should sign and date the contact information pages in the SCC before they actively work on the SCC.
- Complete the competencies listed in the SCC.
- Complete the CT experience requirement outlined in the SCC:
    - The candidate must practice for at least 16 weeks (80 full time shifts or equivalent*) as a certified MRT in an **18-month block** within the allowed 5-year timeframe of the certificate program,
    - This experience may predate registration into the certificate program but may not predate completion of the first pre-requisite to the program.
    - This experience requirement is signed off on by the supervisor or manager of the site(s) at which the candidate completed their work experience.
    - Please ensure that you include a full start and end date (day, month, year) for the experience beginning and being achieved on the experience form.

The candidate is responsible for ensuring that all sections of the Summary are complete. A resubmission fee will apply for any incomplete submission, including any outstanding didactic requirements.

Dates and signatures must be full (no initials, please make the date, month, and year clearly identifiable) and in "ink" (digital signatures are not accepted at this time).

Audits will be conducted at the Committee's discretion to ensure the proper process has been followed. Approximately 10% (or higher) of SCCs are audited per year.

*If you work part-time, split or hybrid shifts or another unusual shift pattern, please contact CAMRT to discuss your eligibility for the CTIC program experience requirement.

Clinical Advisor (CA)

It is the candidate's responsibility to obtain a CA and site for the clinical component of the program. If multiple sites are used, a CA must be identified at each site. Please ensure that the CA completes all SCC introductory forms (contact information, checklist, roles, and responsibilities form) at the time when you register into the program to ensure the clinical advisor/delegated assessor is made aware of their role.

Each Advisor is responsible for assigning their own Delegated Assessor (DA), if applicable, and to ensure they have signed all forms and pages where these signatures appear. All signatures throughout the SCC must match. The following criteria also apply to international CAs for international candidates.

The Role of a Clinical Advisor form can be found in APPENDIX E.

The Clinical Advisor must:

1. Be a medical radiation technologist with a CAMRT CTIC credential **and/or** a medical radiation technologist having a minimum of **five years' experience** in the practice of CT Imaging*
2. Be currently practicing in CT
3. Not be currently registered in any of the CT Certificate programs
4. Identify others delegated to assess the candidate and ensure they are credentialed and competent in their practice
5. Perform the assessment on the candidate for all procedures/associated competencies or delegate the assessment to another credentialed technologist
6. Attest to overall competency of the candidate by signing at the end of each module.

Delegated Assessor(s)

It is the **Clinical Advisor's** responsibility to identify and assign a Delegated Assessor (DA) at their clinical site, if they wish to use one, and to ensure they are aware of their role. All professionals acting as delegated assessors must be identified on the Delegated Assessors Contact Information page in the SCC.

Though we recognize their utility, please ensure that you do use your DA(s) judiciously and that they sign the contact confirmation – too many DA contacts may cause confusion and slow down review of your SCC.

The delegated assessor must:

1. Be a medical radiation technologist with a CAMRT CTIC credential **and/or** a medical radiation technologist having a minimum **of two years' experience** in the practice of CT imaging
2. Be currently practicing in CT
3. Not be currently registered in the CTIC Certificate program

The CA and/or DA will observe and assess each procedure/competency and sign/date the Summary of Clinical Competence (SCC) on the date the competency has been verified and confirmed.

The **module** sign-off and date must be completed by your CA and must represent the date by which all competencies have been verified and completed. You must retain a record (or have access to a record) of the completion of all mandatory competencies in case of audit.

**If this is not possible, please contact CAMRT.*

Clinical Advisors outside of Canada:

The following must be submitted within 30 days of program registration*:

- A notarized copy of the advisor's credentials (degree, diploma, or certificate)
- A copy of the ***Internationally Educated Medical Radiation Technologist Clinical Advisor Verification of Experience*** **form (See APPENDIX F)**. The hospital seal must be affixed to this form prior to submission.
- Clinical Advisor (CA) Check List (**See APPENDIX G**)

All internationally educated clinical advisors must submit the *IEMRT Clinical Advisor Verification of Eligibility* Form.**

**Required documentation not received within 30 days of program registration will result in a program cancellation/partial refund.*
*****Including those who have the CTIC credential.***
CAMRT strongly recommends candidates obtain required documentation prior to program registration and send it electronically in a SINGLE SCAN or PDF within the required timeframe to CPD@camrt.ca or specialtycertificates@camrt.ca.
Candidates may begin working on the Summary of Clinical Competence only upon approval of received documentation from CAMRT.

