Medical Radiation Technologists and Their Work Environment

Canadian Institute for Health Information
Institut canadien d'information sur la santé

Who We Are

Established in 1994, CIHI is an independent, not-for-profit corporation that provides essential information on Canada's health system and the health of Canadians. Funded by federal, provincial and territorial governments, we are guided by a Board of Directors made up of health leaders across the country.

Our Vision

To help improve Canada's health system and the well-being of Canadians by being a leading source of unbiased, credible and comparable information that will enable health leaders to make better-informed decisions.

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Preface

The Canadian Institute for Health Information (CIHI) collects and analyzes information on health and health care in Canada and makes it publicly available. Canada's federal, provincial and territorial governments created CIHI as a not-for-profit, independent organization dedicated to forging a common approach to Canadian health information. CIHI's goal: to provide timely, accurate and comparable information. CIHI's data and reports inform health policies, support the effective delivery of health services and raise awareness among Canadians of the factors that contribute to good health.

To fulfill this goal, CIHI coordinates and promotes national health information standards and health indicators, develops and manages databases and registries, commissions and facilitates population health research and analysis, coordinates and develops education sessions and conferences, and produces and disseminates health information research and analysis. The Medical Radiation Technologist Database (MRTDB) and the Canadian MIS Database (CMDB) are two of the databases developed and maintained by CIHI. The MRTDB contains administrative information for registered medical radiation technologists across the country; the CMDB records financial and statistical information based on a standardized chart of accounts, applying general accounting principles and procedures, workload measurement systems, service activity statistics and indicators that support management decision-making in health service organizations. The information in the CMDB can potentially be used to cost the activities of health service organizations and forms the basis of management reporting, including annual general purpose financial statements, financial ratio analysis and operational budgeting. Although the two databases may have a different focus, CIHI made every effort in this report to examine the relevant information from both databases in order to better inform health human resource planning and management in Canada.

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- College of Medical Radiation Technologists of Ontario
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Please note that the analyses and conclusions in the present document do not necessarily reflect those of the individuals or organizations mentioned above.

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We wish to extend our thanks and gratitude to all medical radiation technologists who work with Canadians to improve their quality of life.

Highlights

This report provides information on registered medical radiation technologists in Canada and their work environment. Based on both the first-year data collected by CIHI's Medical Radiation Technologist Database (MRTDB) and data from the Canadian MIS Database (CMDB), this report provides information on both the medical radiation technologists as a distinct health care provider group and their work environment in public-sector hospital diagnostic imaging functional centres. The report is divided into two sections: Part 1 contains information on the supply, demographics, education, certification and employment characteristics of medical radiation technologists in 2008. Part 2 of the report provides an overview of the medical radiation technologist work environment based on data for fiscal year 2007–2008 drawn from the CMDB. This is the first report of its kind to provide comprehensive information for the medical radiation technology profession.

Highlights for Part 1: Medical Radiation Technologist Database

Supply, Demographics, Education, Certification and Employment Characteristics of Medical Radiation Technologists in 2008

- In 2008, the profession of medical radiation technology was regulated in three Canadian provinces: Quebec, Ontario and Alberta. In the provinces of Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick, Manitoba and Saskatchewan, the profession was not regulated but there was mandatory registration with both the provincial association in medical radiation technology and the Canadian Association of Medical Radiation Technologists (CAMRT).
- In 2008, there were 16,915 registered medical radiation technologists who were employed and working in medical radiation technology in Canada. Due to voluntary registration in British Columbia, the Yukon, the Northwest Territories and Nunavut, this total supply does not represent all medical radiation technologists who worked in Canada.
- More than 80% of registered medical radiation technologists working in 2008 were female.
- The average age of medical radiation technologists who were registered and working in 2008 in all provinces and territories except for Saskatchewan was 42, ranging from 39 to 44.

- In the selected provinces of Newfoundland and Labrador, P.E.I., Quebec, Ontario and Manitoba, and the territories (the Yukon, the Northwest Territories and Nunavut), most medical radiation technologists had a diploma in medical radiation technology (89%).
- Nearly 1,000 medical radiation technologist candidates in Canada passed the certification exams offered by either the CAMRT or the Ordre des technologues en imagerie médicale et en radio-oncologie du Québec (OTIMRO) in 2008. Of 678 successful candidates for the CAMRT exams, nearly 60% obtained certification in radiological technology, approximately 15% obtained certification in either magnetic resonance imaging or radiation therapy and more than 10% obtained certification in nuclear medicine.
- In 2008, most medical radiation technologists in Newfoundland and Labrador, P.E.I., New Brunswick, Quebec, Manitoba and Alberta worked in general hospitals (73.7%). Percentages varied between provinces. The remaining workforce was distributed among other workplaces, such as free-standing imaging facilities and clinics (13.1%), cancer care centres (4.3%), community health centres (2.3%) and other places (2.5%).
- In 2008, across the selected provinces of Newfoundland and Labrador, P.E.I., Quebec, Ontario and Manitoba, most medical radiation technologists worked on a full-time basis, with the percentages of those working full time varying from just less than 65% in Manitoba to more than 90% in Newfoundland and Labrador.

Highlights for Part 2: Canadian MIS Database

Compensation Expense, Earned Hours and Workload in Public-Sector Hospitals; Medical Radiation Technologists' Work Environment in Hospital Diagnostic Imaging Functional Centres

- Compensation expense is but one component of the total diagnostic imaging expenses in public-sector hospitals; nevertheless, it is a major component of all expenses. In fiscal year 2007–2008, for the selected provinces of Nova Scotia, New Brunswick, Ontario, Alberta and B.C., the average percentage of public-sector hospital diagnostic imaging expenses related to compensation expense varied from 43.2% in New Brunswick to 55.9% in B.C.
- Compensation expense includes worked, benefit and benefit contribution expenses. For all provinces and territories except Quebec and Nunavut, the weighted average percentage of compensation expenses related to worked compensation expense in public-sector hospitals varied from 67.0% in B.C. to 77.4% in P.E.I. for fiscal year 2007–2008, suggesting that the compensation for benefits varied from 22.6% to 33.0%.

- For the selected provinces of New Brunswick, Ontario and B.C. for fiscal year 2007–2008, the majority of hours worked by diagnostic imaging unit-producing personnel in public-sector hospitals were full time, with Ontario having the highest percentage of earned hours that were full time, at 66%. In terms of part-time and casual hours, B.C. had the highest percentages at 33% and 12%, respectively.
- In fiscal year 2007–2008, for the selected provinces of New Brunswick, Ontario, B.C., Nova Scotia, Manitoba and Newfoundland and Labrador, the diagnostic imaging workload that was attributed to inpatient service recipients in public-sector hospitals ranged from 15% to 21%, indicating that most of these services are delivered on an outpatient basis.

Introduction

The Health Human Resources and MIS and Costing teams at CIHI are pleased to present *Medical Radiation Technologists and Their Work Environment*.

CIHI has developed five new databases to further its contribution to the picture of health human resources in Canada. The introduction of the five new databases occurred in phases, with the Occupational Therapist and Pharmacist databases becoming operational in 2006, and the Physiotherapist Database in 2007. The Medical Laboratory Technologist Database (MLTDB) and Medical Radiation Technologist Database (MRTDB) both became operational in 2008, thanks to the participation of the provincial regulatory bodies and the provincial and national professional organizations. Data in the MRTDB is compiled and submitted by the provincial regulatory bodies, the provincial professional associations and the Canadian Association of Medical Radiation Technologists (CAMRT) according to the data submission standards and available administrative information of their members. Since medical radiation technologists are neither regulated nor require mandatory registration in B.C., the Yukon, the Northwest Territories and Nunavut, the CAMRT provided 2008 record-level membership data for medical radiation technologists in the territories and aggregate-level data for medical radiation technologists in B.C. If a medical radiation technologist from these four jurisdictions is not a member of the CAMRT, the information for this individual will not be included in the MRTDB and thus will not be included in this publication.

The Canadian MIS Database (CMDB) is the national data source for financial and statistical information about hospitals and health regions. The data is collected according to a standardized framework for collecting and reporting financial and statistical data on the day-to-day operations of health service organizations. The framework is known as the *Standards for Management Information Systems in Canadian Health Service Organizations* (MIS Standards).

Currently, most information in the CMDB is specific to hospitals. A hospital is broadly defined as an institution where patients are accommodated on the basis of medical need and are provided with continuing medical care and supporting diagnostic and therapeutic services and which is licensed or approved as a hospital by a provincial/territorial government or is operated by the government of Canada. Hospital types in the CMDB are specified as follows: general hospital, pediatric hospital, cancer treatment hospital, psychiatric and substance abuse hospital, other specialty hospital, rehabilitation hospital and extended care hospital (including chronic). In provinces and territories where hospitals are part of a regional health authority, regional data is also submitted, providing a complete picture of health services for that region. Statistical data is also collected and includes the number of earned hours, client visits and beds staffed and in operation.

The variables and concepts used to capture information in the CMDB are based on the MIS Standards. The MIS Standards are a comprehensive set of standards used to report management information that is ultimately submitted to the CMDB and is related to staffing, costs, workload and provision of services. The MIS Standards are designed to apply across the continuum of services, ranging from hospitals to community-based health service organizations, providing a framework to generate, maintain and analyze information required for effective decision-making and accountability.

Based on both the first-year data collected in the MRTDB and data from the CMDB, this report provides information on both medical radiation technologists and the profession as a distinct health care provider group. Specifically, the first part of this report contains information on the supply, demographics, education, certification and employment characteristics of medical radiation technologists in 2008. In the second part of this report, supplemental information compiled from the CMDB provides a greater understanding of the work environment in hospitals related to the profession of medical radiation technology. One employment characteristic that is illustrated in Part 1 of this report is workplace of primary employment. For this section, the six provinces of Newfoundland and Labrador, P.E.I., New Brunswick, Quebec, Manitoba and Alberta provided primary employment information, which represented more than 46% of the total registered medical radiation technologist workforce in 2008. Of the entire workforce in these six provinces, more than 70% were employed in a general hospital setting. As such, Part 2 of this report focuses on this work environment.

Data Limitations

It is important to note the data limitations pertaining to this report. Many factors—such as voluntary registration with the CAMRT in B.C., the Yukon, the Northwest Territories and Nunavut, unidentifiable Employment Status and CIHI's methodologies for identifying primary/secondary registrations and point-in-time data collection—may result in data quality issues (for example, under-coverage or over-coverage) for the information presented in Part 1 of this report. Some of the above-noted factors may contribute to discrepancies between the data in this report and data presented by other organizations. See details in the Methodological Notes for Part 1 of this report.

In Part 2 of this report, the MIS data that is included represents the fiscal year 2007–2008, and only includes the financial and statistical data from submitting hospitals whose data is housed in the CMDB; it excludes data from Quebec and Nunavut. It should be noted that although Quebec has not endorsed or adopted the MIS Standards, the province does submit data to CIHI based on a slightly different standard, the *Manuel de gestion financière*, which may be mapped to similar MIS-based accounts. At this time, Quebec data is not included in this report. Also excluded is data from all private/community imaging facilities, as these organizations do not submit data to the CMDB at this time. The indicator values presented were calculated from CMDB data. The ability to calculate accurate indicator values is dependent on the provision of accurate financial and statistical data in the jurisdictions' data submissions to the CMDB. As with any database, the CMDB contains some data quality issues, including the reporting of data that does not meet the CMDB's minimum reporting requirements and the inconsistent reporting of some statistical data elements across jurisdictions. In some cases, these issues prevented the reporting of comparative indicators from all jurisdictions for this report.

Part 1

What We Know About Medical Radiation Technologists in 2008

1.1 What Is a Medical Radiation Technologist?

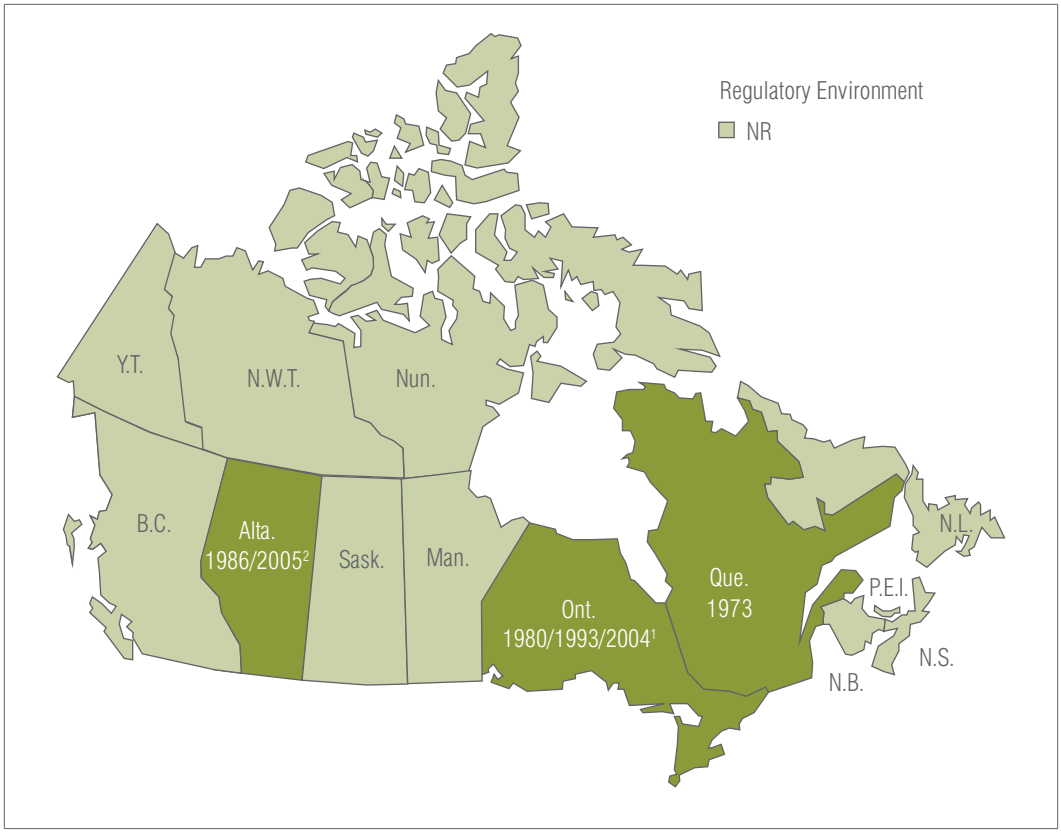
Medical radiation technologists are health care professionals who 1) operate radiographic equipment to produce images of body structures to diagnose and treat injury and disease and 2) operate radiation therapy equipment to plan and administer radiation treatment. Currently, medical radiation technologists can practise in one of four recognized disciplines: magnetic resonance, nuclear medicine, radiation therapy and radiological technology.[1–7] Medical radiation technologists work in a field that is constantly evolving. They use highly sophisticated computerized equipment and play a key role in the early detection of disease; and the results of their examinations assist clinicians in diagnosis and treatment.[8]

Medical radiation technologists provide services in diagnostic imaging in the areas of radiography, mammography, interventional/angiography studies, computed tomography, ultrasound, nuclear medicine—gamma cameras, cardiac catheterization diagnostic services, positron emission tomography and magnetic resonance imaging.[9]

1.2 What Does the Regulatory Environment of Medical Radiation Technology Look Like Across Canada?

The map below identifies the first year in which it became mandatory for medical radiation technologists to register with a provincial regulatory body.

The first province to regulate the profession was Quebec, in 1973. In Ontario, medical radiation technologists certified in the disciplines of radiography and radiation therapy were regulated in 1980; nuclear medicine became regulated in 1993 and magnetic resonance imaging in 2004. The medical radiation technologist profession in Alberta achieved regulatory status in 1986 in radiological technology, nuclear medicine and radiation therapy. Then, in 2005, the discipline of magnetic resonance achieved regulatory status. The remaining provinces and the territories remain unregulated as of 2008.



Notes
NR: not regulated as of 2008.
1: 1980—Radiography, Radiation Therapy
1993—Nuclear Medicine
2004—Magnetic Resonance Imaging
2: 1986—Radiological Technology, Nuclear Medicine, Radiation Therapy
2005—Magnetic Resonance Imaging
Sources
Health Personnel Database and the Medical Radiation Technologist Database, Canadian Institute for Health Information.

Impact of Regulation Status on the Medical Radiation Technologist Database

The provincial regulatory bodies for medical radiation technology in Quebec, Ontario and Alberta submit their members' information to the MRTDB according to data submission standards. Since medical radiation technologists who work in these three provinces have to register with the provincial regulatory body in order to practise, data collected in the MRTDB for these provinces represents the provincial profession's entire population.

Mandatory versus voluntary registration with provincial and national associations categorizes the remaining provinces and the territories, which are unregulated, into two groups. Medical radiation technologists in Newfoundland and Labrador, P.E.I., Nova Scotia, New Brunswick, Manitoba and Saskatchewan are required to belong to their respective provincial professional associations and the Canadian Association of Medical Radiation Technologists (CAMRT). As a result, data in the MRTDB collected from the provincial associations for these provinces is also representative of the provincial profession's entire population. Hence, this data is similar to that of the regulated provinces in terms of coverage. For this reason, the regulated provinces and the non-regulated provinces that require mandatory registration with both provincial associations and the CAMRT are often grouped together for analysis in the following sections.

