Competency Profile
Entry-to-Practice competencies for the professions of the Alberta College of Medical Diagnostic and Therapeutic Technologists (ACMDTT)

Nuclear Medicine Technology
Under the *Health Professions Act of Alberta (HPA)*, the ACMDTT is mandated with establishing standards and registering competent and ethical nuclear medicine technologists who can provide high quality medical therapeutic and diagnostic care to the public.

This competency profile lists the competencies required of nuclear medicine technologists at entry-to-practice. Together with the ACMDTT Standards of Practice and Code of Ethics documents it defines the expectations of practitioners on entry to the profession.

The competencies have been validated through broad consultation with the profession in Alberta. They have been cross-referenced with the Canadian Association of Medical Radiation Technologists (CAMRT) national competency profile to ensure that all the national competencies are included. The College has approved the use of the CAMRT Certification Examination as a requirement for entry-to-practice in Alberta.

In areas where the ACMDTT profile goes beyond the requirements of CAMRT, ACMDTT works with the Canadian Medical Association conjoint accreditation process to ensure that all ACMDTT competencies are included in accredited educational programs within the province.

The ACMDTT entry-to-practice competencies were originally developed and approved in 2006. An extensive re-validation process took place in 2010 involving provincial members, national partners, education providers and provincial employers. New profiles were approved on July 9, 2011.

The competency profiles will be reviewed regularly with an aim to reflect current standards for high quality patient services within an evolving work environment.

**Instructions for educational institutions**

The ACMDTT entry-to-practice competencies identify the minimum learning outcomes required of the nuclear medicine technologists at graduation. The College recognizes that achievement of entry-level proficiency in each competency requires unique cognitive, psychomotor and affective learning. This entry-to-practice competency profile is not considered a curriculum guide. The educational institution should itself determine the level of education and learning activities required to meet the minimum entry-to-practice standard at the expected level of proficiency as set out by the College.

**Structure**

The entry-to-practice competencies for all professions of the ACMDTT are uniformly structured under the following broad areas of practice:

1. Professional Accountability and Responsibility
2. Workplace Health and Safety
3. Patient Care
4. Operation of Equipment
5. Clinical Procedures
6. Interpretation and Analysis

Within each area, sub-sections have been identified. Although there is significant diversity among the professions, some of the competencies within the sub-sections are common. Other competencies reflect the unique nature and function of the individual professions.
**Definitions**

**Competency statement**
A competency statement describes a job task in which an entry-level technologist is expected to demonstrate a prescribed level of proficiency.

**Cognitive learning**
Learning involving knowledge and thinking skills.

**Psychomotor learning**
Learning involving practical skills.

**Affective learning**
Learning of attitudes and values that affect cognitive and psychomotor activities.

**Level of proficiency**
The degree of mastery that a practitioner demonstrates in a job task. Levels of proficiency range on a continuous scale from learner, to entry-level, to mastery, to expertise, to leadership.

**Entry-level proficiency**
The production of results consistent with generally accepted standards in the profession which involves:
- handling routine situations independently within a reasonable time frame
- anticipating likely outcomes and responding appropriately
- recognizing unusual, difficult to resolve and complex situations which are beyond the practitioner’s capacity and handling such situations through consultation, supervision, reviewing literature or referral.

**Assumptions**
Several assumptions have underscored the development of the entry-to-practice competencies. These are:

1. The minimum requirement for achievement of the stated competencies is that entry-level proficiency is necessary in all competencies except those denoted as “assist”. In competencies denoted as “assist”, knowledge of the technique is necessary, but not independent performance. Despite this minimum requirement, ACMDTT encourages higher levels of achievement both at entry-to-practice and beyond.

2. A strong foundation of cognitive, psychomotor and affective learning is a prerequisite for success in achieving the competencies; this learning is initially developed through participation in an ACMDTT-approved educational program.

3. Graduation from an ACMDTT-approved educational program, together with successful completion of the CAMRT certification examination, is indicative of success in achieving the competencies.

4. Learning is expanded through active participation in the provision of high quality medical diagnostic and therapeutic services. This results in levels of proficiency beyond entry-level.