Format of the Summary of Clinical Competence

You must retain a record (or have access to a record) of the completion of all mandatory competencies in case of audit. The following provides an overview of the requirements in the Summary of Clinical Competence:

- Demographic information
- CTIC Checklist
- Verification of practice in CT
- Identification of the clinical advisor and delegates
- Guidelines for assessment of competency requirements
- Professional Accountability Form
- List of procedures and associated competencies required
- Declaration of Completion

The list of procedures and associated competencies required are presented in the following modules:

Module 1 – Patient Care (**all mandatory**)

- CPR (BLS or equivalent required) *
- Patient vital signs
- Patient assessment
- Universal precautions
- Exam indicators
- Patient transfer
- Monitor 0_2 administration
- Verify informed consent
- Patient education

** The CPR must be Basic Life Support (BLS) level or higher, the Heart and Stroke and St. John's Ambulance BLS is most common; we can review an equivalent. The CPR should be valid throughout the completion of the SCC competencies and must be valid at the time of submission.*

Module 2 - Contrast media administration (**all mandatory**)

- Evaluate lab results
- Contrast media selection
- Contrast media preparation
- Site selection
- Venipuncture
- Use of power injector
- Patient monitoring

Module 3 - Image manipulation and quality assurance

- **Four (4) mandatory**
  - Measurement
  - ROI

- Calibration
- Dose reduction strategy

- **Three (3) electives**
  - MPR
  - MIP
  - 3D reconstruction

Module 4 - Head procedures

- **Seven (7) mandatory**
  - Enhanced head
  - Unenhanced head
  - Trauma
  - Orbits & Facial bones
  - Sinuses
  - Temporal bones
  - CTA Head
- **Three (3) electives**
  - TM joints / IACs
  - 3D bone reconstruction
  - Pituitary gland

Module 5 - Neck & chest procedures

- **Five (5) mandatory**
  - Enhanced neck
  - Enhanced chest
  - Unenhanced chest
  - Pulmonary embolism
  - Carotids

- **Three (3) electives**
  - High resolution chest
  - Cardiac
  - Thoracic aorta

Module 6 - Abdomen & pelvis procedures

- **Six (6) mandatory**
  - Enhanced abdomen / pelvis
  - Unenhanced abdomen / pelvis
  - Abdominal Aorta
  - Liver
  - Kidneys
  - Pancreas
- **Four (4) electives**
  - Trauma abdomen / pelvis
  - Colonography
  - Adrenals
  - 3D vascular reconstruction

Module 7 – Spine and extremities

- **Six (6) mandatory**
  - Cervical spine
  - Lumbar spine
  - Post-processing / retrospective (Spine/extremity)
  - Lower extremity
  - Upper extremity
  - Bony Pelvic Structure
- **One (1) elective**
  - Thoracic spine

Module 8 - Other Modalities/Miscellaneous (**all electives**) involve performance, participation, or observation - as indicated.

- CT-guided Intervention
- SPECT CT
- PET/CT
- CT Sim
- CT Pediatrics**
- CT Perfusion

***For the purpose of the CTIC, a pediatric exam must include the use of adapted scan parameters that are specific to an infant, child or adolescent.*

Competencies should not include any patient identifiers (health or exam number).

Candidates must complete a minimum of 10 elective competencies. Electives must be performed clinically unless the SCC procedure indicates otherwise.

Proficiency for achievement of competency for this program is characterized as follows:

- When presented with situations, the MRT performs relevant competencies in a manner consistent with generally accepted standards and practices in the profession, independently and within a reasonable timeframe. The MRT anticipates what outcomes to expect in a given situation, and responds appropriately, selecting and performing competencies in an informed manner.

- The MRT recognizes unusual, difficult to resolve and complex situations which may be beyond their capacity. The MRT takes appropriate and ethical steps to address these situations, which may include consulting with others, seeking supervision or mentorship, reviewing literature or documentation, or referring the situation to the appropriate healthcare professional.

Program Extension

Extensions beyond the five-year time frame are available under exceptional circumstances. Contact CAMRT **prior to your program expiration date** for information.

Extensions to accommodate protected leaves within your program (i.e. parental leaves) should be communicated to CAMRT **prior to your program expiration date** to ensure that you can be assisted.