The second group of non-regulated jurisdictions includes B.C., the Yukon, the Northwest Territories and Nunavut. Medical radiation technologists working in these jurisdictions are not required to register with provincial or national associations. Most but not all employers from these jurisdictions require CAMRT membership as a condition of employment. Since the CAMRT provides data for these jurisdictions to the MRTDB, the statistics for B.C. and the territories (the Yukon, the Northwest Territories and Nunavut), and therefore for Canada, represent registered medical radiation technologists only.

1.3 What Is the Supply of Medical Radiation Technologists?

Medical radiation technologists in Canada are an integrated part of the health delivery team. How many medical radiation technologists does Canada have? What are the ratios of medical radiation technologists to the population served across Canadian jurisdictions? Where do medical radiation technologists work? How old are they and what is the gender distribution? The answers to these questions can help to provide a bigger picture and better understanding of this profession.

These questions are very basic; nevertheless, they are not easy to answer thoroughly due to the lack of complete information for B.C. and the territories (the Yukon, the Northwest Territories and Nunavut). The MRTDB, as well as CIHI's Health Personnel Database (HPDB, for historical data), does not have information for all medical radiation technologists and their geographic distribution in Canada. Instead, the analysis based on the information from the MRTDB and the HPDB is limited to registered medical radiation technologists. Further information is required to obtain a complete picture for the medical radiation technology profession in Canada and to help answer the questions listed above.

Active Membership of Medical Radiation Technologists, 1999 to 2007

Active membership in regulated provinces and non-regulated provinces with mandatory registration with the provincial associations includes those membership categories that authorize a medical radiation technologist to work in that particular province in that specific year. In B.C. and the territories (the Yukon, the Northwest Territories and Nunavut), members may register with the CAMRT with similar membership categories. Table 1 shows the number of medical radiation technologists who actively registered with their provincial regulatory bodies or the CAMRT from 1999 to 2007. Data in this table, while useful for some purposes, should be used within the limitations documented in the Methodological Notes for the following HPDB publications: *Canada's Health Care Providers, 1997 to 2006, A Reference Guide* and *Provincial Profiles* (for 2007), which can be retrieved from CIHI's website (www.cihi.ca).

Table 1 Active Registered Medical Radiation Technologists, by Province or Territories, 1999 to 2007

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total	**14,189**	**14,417**	**14,593**	**14,780**	**15,289**	**15,693**	**16,023**	**16,464**	**16,940**
Regulated Provinces Requiring Mandatory Registration With Regulatory Bodies									
Que.	3,604	3,679	3,679	3,714	3,928	4,028	4,128	4,251	4,448
Ont.*	5,263	5,306	5,388	5,476	5,616	5,775	5,939	6,082	6,199
Alta.*	1,383	1,455	1,515	1,528	1,584	1,660	1,665	1,723	1,706
Non-Regulated Provinces With Mandatory Registration With Both Provincial Associations and the CAMRT									
N.L.	262	262	279	278	293	293	287	303	294
P.E.I.	68	67	67	70	68	75	72	75	83
N.S.	507	502	496	517	528	533	522	551	545
N.B.	458	460	463	475	473	500	501	502	542
Man.	595	586	581	592	603	624	613	628	647
Sask.	420	438	450	451	445	429	453	479	486
Non-Regulated Province and Territories With Voluntary Registration With the CAMRT									
B.C.	1,629	1,662	1,675	1,679	1,725	1,750	1,818	1,870	1,969
Territories†	..	..	..	..	26	26	25	..	21

Notes

.. Information is not available.

* Magnetic resonance became regulated in Ontario in 2004 and in Alberta in 2005. The change to the regulation status for the discipline may have affected the trends of the counts for medical radiation technologists in these two provinces around the year of the change.

† Data for the territories from 1999 to 2002 does not include Yukon data. Data for the territories from 2003 to 2007 does not include Nunavut data.

Data for B.C. and the territories may not represent all medical radiation technologists due to voluntary registrations with the CAMRT.

Source

Health Personnel Database, Canadian Institute for Health Information.

Registered Medical Radiation Technologists in 2008

Beginning in 2008, the provincial regulatory bodies for the medical radiation technology profession in Quebec, Ontario and Alberta, the associations in Newfoundland and Labrador, P.E.I., Nova Scotia, New Brunswick, Manitoba and Saskatchewan and the CAMRT for B.C. and the territories (the Yukon, the Northwest Territories and Nunavut) submitted data to the MRTDB. A total of 17,457 records were received in the database. After excluding 142 records for inactive registrations, a total of 17,315 records represented the number of active registered medical radiation technologists across the country.

Secondary Registrations

From the records submitted, CIHI identified and removed secondary registrations. This group included medical radiation technologists who maintained registration in a Canadian province or territory while living outside of Canada, or whose province or territory of residence and/or province or territory of primary employment was in a Canadian jurisdiction that was different from the province or territory of registration. These registrations are excluded from the analyses in this report to minimize double-counting at the national level. A detailed explanation of the methodology can be found in the Methodological Notes for Part 1 of this report.

In 2008, 184 records were identified as secondary registrations and removed from the analysis, which yielded 17,131 active primary registrations for 2008. When a record has missing values for most data elements used in the methodology, the methodology cannot be applied. This was the case for a number of records during the first year of data collection, which may result in under-counting for secondary registrations.

Employment Status Other Than *Employed (and not on leave) in Medical Radiation Technology*

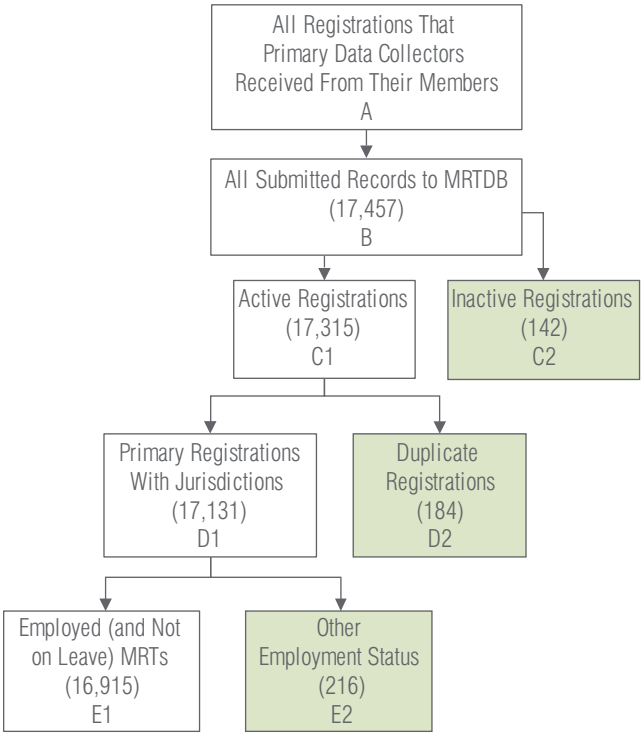
Of the 17,131 active primary registrations submitted for 2008, 216 records were identified with Employment Status other than *employed (and not on leave) in medical radiation technology*. A small number of registrations with other Employment Status values may be counted in the medical radiation technologist workforce in some jurisdictions that could not distinguish this group of registrants for 2008. Other Employment Status values include *employed in medical radiation technology but on leave*, *employed outside of medical radiation technology*, *retired*, *unemployed* and *unknown*. See further detail in the Methodological Notes for Part 1 of this report.

Total Registered Medical Radiation Technologist Workforce

After 216 records with other Employment Status values than *employed (and not on leave) in medical radiation technology* were removed, 16,915 records were identified as the registered workforce across the provinces and territories that submitted data to the MRTDB for 2008.

Diagram 1 illustrates the process of defining the workforce and the number of medical radiation technologists to be included or excluded in each step.

Diagram 1 Defining the Total Registered Medical Radiation Technologist Workforce From the CIHI MRTDB, 2008



Source
Medical Radiation Technologist Database, Canadian Institute for Health Information.

Table 2 summarizes the above descriptions and breaks down the information by jurisdiction for the number of records that were submitted and the number of records that were removed from the workforce due to inactive registrations, interprovincial duplicates and other Employment Status values. Furthermore, the last three columns indicate the registered medical radiation technologist workforce by province or the territories. The total number of the registered medical radiation technologist workforce for 2008 was 16,915. Of all the regulated provinces and the provinces requiring mandatory registration (Quebec, Ontario and Alberta; and Newfoundland and Labrador, P.E.I., Nova Scotia, New Brunswick, Manitoba and Saskatchewan, respectively) in 2008, Ontario accounted for 40.3% (6,030 out of 14,953) of the medical radiation technologist workforce in these provinces. Quebec represented 30.5% and Alberta a further 12.0%. After including 1,962 records for B.C. and the territories, the percentage for all regulated provinces and provinces requiring mandatory registrations was 88.4%, with the non-regulated provinces at 11.6%. However, the percentage for regulated provinces and provinces requiring mandatory registrations would have been slightly lower if non-regulated jurisdictions (B.C., the Yukon, the Northwest Territories and Nunavut) also included the medical radiation technologists who were not registered in 2008.

Table 2 Number, Composition and Percentage of Registered Medical Radiation Technologist Workforce, by Province or Territories of Registration, 2008

	All Submitted Records	Remove Inactive Records	Remove Duplicate Registrations‡	Remove Records if Employment Status Not Identified as Working MRTs§	Registered MRT Workforce		
	(A)	(B)	(C)	(D)	(A–B–C–D)	Percent of Groups 1 and 2	Percent of All
Regulated Provinces Requiring Mandatory Registration With Regulatory Bodies (Group 1)							
Que.	4,596	..	36	..	4,560	30.5%	27.0%
Ont.	6,289	..	60	199	6,030	40.3%	35.6%
Alta.	1,913	64	59	..	1,790	12.0%	10.6%
Sub-Total	12,798	64	155	199	12,380	82.8%	73.2%
Non-Regulated Provinces Requiring Mandatory Registration With Professional Associations (Group 2)							
N.L.	226	..	2	6	218	1.5%	1.3%
P.E.I.	87	..	2	3	82	0.5%	0.5%
N.S.	552	..	7	..	545	3.6%	3.2%
N.B.	543	19	4	2	518	3.5%	3.1%
Man.	661	..	2	6	653	4.4%	3.9%
Sask.	570	1	12	..	557	3.7%	3.3%
Sub-Total	2,639	20	29	17	2,573	17.2%	15.2%
Sub-Total For Groups 1 and 2	15,437	84	184	216	14,953	100.0%	88.4%
Non-Regulated Provinces/Territories With Voluntary CAMRT Registration (Group 3)							
B.C.*	1,997	58	..	..	1,939		11.5%
Territories†	23	..	..	..	23		0.1%
Sub-Total	2,020	58	..	..	1,962		11.6%
Total	**17,457**	**142**	**184**	**216**	**16,915**		**100.0%**

Notes

.. Information is not available.

* B.C. data at the aggregate level was provided by the CAMRT. Data may not represent all medical radiation technologists due to voluntary registrations with the CAMRT.

† Territories include the Yukon, the Northwest Territories and Nunavut. Data may not represent all medical radiation technologists due to voluntary registrations with the CAMRT.

‡ Duplicate registrations between the provinces/territories are identified and removed according to CIHI's primary/secondary registration methodology. See details in the Methodological Notes.

§ Employment Status values included in this column: *employed in medical radiation technology but on leave*, *employed outside of medical radiation technology*, *retired*, *unemployed*, and *unknown*. See details in the Methodological Notes regarding data inclusions and exclusions.

All cells that have values of less than 5 in this table are composed of different values or are the result of a more complicated methodology that was used so the individuals represented by these small cells cannot be identified. For this reason, these small cells are not suppressed.

Source

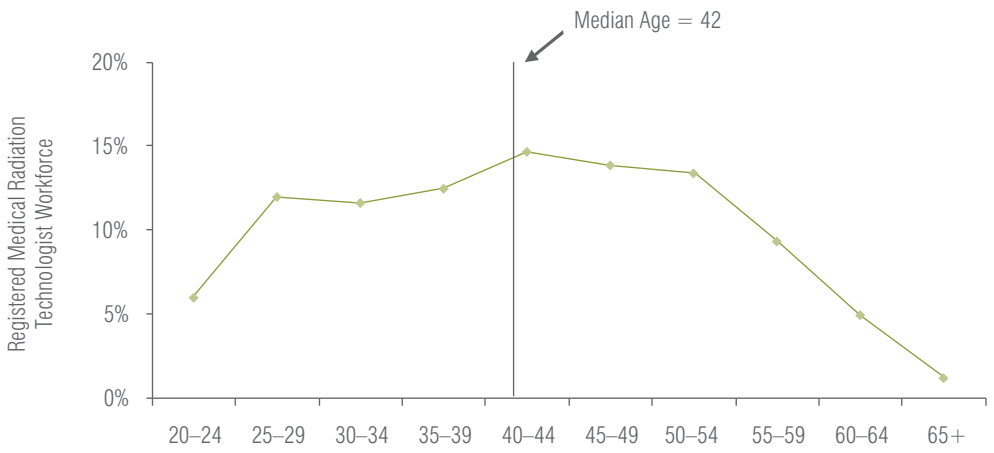
Medical Radiation Technologist Database, Canadian Institute for Health Information.

1.4 What Are the Demographic Factors Associated With Medical Radiation Technologists?

Age Distribution

Figure 1 shows the age distribution of registered medical radiation technologists employed (and not on leave) in all provinces and territories except for Saskatchewan. The largest five-year age group in 2008 was 40 to 44 years, followed by the next two older groups of 45 to 49 and 50 to 54 years. The median age indicates that half of the registered medical radiation technologists were younger than 42 and half were older in all jurisdictions except for Saskatchewan.

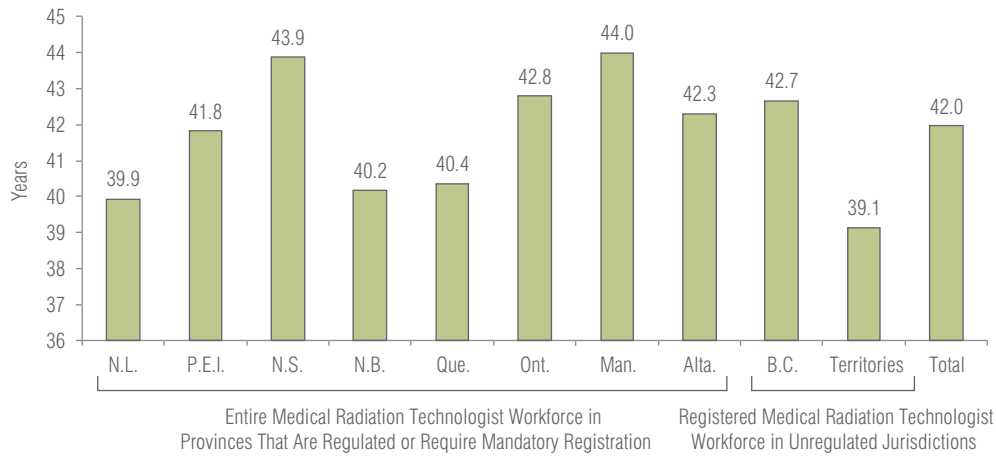
Figure 1 Percentage Distribution of Registered Medical Radiation Technologist Workforce, by Five-Year Age Group, by Selected Provinces and Territories, 2008



Notes
Excludes Saskatchewan.
Excludes 44 records with unknown age (0.3% of the total; 4 for Newfoundland and Labrador, 8 for Nova Scotia, 3 for New Brunswick, 3 for Manitoba and 26 for B.C.).
Provinces and territories are defined by the data element Province/Territory of Registration.
B.C. data at the aggregate level was provided by the CAMRT.
Territories include the Yukon, the Northwest Territories and Nunavut.
CIHI data will differ from provincial and territorial statistics due to the CIHI collection, processing and reporting methodology. The Methodological Notes provide more comprehensive information in this regard.
Source
Medical Radiation Technologist Database, Canadian Institute for Health Information.

Figures 2, 4 and 5 group the provinces that have data for the entire workforce together and group B.C., the Yukon, the Northwest Territories, Nunavut and totals in a separate category, since the data represents registered medical radiation technologists only. In 2008, across all provinces and territories with the exception of Saskatchewan, the average age of the registered medical radiation technologist workforce ranged from 39.1 in the territories to 44 in Manitoba. Almost all provinces had a registered workforce older, on average, than 40, with the exception of Newfoundland and Labrador, where the average age was 39.9 (Figure 2).