**Resources**


## Competency Profile

### 1. Professional Accountability and Responsibility

#### 1.1 Legislation, Standards and Ethics

<table>
<thead>
<tr>
<th>1.1a</th>
<th>Follow regulations as set out by the provincial and federal legislation, Standards of Practice and Code of Ethics governing the practice of medical radiation technologists. (see Appendix 1).</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1b</td>
<td>Recognize the patient’s right to accept or refuse medical services.</td>
</tr>
<tr>
<td>1.1c</td>
<td>Provide care in a fair and unbiased manner.</td>
</tr>
<tr>
<td>1.1d</td>
<td>Comply with employer policies and directives.</td>
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<tr>
<td>1.1e</td>
<td>Maintain complete and secure records.</td>
</tr>
</tbody>
</table>

#### 1.2 Teamwork

<table>
<thead>
<tr>
<th>1.2a</th>
<th>Interact effectively as a member of a multidisciplinary health care team.</th>
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</thead>
<tbody>
<tr>
<td>1.2b</td>
<td>Distinguish between the scopes of practice for health care team members.</td>
</tr>
<tr>
<td>1.2c</td>
<td>Demonstrate respect for a diversity of opinions and values.</td>
</tr>
<tr>
<td>1.2d</td>
<td>Manage personal workload to contribute to team productivity.</td>
</tr>
<tr>
<td>1.2e</td>
<td>Communicate effectively both orally and in writing.</td>
</tr>
<tr>
<td>1.2f</td>
<td>Utilize medical terminology in professional communication.</td>
</tr>
<tr>
<td>1.2g</td>
<td>Apply basic problem solving and conflict resolution techniques.</td>
</tr>
<tr>
<td>1.2h</td>
<td>Provide constructive feedback to colleagues.</td>
</tr>
<tr>
<td>1.2i</td>
<td>Respond appropriately to feedback received from others.</td>
</tr>
</tbody>
</table>

#### 1.3 Support to the Profession

<table>
<thead>
<tr>
<th>1.3a</th>
<th>Supervise students in the clinical environment.</th>
</tr>
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<tbody>
<tr>
<td>1.3b</td>
<td>Provide feedback on student performance.</td>
</tr>
<tr>
<td>1.3c</td>
<td>Promote the profession to the general public and other health care professionals.</td>
</tr>
<tr>
<td>1.3d</td>
<td>Portray a positive and confident demeanour and appearance in all professional activities.</td>
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</table>

#### 1.4 Professional Competence

<table>
<thead>
<tr>
<th>1.4a</th>
<th>Practice within limits of personal knowledge and skills.</th>
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<tbody>
<tr>
<td>1.4b</td>
<td>Self-evaluate and develop clear performance goals to enhance professional effectiveness.</td>
</tr>
<tr>
<td>1.4c</td>
<td>Undertake continuing professional development.</td>
</tr>
<tr>
<td>1.4d</td>
<td>Participate in quality improvement initiatives.</td>
</tr>
</tbody>
</table>

## 2. Workplace Health and Safety

### 2.1 Radiation Safety/Protection

<table>
<thead>
<tr>
<th>2.1a</th>
<th>Apply the principles of as low as reasonably achievable (ALARA) in all work practices.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1b</td>
<td>Implement safety practices which adhere to the standard of the <em>Alberta Radiation Protection Act</em> (see Appendix 2).</td>
</tr>
<tr>
<td>2.1c</td>
<td>Utilize personal radiation monitoring devices according to manufacturers’ specifications.</td>
</tr>
<tr>
<td>2.1d</td>
<td>Inform others of radiation exposure risks in the work environment.</td>
</tr>
<tr>
<td>2.1e</td>
<td>Comply with CNSC regulations (see Appendix 2).</td>
</tr>
<tr>
<td>2.1f</td>
<td>Determine if the patient is pregnant or breast feeding and take appropriate action.</td>
</tr>
</tbody>
</table>

#### 2.1 Radiation Safety/Protection – Sealed/Unsealed Sources

<table>
<thead>
<tr>
<th>2.1a</th>
<th>Post warning signs as appropriate.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1b</td>
<td>Ensure security of sources.</td>
</tr>
<tr>
<td>2.1c</td>
<td>Monitor sources for leakage.</td>
</tr>
<tr>
<td>2.1d</td>
<td>Operate survey meters.</td>
</tr>
<tr>
<td>2.1e</td>
<td>Perform regular radiation surveys and address results.</td>
</tr>
<tr>
<td>2.1f</td>
<td>Perform wipe tests and address results.</td>
</tr>
<tr>
<td>2.1g</td>
<td>Receive, store, handle and dispose of radioactive material according to regulation (Appendix 3).</td>
</tr>
</tbody>
</table>

### 2.2 Occupational Health and Safety

| 2.2a | Apply the standards of the Workplace Hazardous Materials Information System (WHMIS) in the handling, use, storage and disposal of materials (see Appendix 2). |
2.2b Adhere to the workplace standards defined in the Occupational Health and Safety Regulations of the Workers’ Compensation Act (see Appendix 2).