There is a fee associated with extension requests. Extensions are not guaranteed. You can view your program end date in your Portal.

Extensions for specific extenuating circumstances can be made by contacting CAMRT via email at specialtycertificates@camrt.ca.

Submission of Summary of Clinical Competence

Candidates must submit the completed Summary of Clinical Competence to the CAMRT for review and approval by the CT Imaging Committee.

Ensure that you submit one single, in order, complete PDF that includes all CPR and other documentation. Please name the file "SCC Submission_LASTNAME".

Electronic copies submitted as one file may be submitted to specialtycertificates@camrt.ca.

Incomplete Summary of Clinical Competence – Resubmission Fee

Any Summary of Clinical Competence deemed incomplete will be subject to a resubmission fee. This also applies to any incomplete didactic requirements.

Continuing Professional Development

It is the intent that those who earn the CTIC credential will continue their professional development. Continuing education is recommended to remain current in the dynamic field of CT Imaging.

APPENDIX A

INTERNATIONALLY EDUCATED MEDICAL RADIATION TECHNOLOGISTS
CERTIFICATE PROGRAM REGISTRATION ATTESTATION STATEMENT

Included with this signed statement, is the required documentation to finalize my Certificate Program Application with the Canadian Association of Medical Radiation Technologists.

Candidate Name: _____

Certificate Program: _____

Title of Program Completed: _____

Name of Diploma/Degree: _____

Educational Institution for theoretical instruction: _____

Institution for Clinical Training: _____

Length of Total Program: Theoretical (months) [ ] **Clinical (months)** [ ]

By signing below, I verify that:

- ✓ All statements and documentation in this application are accurate. I understand that a false or misleading statement, omission or misrepresentation may compromise my registration request.
- ✓ The documentation attached regarding my education program and/or my clinical advisor is original and has not been modified in any way.
- ✓ I authorize CAMRT to contact any authority, institution, association, body or person in any jurisdiction to verify the statements in my application and related documents.
- ✓ I understand that I may be required to submit further information if required.

_____ _____

Signature of Applicant Date (month/day/year)

APPENDIX B

Prior Learning Assessment and Recognition (PLAR) for CT Imaging 1 – ELIGIBILITY REQUIREMENTS

Non-refundable prior learning assessment and recognition fee:
$75 for members;
$150 for non-members.

Graduates from Canadian accredited radiological technology or nuclear medicine programs may be eligible for prior recognition of learning for CAMRT's CT Imaging 1. Prior learning (based on the criteria below) is considered equivalent to CAMRT's CT Imaging 1 and upon approval from CAMRT, candidates may proceed to the next course in the series. It is important to note that PLAR approval will trigger the 5-year timeline allowed for the CTIC program.

PLAR Eligibility requirements include:
1. Graduates from a Canadian accredited radiological technology or nuclear medicine programs whose applicable courses have been reviewed and approved by the CAMRT, within 3 years of PLAR application. Candidates will be required to select their program during the registration process. See list of eligible programs and courses on our website.

2. Graduated from the accredited education program **within 3 years of PLAR application**. This timeline ensures currency in foundational knowledge.

3. Provide evidence, via OFFICIAL TRANSCRIPT**, of an overall 75% average (or greater) in all relevant didactic courses. Candidates must upload their transcript during the registration process.
***An official transcript is a complete and final representation of a student's academic record on school letterhead. It must bear the embossed seal, date issued and the Registrar's signature. A resubmission fee will apply for candidates submitting unofficial documents.*

Approval of the prior learning assessment and recognition for CT Imaging 1*** will trigger the candidate's CTIC 5-year timeline. This program start date will be automatically defaulted to the closest CAMRT exam date (May or November).
****or upon completion of any of the other CAMRT CT Imaging courses (whichever occurs first).*

APPENDIX C

CT Imaging 1 Course Objectives

Chapter 1

Upon completion of this chapter, you should be able to:

- outline the process of CT.
- explain the role of Godfrey Hounsfield
- chart and break down the four basic steps to achieve a CT image.
- discuss the concept of digital processing.
- determine the role of applications and systems software.
- recognize the role of CT applications.
- explain the principle and role of mobile CT.
- explain the principle and role of CT fluoroscopy.
- explain the principle and role of dual source CT.
- explain the principle and role of CT simulation.
- explain the principle and role of CT in Nuclear Medicine.
- characterize the various acquisition components comprising a CT scanner.