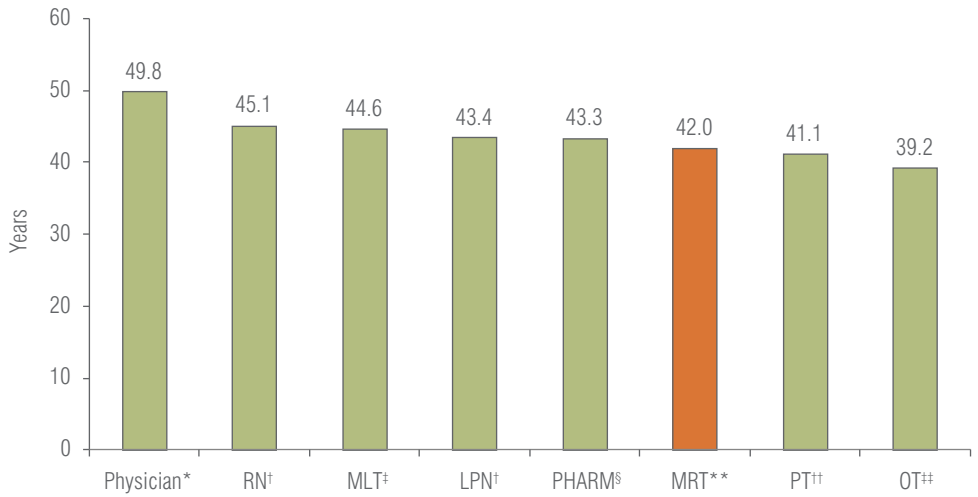
Figure 2 Average Age of Registered Medical Radiation Technologist Workforce, by Selected Province or Territories, 2008



Notes
Excludes 44 records with unknown age (0.3% of the total; 4 for Newfoundland and Labrador, 8 for Nova Scotia, 3 for New Brunswick, 3 for Manitoba and 26 for B.C.).
Provinces and territories are defined by the data element Province/Territory of Registration.
B.C. data at the aggregate level was provided by the CAMRT.
Territories include the Yukon, the Northwest Territories and Nunavut.
For the calculation of average age for "total," see the Methodological Notes for details.
CIHI data will differ from provincial and territorial statistics due to the CIHI collection, processing and reporting methodology. The Methodological Notes provide more comprehensive information in this regard.
Source
Medical Radiation Technologist Database, Canadian Institute for Health Information.

Overall, in all provinces and territories with the exception of Saskatchewan, the average age of the registered medical radiation technologist workforce was 42 years. Figure 3 displays the comparison of average age between eight professions in the same 12 jurisdictions, or those of the 12 jurisdictions where data is available. Medical radiation technologists on average are younger than physicians, registered nurses, medical laboratory technologists, licensed practical nurses and pharmacists, but are older than physiotherapists and occupational therapists.

Figure 3 Average Age of the Workforce, by Selected Health Care Providers, 2008



Notes

* Data for physicians includes Newfoundland and Labrador, P.E.I., Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Alberta, B.C. and the territories.

† Data for registered nurses (RN) and licensed practical nurses (LPN) includes Newfoundland and Labrador, P.E.I., Nova Scotia, New Brunswick, Quebec, Ontario, Alberta, B.C. and the territories.

‡ Data for medical laboratory technologists (MLT) includes Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan and Alberta. Excludes 42 records with unknown age (0.3% of the total; 9 for Manitoba, 3 for New Brunswick, 2 for Ontario, 2 for Quebec and 26 for Saskatchewan).

§ Data for pharmacists (PHARM) includes Newfoundland and Labrador, P.E.I., Nova Scotia, New Brunswick, Ontario, Alberta, B.C. and the Northwest Territories.

** Data for medical radiation technologists (MRT) includes Newfoundland and Labrador, P.E.I., Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Alberta, B.C. and the territories. Excludes 44 records with unknown age (0.3% of the total; 4 for Newfoundland and Labrador, 8 for Nova Scotia, 3 for New Brunswick, 3 for Manitoba and 26 for B.C.).

†† Data for physiotherapists (PT) includes Newfoundland and Labrador, P.E.I., New Brunswick, Quebec, Ontario, Alberta and B.C.

‡‡ Data for occupational therapists (OT) includes Newfoundland and Labrador, P.E.I., Nova Scotia, New Brunswick, Ontario, Manitoba, Alberta, B.C. and the territories. Excludes 36 records for Manitoba.

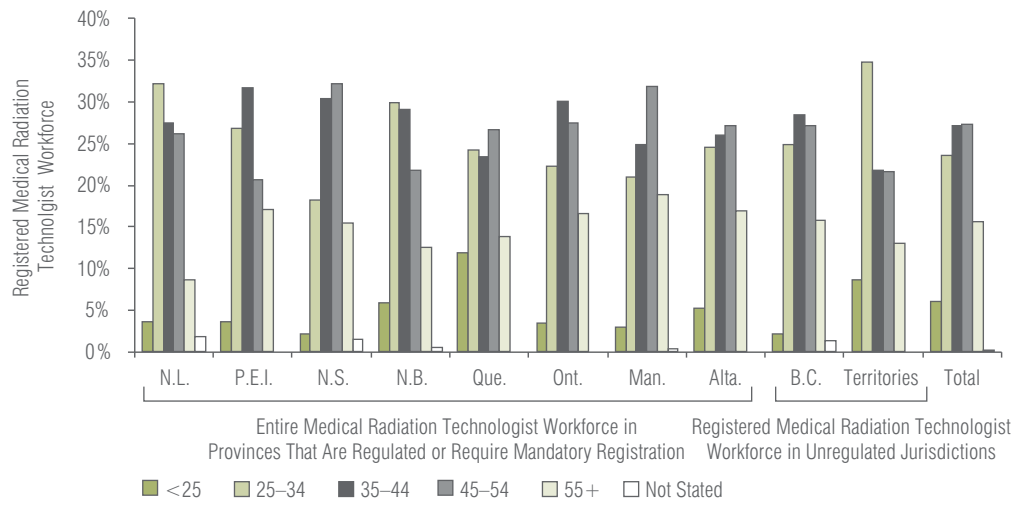
For more information and data limitations for each profession, please refer to the Methodological Notes for the respective databases.

Sources

Scott's Medical Database, Nursing Database, Medical Laboratory Technologist Database, Pharmacist Database, Medical Radiation Technologist Database, Physiotherapist Database and Occupational Therapist Database, Canadian Institute for Health Information.

The age composition of registered medical radiation technologists varied widely from jurisdiction to jurisdiction. While between 30% and 35% of registered medical radiation technologists were age 25 to 34 in Newfoundland and Labrador, New Brunswick and the territories (the Yukon, the Northwest Territories and Nunavut), the largest 10-year age group for Nova Scotia, Quebec, Manitoba and Alberta was 45 to 54. Quebec, however, had a larger proportion of technologists who were younger than 25 compared to other provinces and territories. When this age group is considered, Quebec had the largest proportion of medical radiation technologists younger than 35 among the provinces, followed by Newfoundland and Labrador and New Brunswick, with approximately 36% of medical radiation technologists in each of these provinces. The percentage for this age group for all other provinces was 30% or less. In the territories, the percentage for this age group was 43%. By contrast, Manitoba had a relatively older workforce—31.9% of medical radiation technologists were between 45 and 54, while those who were 55 or older in 2008 accounted for 18.8%. Both age groups together accounted for 50.7% of the workforce in the province, which reveals that in 10 years half of the 2008 workforce could potentially retire from the medical radiation technology profession (Figure 4).

Figure 4 Percentage Distribution of Registered Medical Radiation Technologist Workforce, by 10-Year Age Group, by Selected Province or Territories, 2008

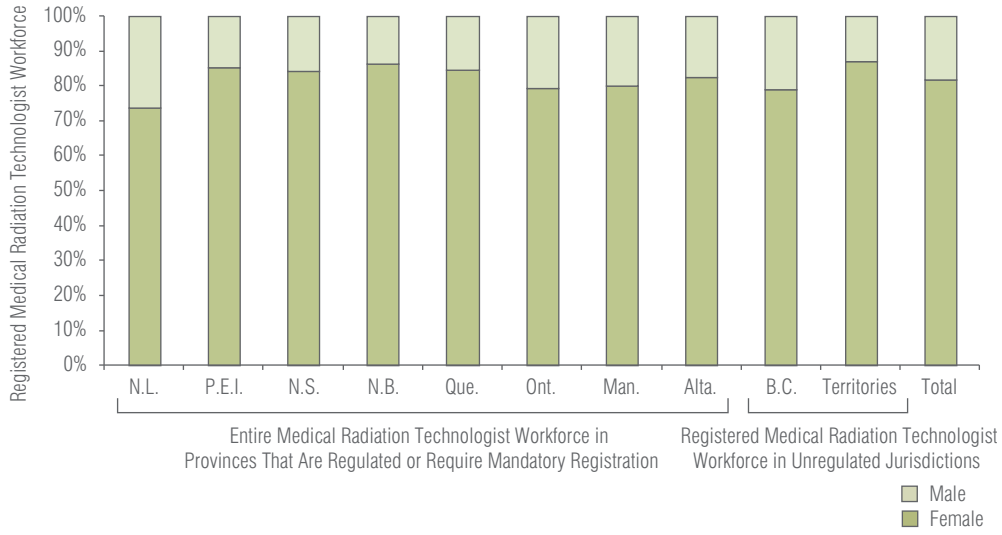


Notes
Excludes 44 records with unknown age (0.3% of the total; 4 for Newfoundland and Labrador, 8 for Nova Scotia, 3 for New Brunswick, 3 for Manitoba and 26 for B.C.).
Provinces and territories are defined by the data element Province/Territory of Registration.
B.C. data at the aggregate level was provided by the CAMRT.
Territories include the Yukon, the Northwest Territories and Nunavut.
Source
Medical Radiation Technologist Database, Canadian Institute for Health Information.

Gender

Figure 5 indicates that most medical radiation technologists were female in 2008. In all eight provinces that were either regulated or required mandatory registration (Newfoundland and Labrador, P.E.I., Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba and Alberta), female medical radiation technologists accounted for approximately 80% of the workforce, of which Newfoundland and Labrador had the lowest proportion (73.9%). Females represented 79% of the registered workforce for B.C. and 87% in the territories (the Yukon, the Northwest Territories and Nunavut).

Figure 5 Percentage Distribution of Registered Medical Radiation Technologist Workforce, by Gender, by Selected Province or Territories, 2008



Notes
Provinces and territories are defined by the data element Province/Territory of Registration.
B.C. data at the aggregate level was provided by the CAMRT.
Territories include the Yukon, the Northwest Territories and Nunavut.
CIHI data will differ from provincial and territorial statistics due to the CIHI collection, processing and reporting methodology. The Methodological Notes provide more comprehensive information in this regard.
Source
Medical Radiation Technologist Database, Canadian Institute for Health Information.

1.5 What Is the Educational Path to Enter Into the Profession of Medical Radiation Technology?

Basic Education in Medical Radiation Technology

Accredited Educational Programs

The first step to becoming a medical radiation technologist is to complete postsecondary education in medical radiation technology through accredited programs. Students may enrol in a degree program in a bachelor of science or a medical radiation technology program or in a two- to three-year college program in medical radiation technology.[10] Programs are accredited through the educational programs in medical radiation technology provided by the Conjoint Accreditation Services from the Canadian Medical Association.[11] The medical radiation technology programs include general radiography, magnetic resonance imaging, nuclear medicine and radiation therapy. Students must complete an accredited medical radiation technology program before taking certification exams, which is the next step to entering the medical radiation technologist workforce.[1, 10]

There were a number of Canadian accredited educational programs available across the country in 2008, as shown in Table 3. Some of these programs also required a period of supervised training.[11] Table 4 shows the number of students who graduated from these programs, where data is available, by school for 2005 to 2008. In total, more than 2,500 students graduated from these programs between 2005 and 2008. The number of graduates may be under-counted due to unavailable data for nine schools for 2005 and 2006 and six schools for 2007 and 2008.

Table 3 Provinces That Offer Accredited Educational Programs, by Medical Radiation Technology Discipline, 2008

Province	Magnetic Resonance	Nuclear Medicine	Radiation Therapy	Radiological Technology
N.L.				•
P.E.I.				•
N.S.		•		•
N.B.		•	•	•
Que.		•	•	•
Ont.	•	•	•	•
Man.	•		•	•
Sask.			•	•
Alta.	•	•	•	•
B.C.	•	•	•	•

Source
Canadian Medical Association.

Table 4 Number of Graduates of Medical Radiation Technologist Programs, by School of Graduation, Canada, 2005 to 2008

School	2005	2006	2007	2008
Newfoundland and Labrador				
College of the North Atlantic	12	13	13	14
Prince Edward Island				
University of Prince Edward Island/Queen Elizabeth Hospital	6	5	6	6
Nova Scotia				
Dalhousie University	9	25	..	..
New Brunswick				
New Brunswick Community College	12	16	..	..
University of New Brunswick	9	18	..	..
Collège communautaire du Nouveau-Brunswick—Campus de Dieppe/Université de Moncton	6	3	6	7
Moncton Hospital/UNB Saint John	..	..	5	6
Saint John Regional Hospital/UNB Saint John	..	..	12	12
Quebec				
Dawson College	..	..	9	9
CEGEP de Rimouski	17	24	..	..
Collège Ahuntsic	97	107	110	131
CEGEP de Sainte-Foy	..	..	85	88
Ontario				
Cambrian College	17	24	24	30
Collège Boréal d'arts appliqués et de technologie	17	25	..	..
Confederation College	7	7	8	7
Fanshawe College	36	43	37	43
Mohawk College/McMaster University	104	124	0	47
Queen's University/Eastern Ontario School of X-ray Technology	13	11	16	16
Michener Institute for Applied Health Sciences	44	41	72	100
University of Toronto/Michener Institute*	125	120	85	83
Manitoba				
Red River College	17	24	..	..
Cancer Care Manitoba	..	..	5	6
Saskatchewan				
Saskatchewan School of Radiation Therapy	17	16	4	3
Alberta				
Alberta School of Radiation Therapy	..	..	4	4
Northern Alberta Institute of Technology	..	..	7	4
Southern Alberta Institute of Technology	..	..	12	20
British Columbia				
British Columbia Institute of Technology	48	54	28	27
Total	**613**	**700**	**548**	**663**

Notes

.. Information was not available.

* Information for the University of Toronto and the Michener Institute combines two disciplines, although the number of graduates for the radiological technology program was not available for 2005 and 2006.

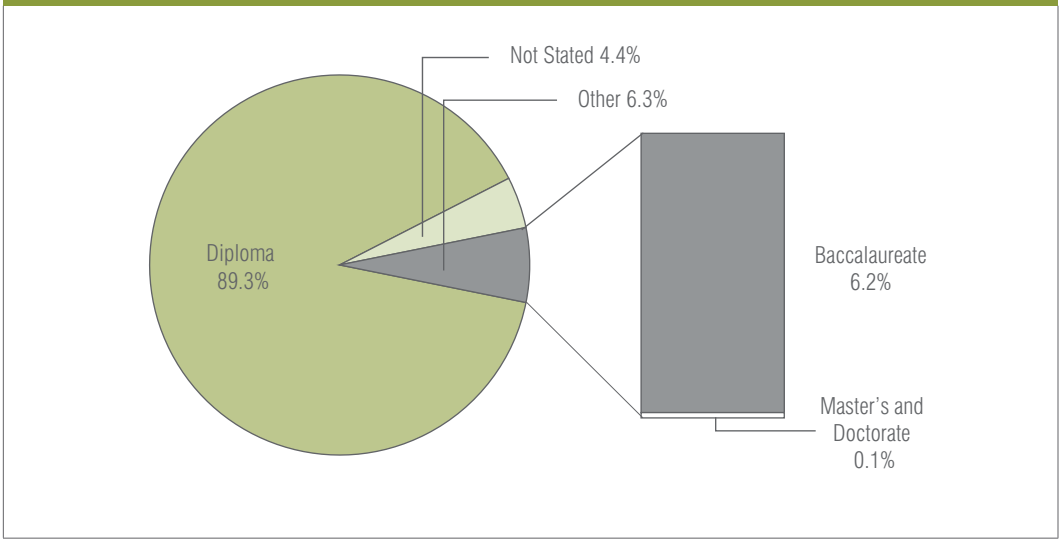
Source

Health Personnel Database, Canadian Institute for Health Information.

Level of Basic Education for the Medical Radiation Technologist Workforce

The MRTDB collects educational data. In contrast to the information presented above, which is for schools and graduates, the educational data from the MRTDB represents medical radiation technologists (that is, those who graduated and passed certification exams) who register with the provincial regulatory bodies, provincial professional associations or the CAMRT, depending on the jurisdiction's regulatory status and mandatory/voluntary registration status. Furthermore, certain methodologies were applied to identify the medical radiation technologist workforce, which is the primary focus of this report. Data for 2008 regarding level of basic education collected in the MRTDB is available for Newfoundland and Labrador, P.E.I., Quebec, Ontario, Manitoba and the territories (the Yukon, the Northwest Territories and Nunavut) only. Across these jurisdictions, the majority of medical radiation technologists held a diploma in medical radiation technology. Only a limited number of professionals held higher degrees than a diploma (Figure 6).