2.2c Apply the standards of Alberta Health and Wellness to prevent contamination of person, equipment and environment (see Appendix 2).

2.3 Emergency/Disaster Plans

2.3a Determine the nature and gravity of an emergency situation and take appropriate action.

2.3b Contain and restrict access to areas of radioactivity.

3. Patient Care

3.1 Patient Environment

3.1a Administer first aid/basic life support in emergency situations.

3.1b Perform aseptic or sterile technique as required.

3.1c Recognize and respond to adverse reactions experienced by patients receiving medications or radiopharmaceuticals.

3.1d Administer cardiopulmonary resuscitation (CPR) according to the standard of CPR-Level C as specified by the Heart and Stroke Foundation of Canada.

3.1e Perform procedures in a manner that maintains the integrity of patient ancillary devices and equipment.

3.1f Regulate flow rate of portable and wall-mount oxygen supplies.

3.1g Apply body-fluid precautions to prevent contamination of person(s), equipment and environment.

3.1h Ensure a safe and comfortable environment for the patient.

3.1i Transfer patient safely.

3.1j Perform procedures in a manner that enhances patient comfort.

3.2 Patient Assessment and Intervention

3.2a Verify patient’s identity.

3.2b Assess patient’s level of understanding of the procedure and adapt communication, assessment and screening accordingly.

3.2c Adapt procedure according to patient’s mobility and stability.

3.2d Assess patient for contraindications to the procedure.

3.2e Verify patient’s consent for procedure.

3.2f Recognize and respond to changes in patient’s physical condition, behaviours and level of consciousness.

3.2g Recognize and respond to changes in patient’s vital signs.

3.2h Perform procedures in a manner that maintains patient’s dignity.

3.2i Perform venipuncture.

3.2j Assist in the administration of contrast agents as required for imaging purposes.

3.2k Administer medications as required for procedural purposes.

3.2l Administer radiopharmaceuticals as required for procedural purposes.

3.3 Communication and Education

3.3a Identify self and explain professional role.

3.3b Facilitate patient’s understanding by encouraging and responding to questions and concerns.

3.3c Respond to patient’s family/representative within the parameters of patient confidentiality.

3.3d Refer patient concerns to other health care providers as appropriate.

3.3e Explain possible radiation exposure implications for patient.

3.4 Recording and Documentation

3.4a Maintain comprehensive records.

3.4b Utilize information and archival systems.

3.4c Maintain confidentiality of records with appropriate access.
4. Operation of Equipment

4.1 Fundamental Equipment Procedures

4.1a Operate only licensed equipment while performing procedures.
4.1b Operate equipment in accordance with manufacturers’ specifications.
4.1c Ensure operational readiness of equipment for specified procedure/study.
4.1d Ensure regular maintenance and cleanliness of equipment.
4.1e Operate computer workstations.

4.2 Equipment Quality Control (QC)

4.2a Regularly inspect equipment for functional integrity.
4.2b Ensure mechanical functionality of equipment.
4.2c Perform regular QC as required.
4.2d Perform uniformity, centre of rotation and spatial resolution on gamma cameras.
4.2e Perform QC on well detectors and probes.
4.2f Perform linearity and constancy tests on dose calibrators.
4.2g Assist in accuracy tests on dose calibrators.
4.2h Perform regular QC on survey meters.
4.2i Maintain equipment QC and repair records.
4.2j Evaluate equipment QC and take corrective action as required.
4.2k Perform QC on CT scanners associated with hybrid imaging.
4.2l Assist in QC for PET systems.
4.2m Assist in QC for bone densitometry equipment.