Chapter 2

Upon completion of this chapter, you should be able to:

- recognize the principle and role of the localizer scan.
- evaluate and diagram the various types of multi-row detector systems.
- compare and contrast the two types of detector arrays.
- list the advantages of the higher slice scanners.
- discuss the principle and role of the data acquisition system.
- outline and evaluate the options available in a CT scan set-up.
- determine and demonstrate the optimal use of scan parameters.
- classify and characterize the four factors that affect radiation.
- explain and apply Beer's Law.
- explain and apply Euler's number.
- explain and apply the linear attenuation coefficient.
- solve for the linear attenuation coefficient given the number of photons involved.
- characterize the role of voxels and views in CT.
- explain and apply the concept of CT numbers.
- solve for the CT number given the linear attenuation coefficient of a tissue.
- solve for the linear attenuation coefficient given the CT number of a tissue.
- assess the role of the array processor.
- illustrate the concept of back-projection form of reconstruction.

- assess the role of filtered back projection.
- assess the role of adaptive statistical iterative reconstruction.

Chapter 3

Upon completion of this chapter, you should be able to:

- explain and demonstrate the concept of windowing.
- contrast and compare typical CT number ranges for various tissues.
- evaluate the role of image display software available.
- implement the various types of image display software available.
- analyse the role of the diagnostic imaging workstation.
- analyse the role of the CT simulator workstation.
- list the scanning restrictions for an MPR image.
- explain the concept of maximum intensity projection.
- explain the concept of three-dimensional imaging.
- explain the concept of isocentre marking and contouring for CT Simulation.
- characterize the placement of radiation treatment fields.
- assess the role of shielding in therapy.
- evaluate the role in therapy of fusion involving CT, MRI & PET images.

Chapter 4

Upon completion of this chapter, you should be able to:

- classify and illustrate temporal resolution.
- determine the factors that affect temporal resolution.
- classify and explain spatial resolution.
- determine the factors that affect spatial resolution.
- classify and explain contrast resolution.
- determine the factors that affect contrast resolution.
- classify and explain image noise.
- determine the factors that affect image noise.
- describe the concept of uniformity.
- describe the concept of linearity.
- recognize and explain patient–related artifacts.
- determine the factors that cause patient-related artifacts.
- recognize and explain equipment–related artifacts.
- determine the factors that cause equipment-related artifacts.
- develop and design a CT preventative maintenance program.
- evaluate current CT preventative maintenance program.
- evaluate the role of a Catphan phantom.

- know the guideline for laser QA for CT simulators.
- develop and design a CT quality assurance program.
- evaluate current CT quality assurance program.

Chapter 5

Upon completion of this chapter, you should be able to:

- compare dose expression quantities and measurements.
- determine contrast dose expression quantities and measurements.
- evaluate typical patient dose values.
- determine scanner design factors that affect patient dose.
- implement steps to reduce patient dose for each of these factors.
- determine operating parameter factors that affect patient dose.
- implement steps to reduce patient dose for each of these factors.
- determine patient factors that affect patient dose.
- implement steps to reduce patient dose for each of these factors.
- apply recommendations of dose reduction campaigns.
- evaluate current site radiation protection program.
- implement a program of radiation protection.

Chapter 6

Upon completion of this chapter, you should be able to:

- evaluate the role of patient screening.
- discuss the concept of consent and develop a consent form.
- evaluate the role of patient education regarding contrast media injection.
- apply tools to assess and monitor the patient for contrast medium injection.
- assess the risk of contrast-induced nephropathy.
- assess the patient for signs of adverse reactions.
- compare various types on contrast media available.
- apply measures to reduce the risk of contrast-induced nephropathy.
- evaluate current site IV injection program.
- implement an IV injection program.
- evaluate current site contrast media handling and administration.
- implement a contrast media handling and administration program.
- determine the factors that affect contrast enhancement and scan timing.
- implement steps to optimize contrast enhancement.