Figure 6 Level of Basic Education in Medical Radiation Technology for Medical Radiation Technologist Workforce, by Selected Provinces and Territories, 2008



Notes
Includes Newfoundland and Labrador, P.E.I., Quebec, Ontario, Manitoba and the Territories.
Provinces and territories are defined by the data element Province/Territory of Registration.
Territories include the Yukon, the Northwest Territories and Nunavut. Data may not represent all medical radiation technologists due to voluntary registrations with the CAMRT.
CIHI data will differ from provincial and territorial statistics due to the CIHI collection, processing and reporting methodology. The Methodological Notes provide more comprehensive information in this regard.
Source
Medical Radiation Technologist Database, Canadian Institute for Health Information.

Certification Requirements for Medical Radiation Technologists

Certification Examinations

After graduating from an accredited medical radiation technology educational program, graduates must successfully write a medical radiation technology certification examination to practise in their respective disciplines. This requirement applies in all jurisdictions except B.C. and the territories (the Yukon, the Northwest Territories and Nunavut). While B.C. and the territories do not legally require these certification requirements, most employers require them as a condition of employment. There are two certifying bodies in Canada: the CAMRT and l'Ordre des technologues en imagerie médicale et en radio-oncologie du Québec (OTIMRO). Both certification exams are deemed equivalent. Once candidates are successful in one or the other, they have national mobility to practise. Most candidates working in Quebec write the OTIMRO exam and candidates working in other jurisdictions usually write the CAMRT exam.[12]

Since 2005, more than 3,000 medical radiation technologist candidates (650 in 2005, 729 in 2006, 633 in 2007 and 678 in 2008) have passed the national certificate exams and received their medical radiation technology certification. Table 5 lists the number of candidates who obtained the CAMRT certification by location of residence and OTIMRO certification in Canada.

Table 5 Number of Medical Radiation Technologist Candidates Who Passed the CAMRT National Certification Exam or OTIMRO* Certification Exam, by Location of Residence, Canada, 2005 to 2008

Exam/Location of Residence	2005	2006	2007	2008
CAMRT Certification Exam				
Newfoundland and Labrador	19	21	14	15
Prince Edward Island	0	4	6	3
Nova Scotia	8	30	9	19
New Brunswick	20	29	26	35
Quebec	3	12	2	6
Ontario	348	365	290	328
Manitoba	27	36	55	44
Saskatchewan	26	28	26	22
Alberta	82	85	104	96
British Columbia	100	101	92	107
Non-Provincial Candidates†	17	18	9	3
Canada	**650**	**729**	**633**	**678**
OTIMRO Certification Exam				
Canada	**205**	**227**	**285**	**308**

Notes

* Quebec data for 2005 to 2008 is the number of candidates who passed the Ordre des technologues en radiologie du Québec (OTRQ) certification exam. The OTRQ changed to the Ordre des technologues en imagerie médicale et en radio-oncologie du Québec (OTIMRO) in 2008.

† Candidates may reside in the territories or outside of Canada.

Source

Health Personnel Database, Canadian Institute for Health Information.

Which Certification Areas Do Medical Radiation Technologists Have When Entering the Workforce?

Of the 678 medical radiation technologist candidates who passed the CAMRT certification exams in 2008, nearly 60% (404) were granted certification in radiological technology. The remaining were certified in magnetic resonance imaging (15.5%), radiation therapy (14.3%) and nuclear medicine (10.6%). Table 6 illustrates this information by certification discipline and by location of residence. The information provides a snapshot of CAMRT examinations in 2008; however, we do not know how many individuals progressed towards working in the profession.

Table 6 Number of Medical Radiation Technologist Candidates Who Obtained CAMRT Certification, by Certification Discipline, by Location of Residence, 2008

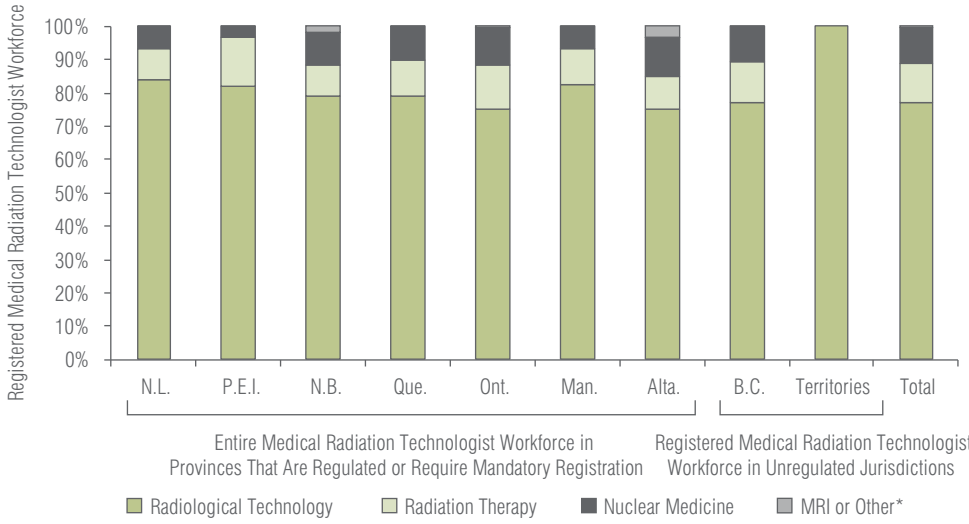
Location of Residence	Radiological Technology	Magnetic Resonance Imaging	Radiation Therapy	Nuclear Medicine
Newfoundland and Labrador	13	2	0	0
Prince Edward Island	3	0	0	0
Nova Scotia	11	2	1	5
New Brunswick	18	9	2	6
Quebec	1	0	5	0
Ontario	173	63	59	33
Manitoba	34	5	5	0
Saskatchewan	18	0	4	0
Alberta	68	7	5	16
British Columbia	63	17	15	12
Non-Provincial Candidates*	2	0	1	0
Canada—Count	**404**	**105**	**97**	**72**
Canada—Percent	**59.6%**	**15.5%**	**14.3%**	**10.6%**

Note
* Candidates may reside in the territories or outside of Canada.
Source
Canadian Association of Medical Radiation Technologists.

The MRTDB collects certification data; however, only the initial certification data passed CIHI's quality screening process for reporting. Initial certification is the first certification that medical radiation technologists receive in order to practise in the profession. In eight provinces (Newfoundland and Labrador, P.E.I., New Brunswick, Quebec, Ontario, Manitoba, Alberta and B.C.), more than three-quarters (76.9%) of registered medical radiation technologists were initially certified in radiological technology, with small variations across the selected provinces. Most of the remaining medical radiation technologists were certified in either radiation therapy (11.7%) or nuclear medicine (10.6%). Only a limited number of medical radiation technologists in Ontario and Alberta chose magnetic resonance imaging (MRI) as their initial certification. This may reflect the fact that this discipline is generally pursued by medical radiation technologists only after they are certified in other areas. This characteristic distinguishes the initial certification from the complete certification profile for the medical radiation technologist workforce.

All registered medical radiation technologists working in the territories were initially certified in radiological technology (Figure 7). Information for B.C. and the territories, however, may not represent all medical radiation technologists in these jurisdictions.

Figure 7 Percentage Distribution of Registered Medical Radiation Technologists, by Initial Certification Discipline, by Selected Province or Territories, 2008



Notes

* New Brunswick had 2% of medical radiation technologists claim other certification discipline due to historical reasons; these are included in the category MRI or Other.

Provinces and territories are defined by the data element Province/Territory of Registration.

B.C. data at the aggregate level was provided by the CAMRT.

Territories include the Yukon, the Northwest Territories and Nunavut.

Excludes 17 records with not stated discipline (0.1% of the total; 6 for Quebec, 5 for Ontario and 6 for Alberta).

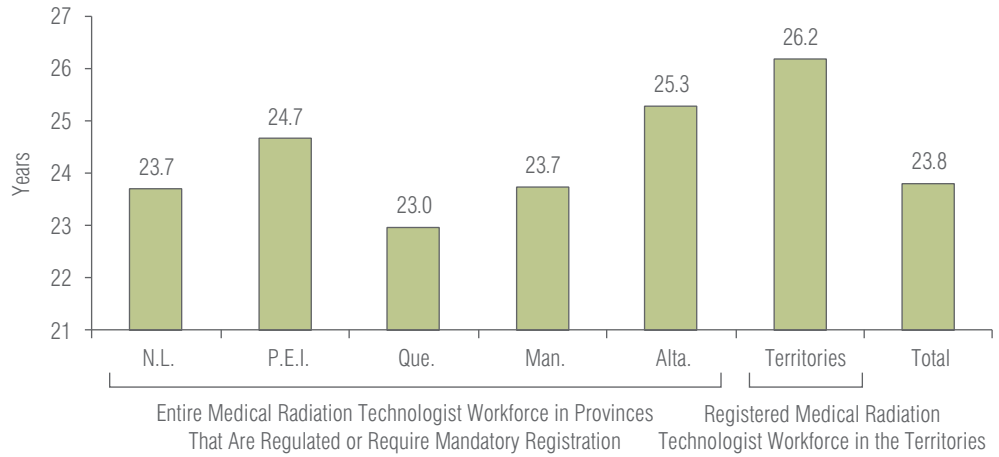
CIHI data will differ from provincial and territorial statistics due to the CIHI collection, processing and reporting methodology. The Methodological Notes provide more comprehensive information in this regard.

Source

Medical Radiation Technologist Database, Canadian Institute for Health Information.

Figure 8 illustrates that, on average, medical radiation technologists received their initial medical radiation technology certification in their 20s, from the youngest at age 23 in Quebec to the oldest at age 26.2 in the territories, among selected jurisdictions.

Figure 8 Average Age of Medical Radiation Technologist Workforce, at Initial Certification, by Selected Province or Territories, 2008



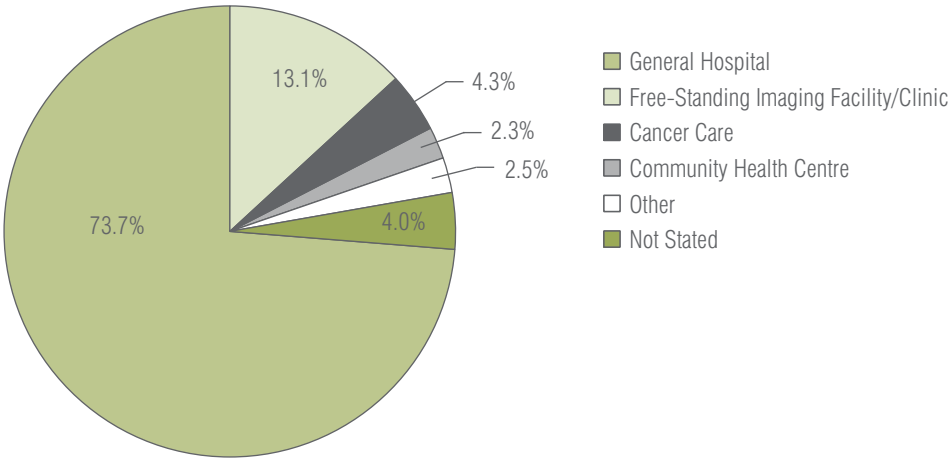
Notes
Excludes 16 records with unknown age at receiving initial certification (0.1% of total; 5 for Newfoundland and Labrador, 5 for Manitoba and 6 for Alberta).
Provinces and territories are defined by the data element Province/Territory of Registration.
Territories include the Yukon, the Northwest Territories and Nunavut.
CIHI data will differ from provincial and territorial statistics due to the CIHI collection, processing and reporting methodology. The Methodological Notes provide more comprehensive information in this regard.
Source
Medical Radiation Technologist Database, Canadian Institute for Health Information.

1.6 In Which Settings Do Medical Radiation Technologists Work?

Workplace of Primary Employment

Medical radiation technologists work in health care facilities such as hospitals, community health centres, cancer treatment centres, free-standing facilities or clinics and mobile imaging units. In these work settings, their roles may be that of managers, supervisors, charge technologists/team leaders, staff technologists, radiation safety officers, consultants, information system specialists or quality management specialists.[13–15] In 2008, 73.7% of medical radiation technologists worked in hospitals (primary employment) in the provinces of Newfoundland and Labrador, P.E.I., New Brunswick, Quebec, Manitoba and Alberta (those that are either regulated or require mandatory registration). The remaining workforce was distributed among different types of workplaces, such as free-standing facilities or clinics (13.1%), cancer treatment centres (4.3%), community health centres (2.3%) and other places of primary employment (2.5%). See Figure 9.

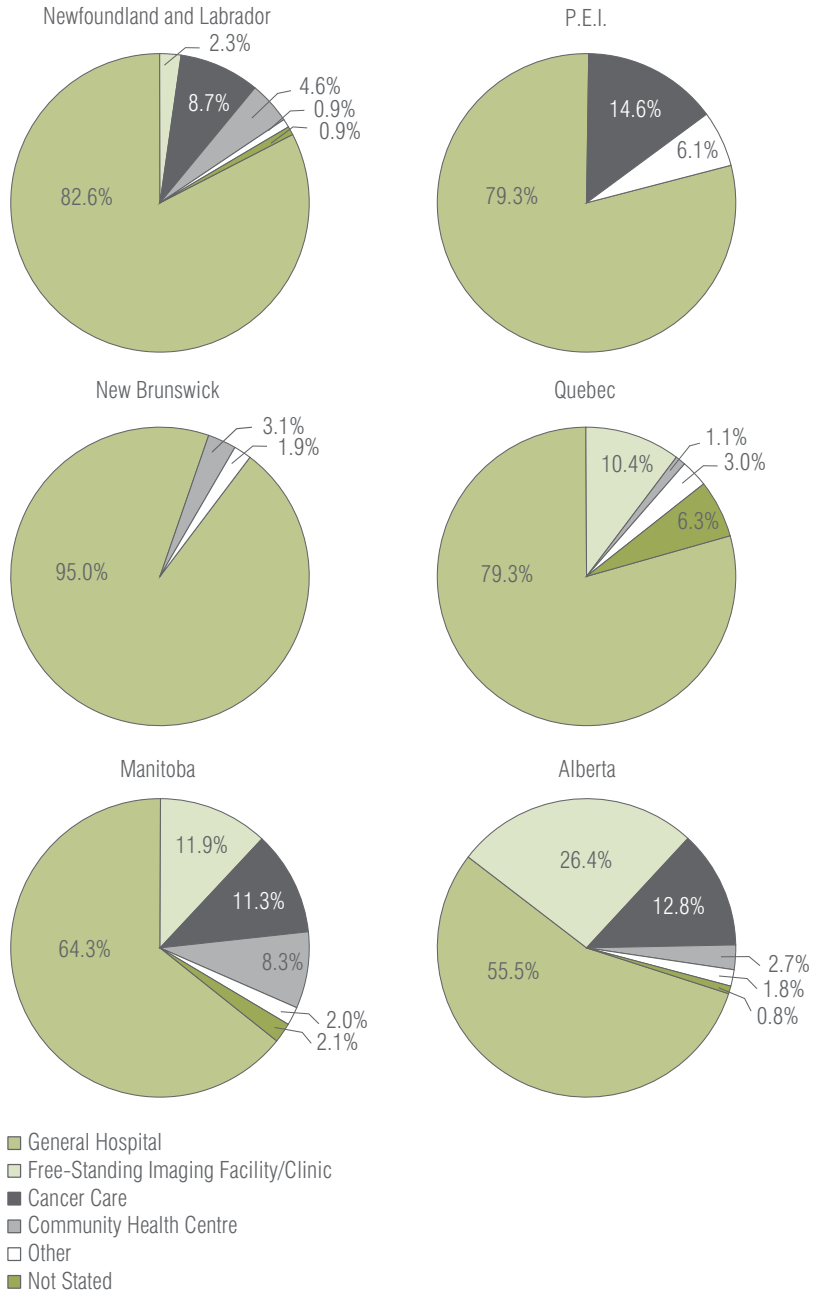
Figure 9 Place of Primary Employment of Medical Radiation Technologist Workforce, by Selected Provinces, 2008



Notes
Includes Newfoundland and Labrador, P.E.I., New Brunswick, Quebec, Manitoba and Alberta.
Other includes mobile imaging unit, postsecondary educational institution, association/government/para-governmental, industry, manufacturing and commercial, and other.
Provinces are defined by the data element Province/Territory of Registration.
CIHI data will differ from provincial and territorial statistics due to the CIHI collection, processing and reporting methodology. The Methodological Notes provide more comprehensive information in this regard.
Source
Medical Radiation Technologist Database, Canadian Institute for Health Information.

At the provincial level for primary employment, although general hospitals employed most medical radiation technologists, each province had its own unique distribution pattern in terms of where medical radiation technologists worked. In 2008, the proportion of medical radiation technologists who worked in general hospitals in Newfoundland and Labrador, P.E.I. and Quebec was approximately 80%; in New Brunswick it was 95%; in Manitoba it was 64.3%; and in Alberta it was 55.5%. The differences may be explained by the ways in which diagnostic imaging services are delivered and organizationally structured from one province to another. For example, some provinces may offer some services in free-standing diagnostic imaging centres, while other jurisdictions may offer the same services in hospitals.