5. Clinical Procedures

5.1 Fundamental Clinical Procedures

5.1a Verify procedure ordered.
5.1b Ensure procedure requisition contains required information; address inconsistencies.
5.1c Efficiently organize procedures based on required exams and views.
5.1d Prepare the physical area for the patient.
5.1e Utilize immobilization devices.
5.1f Utilize positioning aids.
5.1g Position the patient.
5.1h Select parameters for optimal image.
5.1i Select parameters for optimal quantitative data acquisition.
5.1j Assess images and data set for acceptability and completeness.
5.1k Optimize, capture and store images post-procedure.

5.2 Radiopharmacy

5.2a Maintain and elute generator using aseptic technique.
5.2b Perform radionuclide and chemical purity tests on eluate.
5.2c Evaluate eluate QC and take corrective action as required.
5.2d Determine eluate assay.
5.2e Calculate generator yield
5.2f Label eluate, radiopharmaceuticals and patient doses.
5.2g Prepare radiopharmaceuticals according to manufacturers’ specifications.
5.2h Determine radiopharmaceutical assay.
5.2i Perform radiochemical purity tests on radiopharmaceuticals.
5.2j Perform additional quality control tests on radiopharmaceuticals as per manufacturers' requirements and take corrective action as required.
5.2k Prepare radiopharmaceuticals according to department’s workload.
5.2l Store radiopharmaceuticals according to manufacturers’ specifications.
5.2m Calculate activity/volume of radiopharmaceutical required for patient dose.
5.2n Dispense radiopharmaceuticals.
5.2o Prepare blood components as radiopharmaceuticals.
| 5.2p | Verify the radioactivity to be administered using a dose calibrator. |
| 5.2q | Prepare standard and stock solutions for the laboratory/radiopharmacy. |

### 5.3 Clinical Procedures

| 5.3a | Perform cardiovascular procedures including – gated rest equilibrium, myocardial perfusion (rest), myocardial perfusion (exercise stress), myocardial perfusion (pharmacologic stress) and 12-lead electrocardiogram (ECG). |
| 5.3b | Assist in cardiovascular procedures including – gated stress equilibrium, gated equilibrium with SPECT imaging and first pass study. |
| 5.3c | Perform gastrointestinal (GI) procedures including – red blood cell (RBC) liver, hepatobiliary, hepatobiliary with intervention, gastric emptying (solid) and Meckel's diverticulum. |
| 5.3d | Assist in gastrointestinal (GI) procedures including – gastric emptying (liquid), esophageal transit, gastroesophageal reflux, GI bleed, liver/spleen (colloid) and Meckel’s diverticulum with pharmacologic intervention. |
| 5.3e | Perform genitourinary (GU) procedures including - renal function and renal function with pharmacologic intervention. |
| 5.3f | Assist in genitourinary (GU) procedures including – renal transplant, direct cystography, effective renal plasma flow (ERPF), renal cortical and glomerular filtration rate (bloodwork method). |
| 5.3g | Perform skeletal system procedures including - three phase bone, bone (whole body) and bone SPECT. |
| 5.3h | Assist in skeletal system procedures including – bone mineral densitometry and bone marrow imaging. |
| 5.3i | Perform tumour, inflammation and lymphatic procedures including – tumour imaging with iodine, sentinel node imaging and white blood cell (WBC).  
*The ACMDTT acknowledges that the opportunity to dispense and administer radioactive iodine may not be available to all students at all sites; therefore, for the purpose of achieving competence at the program level the student is required to perform all aspects of the procedure with the exception of dispensing and administering iodine.* |
| 5.3j | Assist in tumour, inflammation and lymphatic procedures including – gallium with SPECT, somatostatin receptor study and diagnostic mIBG. |
| 5.3k | Assist in central nervous system procedures including – cerebral perfusion, CSF cisternogram, CSF leak, cerebral spinal fluid (CSF) shunt patency, cerebral blood flow (brain death) and dacrocystogram. |
| 5.3l | Perform endocrine system procedures including – thyroid imaging, thyroid uptake and parathyroid (sestamibi) imaging. |
| 5.3m | Perform respiratory system procedures including – lung ventilation and lung perfusion. |
| 5.3n | Assist in respiratory system procedures including – pulmonary aspiration and quantitative lung. |