CT Imaging 2 Course Objectives

Chapter 1

At the conclusion of this section, the learner will be able to:

» Indicate reasoning for performing or not performing CT scans of the head

» Recognize when contrast media is indicated and contraindicated when imaging the head

» Outline different features of different contrast media injection techniques

» Recognize key indicators for performing head scans for trauma and headache and spine

» Outline key principles of dual energy scanners and their applications to imaging of the head and neck

Chapter 2

Upon completion of this chapter, the learner will be able to:

» Recognize normal features and variants in soft tissue areas of the brain

» Recognize how contrast media enhances diagnosis of some pathology

» Identify features that describe pathological processes in the brain

» Select and modify the correct scan protocol to confirm the diagnosis

» Adapt scan parameters to optimize imaging of brain or cranium for interpretation based on provisional diagnosis

» Identify key indicators of pathology in the brain and the impact they have

» Identify common CT findings of congenital, infectious, and neoplastic pathological processes of the brain and the resulting radiographic manifestations

Chapter 3

Upon completing this chapter, the learner will be able to:

» Adapt scan parameters to optimize imaging of facial bones, sella, and temporal bones for interpretation based on provisional diagnosis

» Interpret the appearance of most common pathologies seen on computed tomography (CT) scans of the skull, facial bones, sella, and temporal bones

» Illustrate the pathological process behind the most common pathologies seen on CT scans of the skull, facial bones, sella, and temporal bones

» Assess, and solve for diagnosis, a case study presentation involving facial bones, sella, and temporal bones

» Make a diagnosis based on patient symptoms and injuries

» Identify the target anatomical area based on the diagnosis

Chapter 4

Upon completing this chapter, the learner will be able to:

» Adapt scan parameters to optimize imaging of orbits and sinuses for interpretation based on provisional diagnosis

» Interpret the appearance of most common orbit and sinus pathologies seen on computed tomography (CT) scans

» Illustrate the pathological process behind the most common pathologies seen on CT scans of the orbits and sinuses

» Assess, and solve for diagnosis, a case study presentation involving the orbits and sinuses

» Make a diagnosis based on patient symptoms and injuries

» Identify the target anatomical area based on the diagnosis

» Select and modify the correct scan protocol to confirm the diagnosis

Chapter 5

Upon completing this chapter, the learner will be able to:

» Adapt scan parameters to optimize imaging of the neck and spine for interpretation based on provisional diagnosis

» Interpret the appearance of most common neck and spine pathologies seen on CT scans

» Illustrate the pathological process behind the most common pathologies seen on CT scans of the neck and spine

» Identify features that describe pathological processes in the brain and arteries that supply it

» Assess, and solve for diagnosis, a case study presentation involving the neck and spine

» Make a diagnosis based on patient symptoms and injuries

» Identify the target anatomical area based on the diagnosis

» Select and modify the correct scan protocol to confirm the diagnosis

CT Imaging 3 Course Objectives

Chapter 1
At the conclusion of this section, the learner will be able to:

» Indicate reasons for performing a CT scan of the thorax.

» Acknowledge the role of technologists in preparing for CT scans.

» Recognize the importance of contrast media administration in thoracic CT.

» Outline features of different contrast optimization techniques.

» Identify unique features of thoracic CT protocols.

» Describe key anatomical components of the lung and vessel layers

» Recognize normal features of the lung on CT

» Recognize common lung patterns described in CT

» Identify features that describe pathological processes in the thorax

» Identify common CT findings of pathological processes in the thorax

Chapter 2

At the conclusion of this section, the learner will be able to:

» Indicate reasons for performing a CT scan of the abdomen and pelvis.

» Recognize the different forms of contrast media for abdominal CT.

» Identify contraindications of IV contrast media.

» Identify unique features of abdominal CT protocols.

» Recognize normal features of the abdomen and pelvis in CT

» Discuss the diagnostic process and related findings

» Identify features that describe pathological processes in the abdomen & pelvis

» Identify common CT findings of pathological processes in the abdomen & pelvis

Chapter 3

Upon completing this chapter, the learner will be able to:

» Determine the role of CT in extremity evaluation

» Identify unique features of extremity

» Reflect on various positioning considerations

» Identify features that describe pathological processes in the extremities

» Identify common CT findings of pathological processes in the extremities

Chapter 4

Upon completing this chapter, the learner will be able to:

» Describe what CT guidance provides during interventional procedures

» Indicate three types of interventional procedures that utilize CT imaging

» Compare the two acquisition methods used for CT guidance

» Describe the benefits that CT guided intervention provides

» Recognize the role of technologists in CT guided procedures

» Explain the importance of laboratory values prior to CT guided procedures

» Recognize the value of skin marking and breathing instructions in CT guided intervention

» Compare two techniques used to introduce a biopsy needle

» Compare fine needle aspiration and core needle biopsy

» Describe the single step and two step techniques used to introduce percutaneous drainage devices.