Figure 10 Place of Primary Employment of Medical Radiation Technologist Workforce, by Selected Province, 2008



Notes

Other includes mobile imaging unit, postsecondary educational institution, association/government/ para-governmental, industry, manufacturing and commercial, and other.
Provinces are defined by the data element Province/Territory of Registration.
CIHI data will differ from provincial and territorial statistics due to the CIHI collection, processing and reporting methodology. The Methodological Notes provide more comprehensive information in this regard.

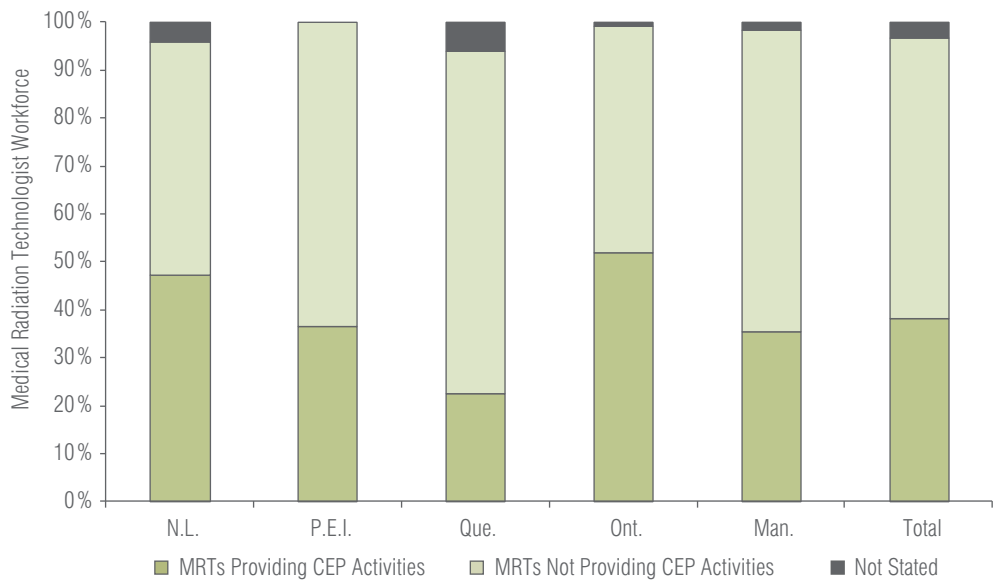
Source

Medical Radiation Technologist Database, Canadian Institute for Health Information.

Clinical Education/Preceptor Activities in Primary Employment

Medical radiation technologists may provide clinical education at their place of work, either as a component of or as the entire responsibility of their position, to medical radiation technologists and/or other health professionals participating in practicum or residency training as part of a postsecondary education program. Figure 11 illustrates the percentage of the workforce that participated in providing clinical education to students as part of their primary employment in 2008. Of five selected provinces that were either regulated or required mandatory registration, Ontario had the highest percentage (51.9%) of medical radiation technologists who provided clinical education/preceptor activities. In contrast, Quebec had the lowest percentage (22.5%) of the workforce engaged in these activities.

Figure 11 Percentage of Medical Radiation Technologist Workforce With or Without Clinical Education/Preceptor Activities, at Place of Primary Employment, by Selected Province, 2008



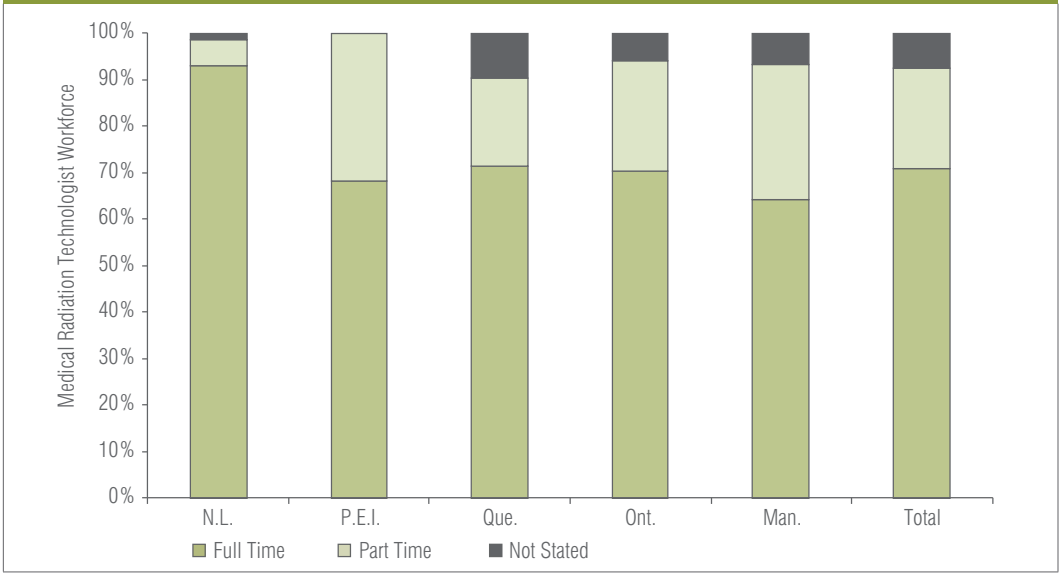
Notes
Provinces are defined by the data element Province/Territory of Registration.
CEP: clinical education/preceptor.
CIHI data will differ from provincial and territorial statistics due to the CIHI collection, processing and reporting methodology. The Methodological Notes provide more comprehensive information in this regard.
Source
Medical Radiation Technologist Database, Canadian Institute for Health Information.

Full-Time/Part-Time Status for Primary Employment

According to the *MRTDB Data Dictionary*, an employee's full-time or part-time status refers to the official status with an employer. If a medical radiation technologist did not report his or her full-time or part-time status, or reported casual employment status at the time of registration with the data provider who submitted data to the MRTDB, the data provider was expected to assign a value to each record, with full-time status if the usual hours worked were 30 or greater and part-time status if the usual hours worked were less than 30. Nevertheless, it is possible that the value for this data element may remain *not stated*.

In 2008, three out of five selected provinces, P.E.I., Quebec and Ontario (that were either regulated or required mandatory registration), had approximately 70% of their medical radiation technology workforce working on a full-time basis. The percentage for the full-time workforce was more than 90% in Newfoundland and Labrador and remained lowest in Manitoba, at 64.3%. Although *not stated* status may change the existing distribution between full-time and part-time status, particularly when the proportion is significant, full-time status still dominates the workforce (Figure 12). This is because even if all of the *not stated* proportion was allocated to the part-time group, the full-time group would still account for more than 60% of the workforce in each of these provinces.

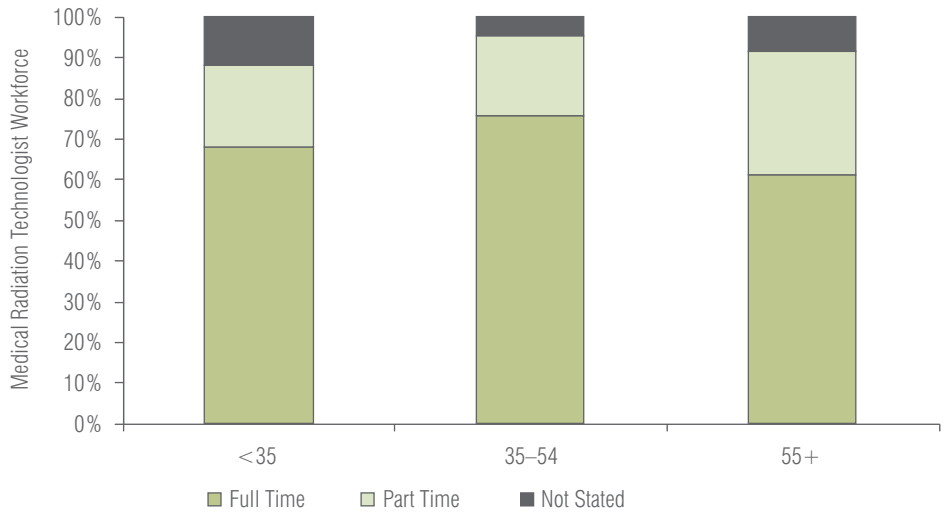
Figure 12 Full-Time/Part-Time Distribution of Medical Radiation Technologist Workforce, for Primary Employment, by Selected Province, 2008



Notes
Provinces are defined by the data element Province/Territory of Registration.
CIHI data will differ from provincial and territorial statistics due to the CIHI collection, processing and reporting methodology. The Methodological Notes provide more comprehensive information in this regard.
Source
Medical Radiation Technologist Database, Canadian Institute for Health Information.

Examining full-time or part-time status for primary employment by age group reveals that those 35 to 54 had the highest percentage for full-time status (75.7%). The age group with the second-highest percentage for full-time status was those younger than 35 (67.8%). For those 55 and older, at which point many medical radiation technologists are eligible for retirement, it appears some tend to shift from a full-time to a part-time job, which resulted in a lower percentage of the workforce having full-time status (60.9%). Nevertheless, if it were possible to categorize *not stated* status into full-time or part-time status, the distribution of full-time/part-time status within an age group or the ranks between the groups might be altered (Figure 13).

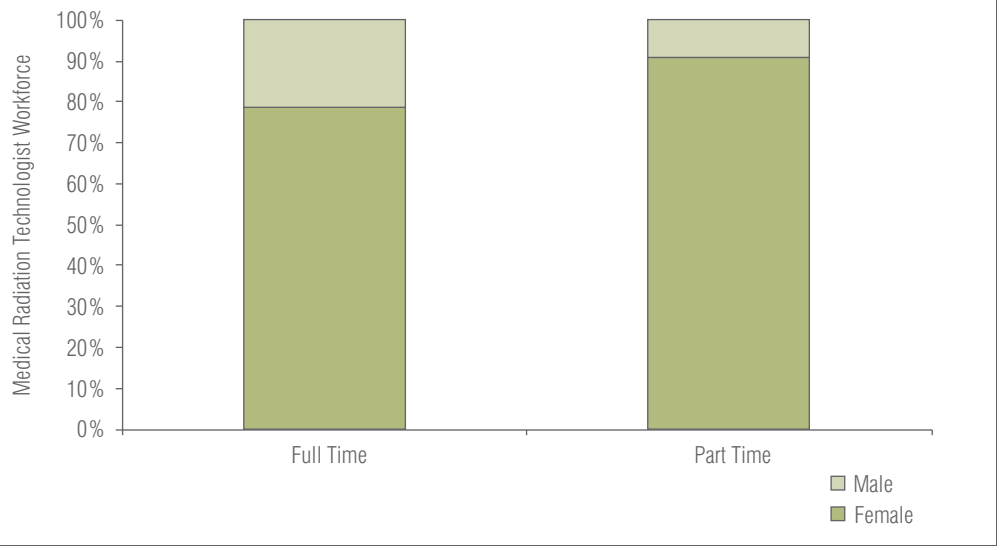
Figure 13 Full-Time/Part-Time Distribution of Medical Radiation Technologist Workforce, by Age Group, for Primary Employment, by Selected Provinces, 2008



Notes
Includes Newfoundland and Labrador, P.E.I., Quebec, Ontario and Manitoba.
Excludes 7 records (0.1% of the total) with unknown age.
Provinces are defined by the data element Province/Territory of Registration.
CIHI data will differ from provincial and territorial statistics due to the CIHI collection, processing and reporting methodology. The Methodological Notes provide more comprehensive information in this regard.
Source
Medical Radiation Technologist Database, Canadian Institute for Health Information.

Figure 14 shows the gender percentage distribution of the medical radiation technologist workforce for primary employment categorized by full-time or part-time status in selected provinces. Nearly 80% of the full-time workforce was female. In the part-time group, the percentage of female workforce increased to 90%. The male workforce accounted for a small proportion in both groups compared to females; however, full-time males had a relatively larger share compared to part-time males. Again, if *not stated* full-time or part-time status (7.4% of all records) could be identified, these statistics might be affected.

Figure 14 Gender Distribution of Medical Radiation Technologist Workforce, by Full-Time/ Part-Time Status at Primary Employment, by Selected Regulated Provinces, 2008



Notes
Includes Newfoundland and Labrador, P.E.I., Quebec, Ontario and Manitoba.
Excludes 801 records (7.4% of the total) with *not stated* full-time/part-time status for primary employment.
Provinces are defined by the data element Province/Territory of Registration.
CIHI data will differ from provincial and territorial statistics due to the CIHI collection, processing and reporting methodology. The Methodological Notes provide more comprehensive information in this regard.
Source
Medical Radiation Technologist Database, Canadian Institute for Health Information.

Part 2

The Hospital Work Environment for Medical Radiation Technologists

2.1 Introduction

In Part 1 of this report, it was shown that most medical radiation technologists worked in general hospitals. Part 2 of this report focuses on hospital data housed in the CMDB. However, it must be noted that hospitals are complex environments, involving daily interactions between numerous professionals. The number of people involved in delivering services and collecting and reporting data in a hospital environment, together with the fact that health services are governed, organized and delivered uniquely by provinces and territories, makes direct operational comparisons and analyses complex. To facilitate such comparisons, hospitals and their diagnostic imaging departments utilize the MIS Standards to quantify and report financial and statistical data in the delivery of their services. Though comparative data is presented in this section, the underlying causes of variability can be understood only by understanding the local operational structure of a hospital and its diagnostic imaging services.

2.2 Why Focus Primarily on the Work Environment of Hospital Diagnostic Imaging Functional Centres for Medical Radiation Technologists?

One employment characteristic that is illustrated in Part 1 of this report is workplace of primary employment. In this section, the six provinces of Newfoundland and Labrador, P.E.I., New Brunswick, Quebec, Manitoba and Alberta provide primary employment information. According to the data presented on these six provinces, most medical radiation technologists (73.7%) were employed in a general hospital setting. In addition, based on 2008 supply information presented in Part 1, the percentage of registered medical radiation technologists for these six selected provinces represents just less than half (46.2%) of the total registered workforce.

Since MIS data includes only the financial and statistical data from hospitals whose data is housed in the CMDB, and excludes data from Quebec and Nunavut, the financial and statistical indicator values presented in this section of the report provide a snapshot of the financial and statistical information related to medical radiation technologists' main place of work, a hospital setting.

2.3 What Is the Role of Diagnostic Imaging Functional Centres Within the Hospital Environment and What Are Their Financial and Statistical Reporting Requirements?

Defining Hospital Diagnostic Imaging Functional Centres

Hospitals are complex environments, with personnel from many departments interacting to provide services to patients, whether these patients are inpatients, emergency patients or outpatients. The financial and statistical data collected in hospitals is based on functional centres that include but are not limited to administration, materials management, finance, decision support, IT/IS services, nursing services, respiratory services, physiotherapy, pharmacy, occupational therapy and diagnostic services, including clinical laboratory and diagnostic imaging.

Diagnostic imaging functional centres play an integral role in delivering those services. According to the World Health Organization, the assumption is that diagnostic imaging is needed in some 20% to 30% of medical cases worldwide. The Canadian experience seems to follow along the same lines.[16] On a daily basis, medical radiation technologists perform exams to help clinicians care for their patients. Throughout the course of their work day, medical radiation technologists and other diagnostic imaging staff often interact with other hospital staff in delivering diagnostic imaging services.

In addition, hospitals and their diagnostic imaging functional centres must manage the resources involved in delivering health care services. To assist in that regard, hospitals and diagnostic imaging departments utilize the MIS Standards to quantify and report financial and statistical data on the delivery of those services.

The MIS Standards

The MIS Standards are a set of national standards for collecting and reporting financial and statistical data related to the day-to-day operations of health service organizations across the continuum of care. These standards provide a framework for developing management information systems needed to identify and track services and their accompanying costs.

The MIS Standards identify the specific types of financial and statistical data that should be collected by the various departments. They also provide direction on how to group the data once it has been collected and how to process it in different ways. Finally, the MIS Standards identify how the information can be used for management purposes, such as in costing activities or developing a budget.

In Canada, the MIS Standards have been endorsed and adopted by all the provinces and territories except Quebec and Nunavut. As such, diagnostic imaging functional centres in hospitals collect and report financial and statistical data using the MIS Standards in most jurisdictions. By doing so, they are able to quantify the amount of resources used to provide patient care in a standardized format.

The major goals of the MIS Standards are to improve the quality and comparability of the data on a national basis and to better measure resource utilization and activity expenditure by integrating financial, statistical and clinical data. This data, which is housed in the CMDB, can be used to report financial and statistical data at a national level.

The MIS Standards address information at the functional centre and patient-specific levels but do not encompass information related to the care, treatment or clinical status of the patient; nor do they attempt to quantify or assess the quality of such services.

Submission of MIS Data to CIHI

Each year, hospitals (including their diagnostic imaging functional centres) and health regions from across Canada (except Quebec and Nunavut) are expected to submit MIS Standards–compliant financial and statistical data relating to hospital services to CIHI's CMDB. Although Quebec has not endorsed or adopted the MIS Standards, the province does submit data to CIHI based on a slightly different standard, the *Manuel de gestion financièr*e, which, in the near future, may be mapped to similar MIS-based accounts. At this time, Quebec data is not included in this report. Health regions also submit other health service activities. Most provinces and territories submit hospital data through their respective ministries of health.