### 5.4 Therapeutic Procedures

| 5.4a | Prepare patient isolation room for I-131 therapy. |
| 5.4b | Administer treatment for hyperthyroidism.  
*The ACMDTT acknowledges that the opportunity to dispense and administer radioactive iodine may not be available to all students at all sites; therefore, for the purpose of achieving competence at the program level the student is required to perform all aspects of the procedure with the exception of dispensing and administering iodine.* |
| 5.4c | Assist in the administration of thyroid ablation therapy. |
| 5.4d | Decontaminate patient isolation room following I-131 therapy. |

### 5.5 Advanced Clinical Procedures

| 5.5a | Perform SPECT/CT imaging.  
*CT imaging is used strictly for attenuation correction and anatomical mapping.* |
| 5.5b | Assist in PET/CT imaging. |
| 5.5c | Assist in cardiac PET. |
| 5.5d | Assist in 18F-FDG PET. |
### 5.6 Adapt Clinical Functions

<table>
<thead>
<tr>
<th>5.6a</th>
<th>Evaluate the need for additional patient history based on initial results.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.6b</td>
<td>Adapt standard protocols for the pediatric patient.</td>
</tr>
<tr>
<td>5.6c</td>
<td>Evaluate the need for additional or modified views.</td>
</tr>
<tr>
<td>5.6d</td>
<td>Evaluate quantitative test results for accuracy.</td>
</tr>
</tbody>
</table>

### 6. Interpretation and Analysis

#### 6.1 Analysis and Enhancement of Practice

<table>
<thead>
<tr>
<th>6.1a</th>
<th>Utilize problem-solving strategies.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1b</td>
<td>Generate and evaluate effectiveness of alternate approaches to practice.</td>
</tr>
<tr>
<td>6.1c</td>
<td>Critically evaluate performance to ensure best practice.</td>
</tr>
<tr>
<td>6.1d</td>
<td>Manage professional and personal roles to minimize risk.</td>
</tr>
<tr>
<td>6.1e</td>
<td>Manage resources effectively.</td>
</tr>
<tr>
<td>6.1f</td>
<td>Assist in research-based initiatives.</td>
</tr>
<tr>
<td>6.1g</td>
<td>Maintain awareness of changes within the Canadian healthcare environment as they affect the practice of nuclear medicine technology.</td>
</tr>
</tbody>
</table>
Appendix 1

Provincial/Federal Legislation
   Information available through:
   - Alberta Queen’s Printer (website)
   - Alberta Government: Health and Wellness (website)

   Information available through:
   - Alberta Queen’s Printer (website)
   - Office of the Information and Privacy Commissioner of Alberta

   Information available through:
   - Alberta Queen’s Printer (website)
   - Alberta Government: Seniors and Community Services (website)

Standards
1. ACMDTT Standards of Practice
   Information available through:
   - ACMDTT (website)

2. ACMDTT Code of Ethics
   Information available through:
   - ACMDTT (website)

Appendix 2

Workplace Health and Safety
   Information available through:
   - Alberta Queen’s Printer (website)
   - Human Resources and Skills Development of Canada (website)
   
   **Key search items:**
   - Back care & lifting
   - Ergonomics
   - Storage & handling
   - Use of tools, appliances, etc.
   - Serious injuries & accidents.
   - Biological hazards
   - Chemical hazards
   - Fire/explosion hazards
   - Physical hazards
   - Personal protective equipment

   Information available through:
   - Department of Justice Canada (website): search by Index listing or ‘Statutes’

   **Key search items:**
   - Canadian Nuclear Safety Commission Regulations.
   - Proposed Regulatory Guide, Radiation Safety Training for Radioisotope,
   - Medical Accelerator and Transportation Workers.
   - Developing and Using Action Levels.

   Information available through:
   - Alberta Government: Human Resources and Employment (website)
   Information available through:
   - Alberta Health website

Appendix 3

Workplace Health and Safety

   Information available through:
   - Department of Justice Canada (website): search by Index listing or ‘Statutes’

   **Key search items:**
   - Nuclear Substances and Radiation Devices Regulation.
   - Packaging and Transport of Nuclear Substances Regulations.
   - Distribution of Nuclear Substances and Radiation Devices.
   - Requirement for Leak Testing Selected Sealed Radiation Sources.
   - Requirements for Gamma Radiation Survey Meter Calibration.
   - Bioassay Requirements.
   - Monitoring and Dose Recording for the Individuals.
   - Design Guide for Basic and Intermediate Level Radioisotope Labs.

   Information available through:
   - Transport Canada (website): search Dangerous Goods Regulations