» Indicate how a joint injection differs from percutaneous biopsy or drainage

» Describe the needle tip artifact

» Outline potential contraindications to CT guided procedures

» Recognize potential complications from percutaneous procedures

CT Colonography QSS Learning Objectives

Upon completion of this course the learner will be able to

- Recognize the clinical indications for CT colonography.
- Describe the bowel preparation.
- Determine the rationale behind fecal tagging.
- Explain the procedure and value of colonic distension.
- Identify the protocol for appropriate scanning.
- Recognize the process of interpretation and the importance of accurate measurement.
- Describe the role of computer-aided diagnosis.

Cardiac CT QSS Learning Objectives

Upon completion of this course the learner will be able to

- Recognize when to use cardiac CT
- Identify normal cross-sectional cardiac anatomy
- Discuss radiation exposure concerns
- Explain the principles of image reconstruction
- Describe coronary calcium scoring
- Optimize patient preparation, heart rate control & ECG optimization
- Understand injection techniques
- Discuss coronary angiography
- Describe non-coronary ECG-gated CT applications – TAVR
- Be familiar with new advances – CT-FFR & CT-MPI

Stroke & CT Perfusion Learning Objectives

Upon completion of this course the learner will be able to

- Understand the types of stroke
- Recognize the signs and symptoms of stroke
- Describe the treatment options for acute ischemic stroke
- Recognize stroke on non-contrast enhanced CT
- Identify the purpose of CT angiography in acute stroke
- Explain the principles of CT perfusion
- Describe the terms cerebral blood flow (CBF), cerebral blood volume (CBV), mean transit time (MTT) and time to peak (TTP)
- Understand the risks associated with CT Perfusion
- Identify other indications for the use of CT Perfusion

APPENDIX D

CAMRT CT Imaging 1 Exam blueprint

Item presentation - % of question types	
Multiple Choice: 100% Label: 0% Short Answer: 0%	
Exam structure	
Exam length: 2 hours 15 minutes Number of questions: 100	
Exam delivery format	
On-line	
Course Content and question weighting	
Chapters	**Percentage weighting of number of questions/chapters**
1 – CT Principles and CT Physics	15-18%
2 – Data Acquisition and Image Reconstruction	15-18%
3 – Image Manipulation and Management	15-18%
4 – Quality Control and Quality Assurance	15-18%
5 – Radiation Dose, Patient Dose, and Protection	15-18%
6 – Contrast Media and Injection Techniques	15-18%

CAMRT CT Anatomy Exam Blueprint

Item presentation - % of question types	
Multiple Choice: 100%	
Exam structure	
Exam length: 2 hours 15 minutes Number of questions: 100	
Exam delivery format	
On-line	
Course Content and question weighting	
Chapters	**Percentage weighting of number of questions/chapter**
1 – Brain	15%
2 – Cranium and Facial Bones	15%
3 – Neck	10%
4 – Spine	10%
5 – Chest	15%
6 – Abdomen and pelvis	30%
7 – Extremities	5%

CAMRT CT Imaging 2 Exam Blueprint*

Item presentation - % of question types	
Multiple Choice:	75%
Case Studies (multiple choice):	25%
Exam structure	
Exam length:	2 hours 15 minutes
Number of questions:	100
Exam delivery format	
On-line	
Course Content and question weighting	
Chapters	**Percentage weighting of number of questions/chapters**
1 – Introduction to CT of the Head Neck and Spine	5-7%
2 – Brain	24-26%
3 – Skull, Facial Bones, Sella & Temporal Bones	23-25%
4 – Orbits and Sinuses	15-17%
5 – Neck and Spine	23-25%

**Blueprint for 2021 version of CT Imaging 2 exam*

CAMRT CT Imaging 3 Exam Blueprint*

Item presentation - % of question types	
Multiple Choice: 100%	
Exam structure	
Exam length: 2 hours 15 minutes Number of questions: 100	
Exam delivery format	
Online	
Course Content and question weighting	
Chapters	**% weighting of number of questions/chapters**
Thorax	25-30%
Abdomen & Pelvis	25-30%
Extremities	20-25%
CT-Guided Interventional Procedures	15-20%

**Blueprint for 2021 version of CT Imaging 3 exam*

APPENDIX E

The Role of a Clinical Advisor

To maintain the integrity of CAMRT Certificate programs, it is essential that all parties involved in the training and evaluation of certificate program candidates follow the procedures set out in the Program Handbook and Summary of Clinical Competence (SCC). A CAMRT Certificate indicates a level of competence above entry-to-practice that has been verified through the requirements of the program.