Data Quality in the CMDB

The ability to calculate accurate indicator values from CMDB data is dependent on the provision of accurate financial and statistical data in the jurisdictions' data submissions to the CMDB. As with any database, the CMDB contains some data quality issues, including

- The reporting of data that does not meet the CMDB's minimum reporting requirements; and
- The inconsistent reporting of some statistical data elements across jurisdictions.

In some cases, these issues prevented CIHI from reporting comparative indicators for all jurisdictions for this report. CIHI continues to work with the provinces and territories to improve the quality of data in the CMDB to improve the ability to provide interjurisdictional comparisons for analysis.

2.4 What Does a Diagnostic Imaging Setting Encompass?

The MIS Standards define diagnostic imaging as an environment where medical radiation technologists obtain images by producing visual records of body tissues and functions and where the records are interpreted to assist in the clinical investigation and management of patients.[9]

Within the diagnostic imaging environment, medical radiation technologists interact with other diagnostic imaging staff, such as directors, managers, PACS coordinators, clerical and secretarial staff, dark room technicians, film librarians, diagnostic medical sonographers, registered nurses and medical personnel, such as radiologists, medical residents, interns and medical students.

In addition, the MIS Standards provide more detailed information regarding areas within diagnostic imaging, as described below.[9]

Diagnostic Imaging Administration

This area of diagnostic imaging is where clerical, secretarial, quality, utilization, computer, management and operational support are provided to the entire diagnostic imaging service.

Radiography

In radiography, medical radiation technologists obtain images for general diagnostic purposes by using X-ray equipment.

Mammography

In this area, medical radiation technologists take X-rays of breast tissue for screening and/or diagnostic purposes.

Interventional/Angiography Studies

During interventional and angiography studies, medical radiation technologists obtain images by using X-ray equipment. In the interventional suite, studies are done by using radiographic techniques that use minimally invasive methods as well as imaging guidance to perform studies that replace conventional surgery, such as diagnostic arteriography, renal and peripheral vascular interventions, biliary, venous access procedures and embolization.

During angiography studies, medical radiation technologists use a radiographic technique where a radio-opaque contrast material is injected into a blood vessel to identify its anatomy on X-ray (for example, brain, heart, kidneys, aorta, neck and pulmonary circuit).

Computed Tomography

In computed tomography (CT), medical radiation technologists obtain images by using radiant energy to reconstruct images of tissues and organs by means of a visual display on a TV monitor or graphical representation. This area may also include the fusion single photon emission computed tomography (SPECT)/CT technology.

Ultrasound

In this area, medical radiation technologists produce a visual record of body tissues by means of high-frequency sound waves and interpret the record to assist in the clinical investigation of patients. Medical radiation technologists working in ultrasound may perform abdominal, echocardiography, obstetrical and gynecological, ophthalmological, neurological or vascular ultrasounds.

Nuclear Medicine—Gamma Cameras

In nuclear medicine, medical radiation technologists prepare, deliver and evaluate diagnostic images and treatment procedures using radiopharmaceuticals (radioisotopes). This includes SPECT without CT.

Cardiac Catheterization Diagnostic Services

Medical radiation technologists working in this suite obtain images during cardiac catheterization and angioplasty procedures.

Positron Emission Tomography

In positron emission tomography (PET), medical radiation technologists obtain images by introducing positron-emitting radioisotopes to the body to make diagnostic examinations and to evaluate disease states by measuring the metabolic activity of cells. This area may also include new fusion technologies such as PET/CT.

Magnetic Resonance Imaging

In this area, medical radiation technologists obtain images by producing a visual record of body tissues and organs by use of radiant energy from magnetic resonance equipment; they also interpret the record to assist in the clinical investigation of patients.

As noted above, there are many different areas within diagnostic imaging. Depending on the size of the facility and the population it serves, the diagnostic imaging department will vary in the number and types of areas within it. Medical radiation technologists may work in one area or they may work in a combination of areas; this depends on a number of factors, such as the size of the diagnostic imaging department, number of staff and coverage 24 hours a day, 7 days a week.

2.5 What Was the Cost of Delivering Health Services in Hospitals in 2008 and What Resources Were Consumed by Their Diagnostic Imaging Functional Centres to Deliver Those Services?

Delivering health services to patients can be a costly endeavour. We know that in Canada in 2007, total health expenditure in current dollars was estimated at $161.0 billion and was forecast to have reached $173.6 billion in 2008.[17] Included in those costs were those related to the services provided by diagnostic imaging functional centres.

Diagnostic imaging services can include hospital-based diagnostic imaging services, community-based diagnostic imaging services and other service delivery mechanisms. Of the $173.6 billion forecast to be expended in 2008 for health expenditures, the largest single component continued to be expenditures in hospitals, making up 28%, or $48.5 billion.[17] This section focuses on those services that are delivered from hospital-based diagnostic imaging services.

In delivering those services, diagnostic imaging functional centres consume various resources to deliver patient care. Resources can be in the form of health human resources or material resources.

Consuming resources generates expenses in diagnostic imaging, including such costs as

- Compensation (such as salaries);
- Supplies (such as film and contrast media);
- Sundries (such as continuing education fees and materials);
- Equipment expenses (such as amortizing the cost of imaging equipment, for example, a CT scanner); and
- Contracted-out services (such as the cost of referring patients to other facilities for services not performed in house, for example, MRI scans).

In diagnostic imaging, measuring the amount of resources consumed is facilitated by collecting and reporting statistical information for both service activity and workload data by the category of service recipient.

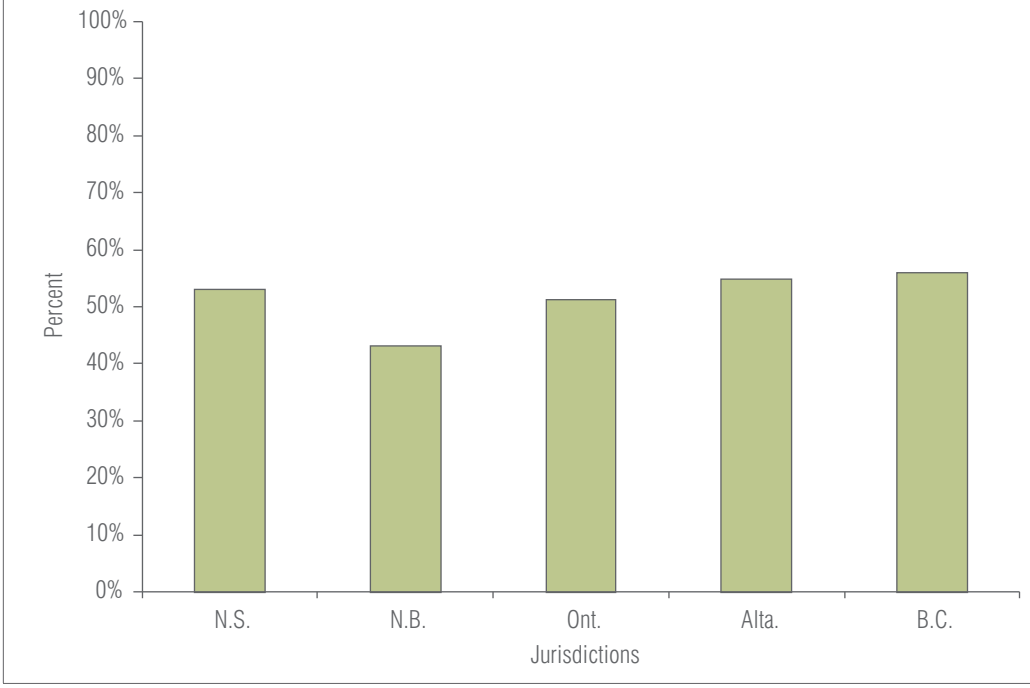
2.6 What Are the Compensation Expenses in Hospital Diagnostic Imaging Functional Centres?

Delivering diagnostic imaging services would not be possible without staffing. The staffing of diagnostic imaging functional centres includes medical personnel, management and operational support personnel and unit-producing personnel (UPP). UPP are those staff who carry out the hands-on service mandate of the diagnostic imaging functional centre. Medical radiation technologists and diagnostic medical sonographers are two examples of UPP. Typical duties of UPP could include reviewing the physician orders for completeness and appropriateness, assessing the patient's status prior to the exam, administering radiopharmaceuticals and/or contrast media, acquiring images and assessing the quality of images.

For rendering services, diagnostic imaging staff are compensated with a monetary payment in the form of a salary and benefits. Compensation expense is only one component of the total diagnostic imaging expenses, which also include supplies, sundries, equipment and contracted-out expenses. Without personnel, there would be no services.

In Canada, across the selected jurisdictions of Nova Scotia, New Brunswick, Ontario, Alberta and British Columbia, the proportion of expenses which encompass compensation varies. In Figure 15, the average proportion of compensation in 2007–2008 illustrates that the weighted average percentage of diagnostic imaging expenses related to compensation varied from 43.2% in New Brunswick to 55.9% in British Columbia. Refer to the Methodological Notes for Part 2 of this report for further information on weighted averages.

Figure 15 Diagnostic Imaging Compensation Expense* as a Percentage of Total Diagnostic Imaging Expenses, by Selected Province, 2007–2008



Note

* Includes compensation for management and operational support personnel and unit-producing personnel working in diagnostic imaging functional centres, excluding medical personnel.

Source

Canadian MIS Database, Canadian Institute for Health Information.

Many factors can affect the compensation rates across hospitals and jurisdictions. The economic situation in the jurisdiction and the local job market may influence the compensation rate. Other factors may include the staffing mix, as compensation rates vary across the different professions (for example, medical radiation technologists versus dark room technicians) and across jurisdictions. In addition, compensation rates may be affected by the negotiation of salary rates, including overtime rates, shift differentials and rates for working on a statutory holiday. Further details about this information are not available in the CMDB but may be available at the provincial or local level. Compensation rates may also be affected by the proportion of personnel with many years of service and the level and amount of benefits received by personnel.

The breadth and complexity of the services provided by diagnostic imaging may determine the number of specialized positions required and the supervisory staff needed, as well as the staffing mix. Size of the diagnostic imaging functional centre may also determine whether there is staff on site 24 hours a day, 7 days a week, or whether staff is scheduled on stand-by after regular hours.

The amount of diagnostic imaging services that is contracted-out from the hospital may be another cause of variation for this indicator. The amount of services contracted out may depend on the complexity of imaging required, the scope of services provided and the availability of specialized equipment or expertise.

Technology is another significant factor that may affect this indicator. A highly integrated diagnostic imaging functional centre may have proportionally less compensation than a less-integrated diagnostic imaging functional centre (for example, a filmless diagnostic imaging functional centre versus one that must process films manually). The type of equipment as well as the age of equipment may also affect the proportion of compensation.

Geographical location may also affect the proportion of expenses that is compensation. For example, a diagnostic imaging functional centre housed in a remote hospital with no other diagnostic imaging services nearby may require backup or duplicate equipment and systems to ensure continued patient care when one piece of equipment or system malfunctions. Furthermore, geographically isolated diagnostic imaging functional centres may pay a higher price for equipment, supplies and personnel as a result of increased transportation or travel costs.

2.7 What Are the Details of Compensation in Hospital Diagnostic Imaging Functional Centres?

Compensation expense includes three major components: worked compensation, benefit compensation and benefit contributions compensation. Worked compensation is those salaries paid to personnel for the hours in which they are present and available for work. This includes regular salaries, overtime, call-back and standby salaries, as well as salaries for statutory holidays that are worked.

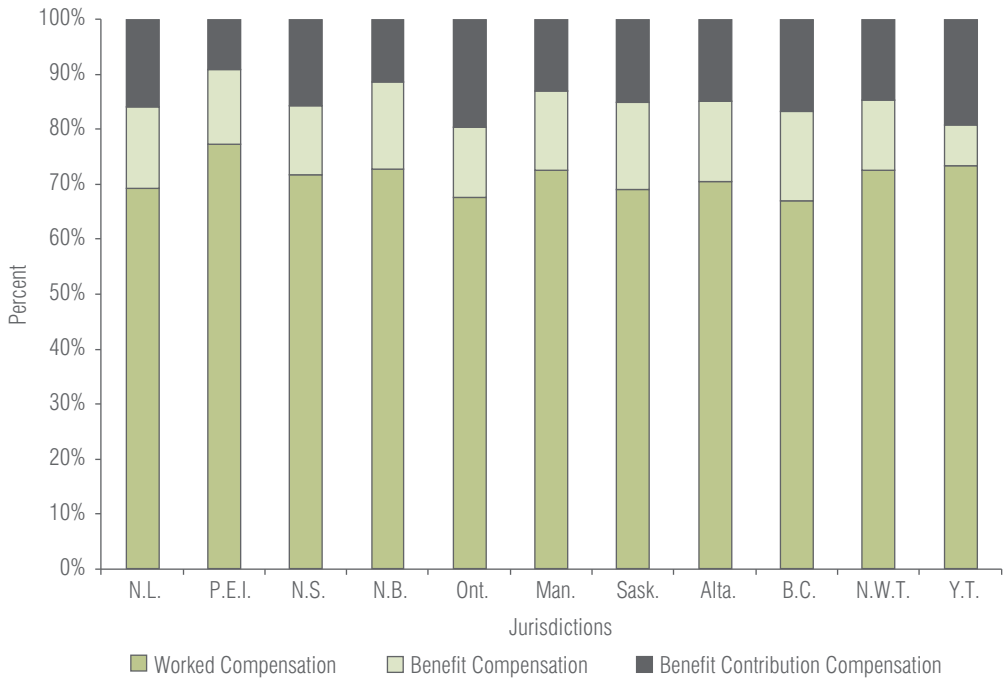
The second major component of compensation expense is benefit compensation. Benefit compensation is the salaries paid to personnel for the hours in which they are not present and available for work. This includes vacation, sick time, education leave and other paid leaves.

The benefit contributions component of the compensation expense is the employer's share of employee benefit contributions. These may include the employer's share of Canada Pension Plan, Employment Insurance, pension contributions and medical, dental or other health benefit plans.

Figure 16 illustrates the proportion of worked salary, benefit salary and benefit contributions in hospital diagnostic imaging functional centres in all jurisdictions except for Quebec and Nunavut in 2007–2008.

The weighted average percentage of compensation expenses related to worked compensation varied from 67.0% in B.C. to 77.4% in P.E.I. Benefit compensation ranged from 7.5% in the Yukon to 16.2% in B.C., whereas benefit contribution compensation ranged from 9.0% in P.E.I. to 19.6% in Ontario.

Figure 16 Worked, Benefit and Benefit Contribution Compensation as a Percentage of Total Diagnostic Imaging Compensation, by Selected Province or Territory, 2007–2008



Notes
Includes compensation for management and operational support personnel and unit-producing personnel working in the diagnostic imaging functional centre, such as medical radiation technologists and diagnostic medical sonographers; excludes medical personnel.
At present, Quebec and Nunavut have not endorsed and adopted the MIS Standards and therefore do not submit their financial and statistical data to the CMDB. Quebec does submit data to CIHI based on a slightly different standard.
Source
Canadian MIS Database, Canadian Institute for Health Information.

Several factors may affect these proportions. The amount of overtime may affect the proportion of worked salary, because in many cases overtime is paid at a higher rate than benefit salaries. Therefore, an organization with more overtime may show a higher worked salary proportion and a lower proportion of benefit salary and benefit contributions. Further details are not available in the CMDB but may be available at the provincial or local level.

Staff seniority levels, collective agreements and other policies may affect these proportions. For example, staff with more seniority may be entitled to more vacation, thus increasing the benefit salary component. Similarly, the number of statutory holidays in a given jurisdiction may also affect the proportion of benefit salaries, as would the use of sick time or other leave.

The number of benefit contributions programs to which the employer contributes may also vary, as could the proportion of the employer's share. For example, employers may contribute a different percentage to employee pension plans from one jurisdiction to another. These differences may affect the proportion of benefit contributions.

The use of purchased services may also affect this indicator. Purchased services are those hours for which the diagnostic imaging functional centre reimburses another organization to provide staff to work in diagnostic imaging. An example may be a temporary agency that provides placement for temporary staff. In this case, all compensation is considered worked salary, even though the hourly rate may include a component of administration, vacation or other benefits. A diagnostic imaging functional centre with a high proportion of purchased services may also have a larger proportion of worked salary. In Figure 16, purchased services are included in worked compensation and represent 0.5% or less of total compensation.

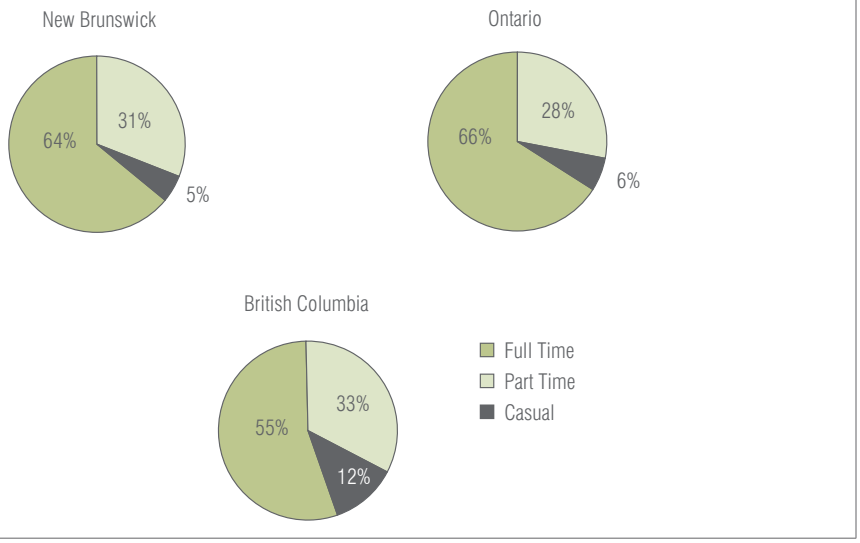
As indicated in Section 2.1 of this report, hospitals are complex environments, involving daily interactions between numerous professionals. The number of people involved in delivering services and collecting and reporting data in a hospital environment, together with the fact that health services are governed, organized and delivered uniquely by provinces and territories, makes direct operational comparisons and analyses complex. Though comparative data is presented in this section, the underlying causes of variability can be understood only by understanding the local operational structure of a hospital and its diagnostic imaging services.

2.8 What Does Medical Radiation Technologist Staffing Look Like in Hospital Diagnostic Imaging Functional Centres?

Medical radiation technologists are employed as either UPP or management and operational personnel in diagnostic imaging. UPP are those personnel who perform activities that directly contribute to the fulfillment of the functional centre's mandate. This category describes the individuals who acquire images in the diagnostic imaging functional centre.

UPP may be employed as full-time, part-time or casual employees. In some cases, individuals may choose their Employment Status, whereas in other cases, Employment Status may be determined by availability of positions. Within the health service organizations represented in the CMDB, Figure 17 shows the distribution of earned hours for 2007–2008 by Employment Status (full time, part time and casual) for the selected provinces of New Brunswick, Ontario and B.C. Ontario had the highest percentage of earned hours that were full time, at 66%, while B.C. had the highest percentage of part-time and casual hours, at 33% and 12%, respectively.

Figure 17 Percentage of Diagnostic Imaging Unit-Producing Personnel Earned Hours for Medical Radiation Technologists, by Full-Time, Part-Time and Casual Employment Status, by Selected Province, 2007–2008



Note
Includes only unit-producing personnel who are medical radiation technologists.
Source
Canadian MIS Database, Canadian Institute for Health Information.

The data in Figure 17 does not identify the number of individuals in each of the three categories of Employment Status (full time, part time or casual), but rather the total earned hours by Employment Status. The earned hours include worked hours, benefit hours and purchased service hours. Refer to the Methodological Notes for further information on worked, benefit and purchased service hours.

One of the factors to consider in interpreting the data is that earned hours include both worked hours and benefit hours. The proportion of full-time earned hours includes benefit hours, such as statutory holidays, vacation and sick time. In some cases, part-time or casual employees may receive compensation in lieu of these benefit hours. If that is the case, the proportion of part-time or casual hours may not include the benefit hours. Refer to the Methodological Notes for the definitions of full time, part time and casual.

Additionally, diagnostic imaging functional centres may be structured differently in terms of staffing mix and operational needs. The proportion of full-time, part-time and casual staff may also be balanced to ensure staff retention and the ability for staff to remain current and competent.

2.9 What Comprises Diagnostic Imaging Workload in Hospitals?

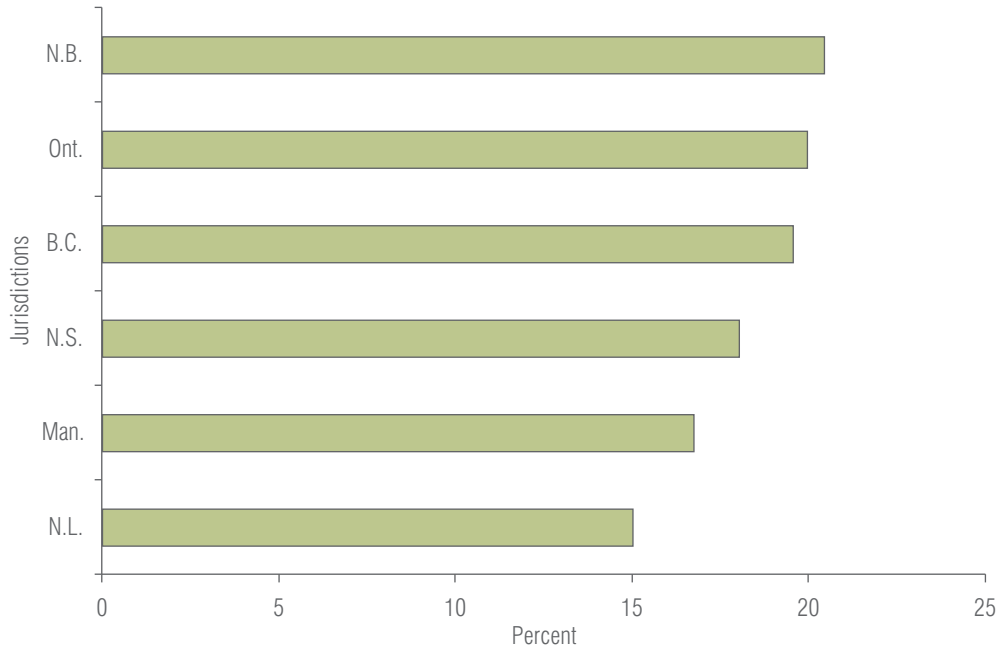
Defining Diagnostic Imaging Workload

Workload is measured in diagnostic imaging using a national workload measurement system (WMS). In the WMS, one unit is intended to represent one minute of time required to perform an activity. The workload is categorized into two major categories: service-recipient and non–service recipient activity. The service-recipient activity category includes workload that is related to the mandate of the functional centre (for example, taking an X-ray) and is being performed for an individual service recipient. This category of workload is further subdivided into categories of service recipient, including inpatients, clients such as those in emergency, day surgery or clinics, or patients being referred to diagnostic imaging by the physician. In addition, diagnostic imaging functional centres may receive referred-in work from other facilities for patients requiring specialized imaging in modalities not offered in their own facility, such as CT or MRI scans.

Distribution of Workload in Diagnostic Imaging

In diagnostic imaging, the patients served are either inpatient or outpatient service recipients. In Figure 18, the proportion of workload in diagnostic imaging for the selected provinces of New Brunswick, Ontario, British Columbia, Nova Scotia, Manitoba and Newfoundland and Labrador that can be attributed to inpatient service recipients ranged from 15% to 21% of the total workload in 2007–2008.

Figure 18 Service-Recipient Inpatient Workload as a Percentage of Total Service-Recipient Workload, by Selected Province, 2007–2008



Source
Canadian MIS Database, Canadian Institute for Health Information.

In diagnostic imaging, most services were delivered on an outpatient basis, as indicated by the proportion of workload that was attributed to inpatients for the selected provinces in Figure 18. The total outpatient-to-inpatient workload ratio for the selected provinces ranged from 85%:15% in Newfoundland and Labrador to 79%:21% in New Brunswick.

The type of outpatient services provided by diagnostic imaging functional centres includes obtaining images for patients in emergency and those attending orthopedic and oncology clinics, referrals from physicians' offices (such as mammography exams, ultrasound or CT scans) or patients referred by workers' compensation boards.

The slight variation between the selected provinces for inpatient workload could be attributed to the range of modalities offered by the diagnostic imaging functional centre. For example, if the functional centres provide services in the areas of cardiac catheterization or interventional radiology, some of these patients would most likely be admitted, depending on which procedure they undertake.

Part 3

Methodological Notes

Methodological Notes: Part 1 of Report

These notes outline the basic concepts behind the data provided in Part 1 of this publication, the underlying methodology of the data collection and key aspects of data quality. They will help provide a better understanding of the strengths and limitations of the data and illustrate the ways in which the data can be used effectively. This information is of particular importance when comparisons are made with data from other sources and regarding conclusions based on changes over time.

The Canadian Institute for Health Information relies on superior principles of data quality, privacy and confidentiality. CIHI's commitment to ensuring the collection of quality data in a privacy-sensitive manner is applied to data collection, processing, analysis and dissemination. For further details regarding CIHI's privacy principles, outlined in *Privacy and Confidentiality of Health Information at CIHI: Principles and Policies for the Protection of Personal Health Information*, please visit our website at www.cihi.ca.

Background

Policy reports and research papers have consistently demonstrated that there is very little standardized data available on health professionals on a national basis, with the exception of physicians and regulated nursing professionals. Based on consultations with federal and provincial/territorial ministries of health, the profession of medical radiation technology, together with four other professions,[i] has been identified by CIHI, Health Canada and other stakeholders as a priority for the development of such data. As a result, the Medical Radiation Technologist Database (MRTDB) was established in 2008, when the database started its first-year data collection across Canada. CIHI would like to thank Health Canada, provincial regulatory bodies, provincial professional associations and the national professional association for their efforts around, commitment to and collaboration in the funding, development and support of the MRTDB.

Purpose of Part 1 of This Report

Supply and distribution information is a key component of health human resource planning at the pan-Canadian and provincial/territorial levels. Any planning or projection of the number of health professionals required for a particular jurisdiction must begin with an understanding of the current supply and how that supply is changing. The presentation of clear, objective data and data analysis enables informed decision-making and supports policy formulation.

i. The four other professions are medical laboratory technology, occupational therapy, pharmacy and physiotherapy.

The analysis in Part 1 of this report primarily focuses on selected information from the previously published *Medical Radiation Technologist Database, 2008 Data Release*. It covers information on the regulatory environment and supply of medical radiation technologists, along with their demographic composition, education requirements, certification process and workplace settings, and helps readers better understand this profession through descriptive analysis of these characteristics.

Scope of the MRTDB

Population of Interest

The population of interest for the MRTDB includes all medical radiation technologists who are qualified to work in Canada.

Population of Reference

The population of reference for the MRTDB includes all medical radiation technologists who register with a Canadian provincial regulatory body, a provincial association or the Canadian Association of Medical Radiation Technologists (CAMRT), given that these organizations submitted data to the MRTDB, regardless of whether the registrations were active or inactive.

Period of Reference

For any given year, the population of reference includes those medical radiation technologists who register between the start of the registration period for the provincial regulatory body, provincial association or the CAMRT and August 1. For 2008, the period of reference began with the registration start period and ended on August 1, 2008.

Regulation Status

The profession of medical radiation technology is not regulated in all Canadian jurisdictions. As of 2008, in Quebec, Ontario and Alberta, medical radiation technologists must register with the provincial regulatory body in order to practise. In Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick, Manitoba and Saskatchewan, medical radiation technology as a profession is not regulated; nevertheless, mandatory registration with both the provincial association and the CAMRT is a condition of being employed as a medical radiation technologist in these provinces. Medical radiation technologists who are employed in some other non-regulated jurisdictions (British Columbia, the Yukon, the Northwest Territories and Nunavut) are not obliged to register with a provincial professional association or the CAMRT unless mandated by the employer. A summary of regulation status by province and territory is presented in Appendix A.

The circumstance of non-regulation and voluntary registration has a significant impact on the quality of the data; particularly, under-coverage becomes a major concern for jurisdictions that are neither regulated nor require mandatory registration with any professional association. See the Under-Coverage section of these Methodological Notes.

Data Inclusions for the MRTDB

Data collected for the MRTDB includes all registrations received by the provincial regulatory bodies, provincial professional associations and the CAMRT before August 1, 2008. See Appendix B of this document for the list of data providers.

Data Exclusions for the MRTDB

Data collected for the MRTDB does not include

- Medical radiation technologists residing and working in non-regulated provinces and territories who chose not to obtain a voluntary membership with the CAMRT; and
- Medical radiation technologists who registered with regulatory bodies, provincial professional associations or the CAMRT after July 31, 2008.

Scope of Part 1 of This Report

Part 1 of this report focuses on describing the medical radiation technologist workforce. The workforce data elements included in the analysis were extracted from the MRTDB and from supplemental data for B.C. that was provided by the CAMRT; they were selected when their coverage and relevance were able to support the purpose of the report. In addition to the workforce data, the report also includes a description of the regulation environment, historical workforce trends and the educational path medical radiation technologist candidates take to enter the workforce; this information is from other sources than the MRTDB.

Point-in-Time Data Collection

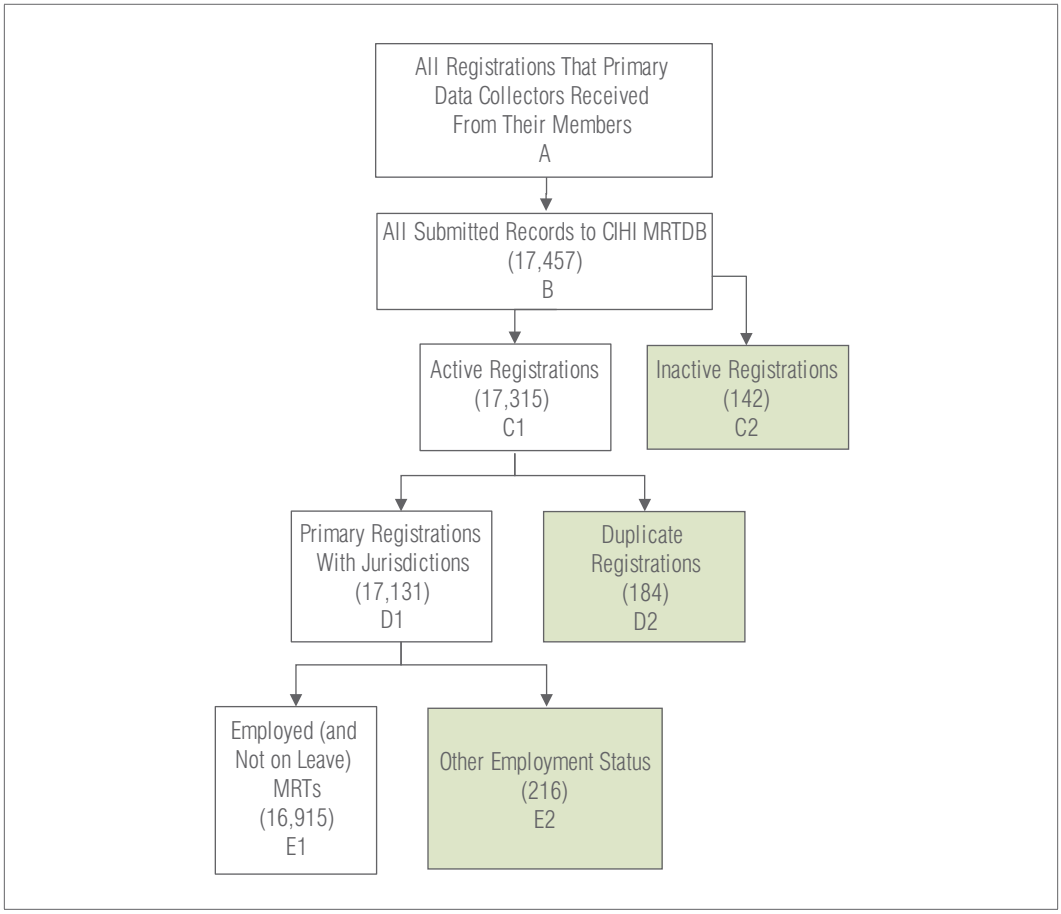
The point-in-time approach to data collection provides a snapshot of the medical radiation technologist workforce across jurisdictions on a specific day. Using the same approach consistently enables comparability in time, which is necessary to accurately determine a trend. However, depending on the jurisdiction, this approach may not capture the entire year-end totals equally in every province and territory, as each jurisdiction can have a different start date to its registration period.

Data collection begins at the onset of the data provider's respective annual registration period and ends on August 1. This collection period was identified as the period that captures most of the registrants renewing or applying for membership. The registration periods for provincial and territorial jurisdictions for the 2008 registration year are presented in Appendix C.

Data Flow From Primary Data Collector to CIHI

As part of their registration/licensing processes, the regulatory bodies and the professional associations (both provincial and national) collect membership data on an annual basis. This administrative data is submitted to the MRTDB according to established standards.

The diagram below illustrates the data flow when this methodology is applied. Explanations of each step within the data flow are provided in the text following the diagram.



Box A: Includes all registrations that the medical radiation technologist regulatory bodies or professional associations received from their members.

Box B: Includes all registrations that are submitted from medical radiation technologist regulatory bodies or professional associations to the CIHI MRTDB. The cut-off date for data collection is August 1 of the year.

Box C1: Includes registrations that are identified with active registration type.

Box C2: Includes registrations that are identified with inactive registration type. These records are removed from the final count.

Box D1: Represents primary registrations where the province or territory of registration reflects the registrant's primary jurisdiction of practice.