Clinical Advisor's responsibilities include:

- review the Program Handbook and SCC with the candidate.
- mentor and support candidates in their skill development
- assess firsthand competency/procedures performed by the candidate and verify competence by signing and dating each procedure in the SCC at the time competence is established and/or
- delegate assessment duties to individuals who have the expertise and qualifications outlined in the Program Handbook.
- ensure all delegated assessors have read the most current version of the Program Handbook and SCC. These documents are updated on an annual basis, so clinical advisors and delegated assessors must review the handbook and SCC with each new candidate.
- attest to overall competency by signing at the end of each module
- verify the overall competence of the candidate at the end of the clinical placement by signing the Declaration of Completion.

During clinical placements, the following criteria must be upheld:

All competencies must be **performed** independently by the candidate on a patient. A candidate cannot be deemed competent if they have only observed or simulated a procedure, unless otherwise indicated in the SCC.

The clinical advisor/delegated assessor must witness competent practice for a procedure/competency multiple times prior to the date of the final assessment. A signature in the SCC verifies that the technologist has **consistently shown** they have the knowledge, skill and judgement to be declared competent in each aspect of practice. It is recognized in some circumstances that procedures are not performed frequently; however, it is appreciated that there is a transference of skills between many procedures. ***It is the responsibility of the clinical advisor or delegated assessor to ensure this expected level of competence as evidenced by their signatures in the appropriate areas.***

If there are procedures in the SCC that are not performed at your clinical site it is the responsibility of the candidate to contact CAMRT to determine an alternate option (if any).

Detailed guidelines for assessment of competency are found in each module of the SCC. The guidelines listed provide an overview of the expectation for assessment by the clinical advisor or delegated assessor.

It is recognized being a clinical advisor or delegated assessor adds to your already heavy workload and responsibilities in your daily practice. The CAMRT appreciates your professionalism and commitment to help the candidate continue their education in an ever-changing healthcare environment.

APPENDIX F

Internationally Educated Medical Radiation Technologist
Clinical Advisor Verification of Experience

Hospital/Organization: _____

Name of Supervisor: _____

Supervisor Credential(s): _____

Supervisor Email: _____

NAME OF CTIC CANDIDATE: _____

To CAMRT Certificate Programs:

This is to confirm _____ (name of Clinical Advisor) is a current employee of the above noted hospital/organization.

The Clinical Advisor listed above is:

- A registered medical radiation technologist with a minimum of five years' experience in the practice of CT Imaging
- Currently practicing in CT

My signature below confirms the above meets the CAMRT's eligibility requirement to act in a Clinical Advisor (CA) role for the purpose of the CT Imaging Certificate (CTIC) program.

The affixed hospital seal confirms the authenticity of this submission.

_____ _____

Signature of Clinical Advisor Supervisor/Employer **Date**

APPENDIX G

Clinical Advisor (CA) Check List

To maintain the integrity of CAMRT Certificate programs, it is essential all parties involved in the training and evaluation of certificate program candidates follow the procedures set out in the Program Handbook and Summary of Clinical Competence (SCC). A CAMRT Certificate indicates a level of competence above entry-to-practice that has been verified through the requirements of the program.

As such, CAMRT must ensure all Clinical Advisors meet the same standards and are eligible to take on this assessment role.

This form must be submitted to the CAMRT along with the notarized documentation required for all internationally educated medical radiation technologists.

I, _____, acknowledge by my initials, the following to be true.

	I am a medical radiation technologist* with a CAMRT CTIC credential **OR**** a medical radiation technologist having a minimum of five years' experience in the practice of CT Imaging **or other:* _____
	I am **currently practicing** in CT.
	I am not currently registered in any of the CAMRT CT Certificate programs.
	I have no conflicts of interest* with the CTIC candidate. ***Conflicts of interest may include:** • Close personal relationships that could threaten independence or objectivity during assessments • Spouse or family member • A direct report (i.e. the assessor reports to the candidate)

I understand that any false or misleading statement, omission or misrepresentation may result in the candidate's automatic withdrawal from the program and/or revocation of the CTIC designation.

_____ _____

Clinical Advisor Signature Date