Box D2: Medical radiation technologists in Canada can work in more than one jurisdiction concurrently as long as they meet the requirements of the provincial regulatory bodies or employers. In the interests of preventing double-counting of medical radiation technologists across jurisdictions, this box represents the secondary registrations or interprovincial duplicates to be removed from the final count. The methodology that identifies primary and secondary registrations is explained in detail in the Data Processing Methods section.

Boxes E1 and E2: In most cases, statistics produced by provincial regulatory bodies or professional associations include all active practising registrations, regardless of Employment Status. In contrast, CIHI statistics, whenever possible, include only those registrants who explicitly stated they were working in medical radiation technology (Box E1) at the time of registration or renewal. Those medical radiation technologists who were on leave, employed outside of medical radiation technology, retired or unemployed, or whose Employment Status was unknown at the time of registration or renewal, are excluded from the final statistics for the workforce published in this report (Box E2).

Impact of CIHI's Methodology of Identifying the Medical Radiation Technologist Workforce

By carefully selecting the reference population for the medical radiation technologist workforce, CIHI is able to provide standardized, comparable data suitable for analysis and trending purposes. As explained previously, the population of reference for CIHI's publications includes all medical radiation technologists who registered with the provincial regulatory bodies or professional associations and were working in medical radiation technology as of August 1, 2008. In addition, interprovincial duplicates are removed. The population of reference for reporting by other organizations may differ for various reasons, such as differences in the time frame used, the inclusion of other registration types (such as inactive and others), differences in Employment Status (employed versus unemployed) and the inclusion of secondary registrations. Discrepancies between the data in the CIHI publication and data presented by other organizations are often the result of these differences. We therefore caution readers to be mindful of these differences when comparing MRTDB data with other data holdings and publications.

Data Collection Methods

Data Sources

The sources of data for the MRTDB are the provincial regulatory bodies, provincial professional associations and the CAMRT, which collect the data in written or electronic format. See details of data sources in Appendix B.

Data Collection

Paper or online registration forms completed by the registrants for registration/licensing purposes are the usual methods of primary data collection for the provincial regulatory bodies, provincial professional associations and the CAMRT.

Once in electronic format, an extract of the data is prepared for submission to CIHI. Only those data elements defined in the *Medical Radiation Technologist Database Data Dictionary* (available at www.cihi.ca) are submitted to CIHI. The data extract must conform to the specifications of the MRTDB, as outlined in the *Medical Radiation Technologist Database Data Submission Specifications Manual* (available at www.cihi.ca).

A letter of agreement governs CIHI's collection of medical radiation technologist data. Each year, data providers who participate in the MRTDB will review the core set of elements that they collect on their registration forms. Under the current agreement, each data provider agrees to make every reasonable effort to collect and submit the 159 data elements for each registrant according to the definitions outlined in the *Medical Radiation Technologist Database Data Dictionary*.

Key Concepts and Definitions

Only data elements used in the analysis of Part 1 of the publication are described. For a complete list of data elements in the MRTDB, as well as complete data element names and definitions, please refer to the *Medical Radiation Technologist Database Data Dictionary*, which can be downloaded from the CIHI website (www.cihi.ca), or contact the MRTDB program area at CIHI for more information.

Demographics

Gender

The reported sexual category of a registrant at the time of registration or renewal, used for administrative purposes.

Age

Derived from the year of birth of the registrant.

Geography

Location of Residence

Canadian province or territory of residence or locations outside of Canada.

Province/Territory of Registration

For regulated provinces or provinces requiring mandatory registration with the respective provincial association, the province in which the organization submitting medical radiation technologist data is located. For B.C., the Yukon, the Northwest Territories and Nunavut, the CAMRT provided information for this data element based on CIHI's criteria.

Education

Level of Basic Education in Medical Radiation Technology

Initial educational program used to prepare a medical radiation technologist for practice. This refers to the initial educational program used, in whole or in part, for consideration of licensure as a medical radiation technologist in Canada.

Initial MRT Certification Discipline

Reflects the entry-level certification issued by either the CAMRT or l'Ordre des technologues en imagerie médicale et en radio-oncologie du Québec (OTIMRO).

Primary Employment

Place of Primary Employment

At the time of registration or renewal, the workplace of primary employment where service is delivered, either as an employee or self-employed.

Full-Time/Part-Time Status for Primary Employment

The official status with an employer, or if official status is unknown, the classification of status based on usual weekly hours of work, at the time of registration or renewal. The data element will be assigned by data providers to the MRTDB with a full-time status if the usual weekly hours of work are equal to or greater than 30 or part-time status if the usual weekly hours of work are less than 30. Registrants with casual work status are also expected to be reclassified to full-time or part-time status based on their usual hours worked.

Data Processing Methods

File Processing

Once data files are received by CIHI, all records undergo processing before they are included in the national database.

Data Validation

The MRTDB system first ensures that records are in the proper format and that all responses pass specific validity and logic tests. If submitted data does not match CIHI's standard or a logical relationship between specific fields does not make sense (for example, if the Year of Graduation is earlier than the Year of Birth), an exception and/or anomaly report will be generated. Together with a data file summary (identifying and explaining the errors), the reports are sent to the data provider.

Errors and/or anomalies are reviewed jointly by CIHI and the respective data provider representative. The data provider then corrects the data and resubmits its data file to CIHI, where it is reviewed again. In cases where the data provider is not able to make the corrections, CIHI may make them directly with the explicit consent of the provider. If a correction cannot be made, the code is changed to the appropriate default/missing value.

Derived Variables

Once the file has passed all validity and logic tests, some variables with high interest or importance are derived in the database and for reporting, such as Age, which is derived from Year of Birth. These derived variables help the reader better understand the data reported from the MRTDB.

Identification of Primary and Secondary Registrations

As part of the derivation process, each record is analyzed and marked as either a primary or secondary registration, according to CIHI methodology. If a submitted record indicates that an individual lives outside of Canada, this record must be identified and removed from the analysis for CIHI to avoid over-counting the medical radiation technologists within Canada.

Similar to the international situation, there are administrative incentives for medical radiation technologists to maintain their registration for one Canadian jurisdiction while living and/or working in another. To avoid double-counting at the national level, CIHI evaluates each registration to ensure that it reflects the primary jurisdiction of practice. All secondary registrations that are termed duplicate registrations are excluded.

Primary registrations are defined as records meeting the following conditions:

- Location of Residence is either in Canada or not provided.
- For medical radiation technologists employed in medical radiation technology, Province/Territory of Primary Employment equals Province/Territory of Registration; if Province/Territory of Primary Employment is not provided, then Location of Residence equals Province/Territory of Registration.
- For medical radiation technologists not employed in medical radiation technology, retired or unemployed, or for medical radiation technologists with an Employment Status of *unknown*, Location of Residence equals Province/Territory of Registration.
- If the registrant does not provide any information on Province/Territory of Primary Employment or Location of Residence, the registrant is assumed to have primary registration with the province/territory that submitted the data (that is, Province/Territory of Registration).

See Appendix D for the flow diagram illustrating the process for identifying primary and secondary registrations.

The purpose of this methodology is to remove secondary registrations. However, it is not without its limitations. For example, a medical radiation technologist living in the United States but working in Canada will be erroneously removed as living abroad. Also, when a medical radiation technologist is registered and employed in a Canadian jurisdiction and decides to provide short-term relief staffing in another jurisdiction, depending on what information was provided by the registrant, the identification of primary versus secondary registration may not be accurate.

Data Verification With Compare Reports

Once a data submission from a data provider is accepted into the national database, values for each submitted data element are aggregated to the provincial/territorial level. Three compare reports are prepared for this information: a compare report for active registrations, a compare report for inactive registrations and a compare report for the data that is filtered for the workforce and to be published by CIHI. All three reports are sent to the data provider that submitted the data for review and approved the use of the data.

After the compare reports were signed off, a few more data quality issues were identified during the preparation of the *Medical Radiation Technologist Database, 2008 Data Release* (released in January 2010). All the issues were raised with the corresponding data provider for clarification and verification. With the data provider's consent, some changes at the value level were made. As a result, in some tables and figures, value distribution within a data element may differ slightly from the values shown in the compare reports.

Processing the Missing Values

When a data provider is unable to provide information for a registrant for a specific data element, a missing value in the terms *not collected* or *unknown* is provided to the MRTDB. When the data collected is not relevant to a registrant, the data provider is required to submit *not applicable* to the database. See definitions of the terms in the Missing Values section of the Methodological Notes.

The MRTDB derives some variables such as Age (from Year of Birth) and Highest Level of Education in Profession (from Level of Basic Education and Level of Post-Basic Education 1, 2, 3) when data is submitted. If the reference data elements have missing values, the variable derived from them is usually assigned an *unknown* value.

Throughout the publication, *not collected*, *unknown* and *not applicable* have been combined into the term *not stated*. Because *not collected* data elements are not included in the data tables and figures and *not applicable* usually has a particular meaning,[ii] the majority of the *not stated* values listed in the data tables and figures are *unknown*.

ii. For example, *not applicable* for Level of Education in Other Than Medical Radiation Technology means the registrant does not have other education. *Not applicable* in this case is a known value.

Data Quality Assessment

To ensure a high level of accuracy and usefulness, CIHI developed a framework to assess and report on the quality of data contained in its databases and registries. This framework focuses on the five dimensions of data quality: timeliness, usability, relevance, accuracy and comparability. Briefly, they are as follows for the MRTDB:

- Timeliness is achieved by collecting data at a point in time that is determined and agreed upon by the data providers and that reflects a majority of total records. This allows CIHI to analyze and release data in a timely manner.
- Usability refers to the availability and documentation of the data and the ease of interpretation.
- Relevance of the data set includes the adaptability and value of the data when used by decision-makers, policy developers, researchers and the media.
- Accuracy is an assessment of how well the data reflects reality or how closely the data presented in this publication reflects the population of reference. Under- or over-coverage issues and CIHI's methodologies of point-in-time data collection, primary/secondary registration identification and missing data values all have an impact on accuracy.
- Comparability measures how well the data for the current year compares with the data from previous years and how data from the MRTDB compares with data from other sources or between jurisdictions. This publication presents medical radiation technologist data for the 2008 registration year. Previous data years are available only in aggregate counts from the Health Personnel Database at CIHI.

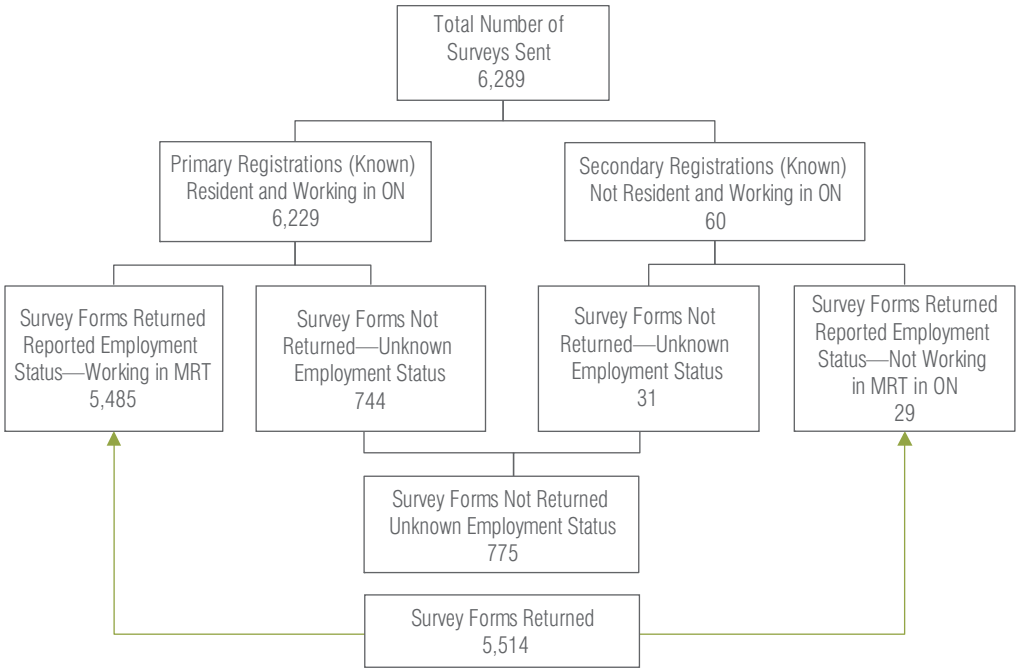
It is important to note that the levels of accuracy and completeness necessary to meet the financial and administrative requirements of a registry can differ from those required for research. An extensive mapping exercise took place collaboratively with each data provider to ensure alignment between the data collected on the registration forms and the data elements of the *Medical Radiation Technologist Database Data Dictionary*. When discrepancies were detected, these differences were documented and accounted for in the analysis and described in the Methodological Notes or the notes for the figures or tables. In some cases, data providers supplied user guides to their membership to assist in the completion of their registration forms, which facilitated a higher level of data accuracy.

Estimated Medical Radiation Technologist Workforce in Ontario

In 2008, the College of Medical Radiation Technologists of Ontario (CMRTO) sent its members a survey to collect the data required for the Medical Radiation Technologist Database. Of the 6,289 CMRTO members surveyed, 5,514 completed surveys were received by the college. This resulted in unknown values for Employment Status and other data elements for 775 records. Some information is known of these 775 members, such as Location of Residence. The CMRTO recommended that CIHI include these 775 members when estimating the total medical radiation technologist workforce in Ontario. The following are the assumptions made to obtain the estimated values for these missing records.

The majority of the 775 members are likely to be employed and working in medical radiation technology. They should therefore be included in the medical radiation technologist workforce; recognizing that, a small portion of the members may be on leave, working outside of medical radiation technology, retired or unemployed.

Figure 2 Illustrations of the Records Breakdown



Following consultation with the CMRTO, CIHI estimated the workforce through the following steps.

Step 1—identify and exclude the secondary registrations: Sixty records were identified as secondary registrations due to interprovincial duplicates according to CIHI methodologies. This included 31 records with unknown Employment Status (as a part of the 775 unreturned survey forms). The remaining 6,229 records (6,289 minus 60), which included 5,485 records with known Employment Status and 744 records (775 minus 31) with unknown Employment Status, were carried over to the next steps for processing.

Step 2—estimation methodology: The records with a known Employment Status (5,485 records) were broken down into two categories: the medical radiation technologists who were employed and working in medical radiation technology and those who fell into other Employment Status categories (on leave, employed outside of medical radiation technology, retired or unemployed). The percentage breakdown between these two categories was used to estimate the percentage breakdown for the records in the *unknown* Employment Status group (744 records).

Step 3—calculation: Of the 5,485 CMRTO members with a known Employment Status, 96.8% (5,310) of them stated they were employed and working in medical radiation technology. The remaining 3.2% (175) were on leave, working outside of medical radiation technology, retired or unemployed. These proportions were applied to the total number of primary registrations that had *unknown* values for Employment Status (744), using the following calculations:

Estimated medical radiation technologist workforce in Ontario
= 5,310 + (744 x 96.8%) = 6,030

Estimated number of primary registrations with Employment Status other than *employed in medical radiation technology*
= 175 + (744 x 3.2%) = 199

These 199 records, together with 60 records that were identified as secondary registrations (not working in Ontario), were excluded from the estimates for the Ontario medical radiation technologist workforce.

These estimates were included in Data Table 3.1 in the Cross-Jurisdictional Data Tables, Table 1 and Figure 1 in the Methodological Notes of the *Medical Radiation Technologist Database, 2008 Data Release*.

The 744 primary registrations that had unknown Employment Status also did not have information for other data elements. As a result, these records were not included in the data tables for demographic, education, certification and employment information. Only the 5,310 CMRTO members who submitted detailed information for the reporting data elements were included in these tables.

Estimated Median Age in Figure 1

The median age of registered medical radiation technologists for all jurisdictions except Saskatchewan and B.C. was calculated based on the record-level data received by CIHI; the result was 42 years. The median age for the registered medical radiation technologists in B.C. was also 42, based on aggregate-level information received from the CAMRT. Consequently, the median age shown in Figure 1 for all registered medical radiation technologists across the country except Saskatchewan was 42.

Estimated Average Age for Total in Figure 2

The following formula illustrates the calculation of the average age for "total" shown in Figure 2:

$$\text{Average Age for Total} = [\sum(Ai \times Bi) + C \times D] / [\sum(Ai) + C]$$

Ai: number of registrants with known age for each jurisdiction except B.C.
Bi: average age for each jurisdiction except B.C.
C: number of registrants with known age for B.C.
D: average age for B.C.

$$\text{Average Age for Total} = (572{,}713 + 82{,}795) / (13{,}681 + 1{,}939) = 42.0 \text{ years}$$

Under-Coverage

Under-coverage results when data that should be collected for the database is not included in the frame for the MRTDB. This section outlines the instances where caution must be applied when analyzing data presented in this publication.

- Medical radiation technologists who work in British Columbia and the territories (the Yukon, the Northwest Territories and Nunavut) are not required to register with the CAMRT unless otherwise required by their employer. Due to this voluntary registration, the statistics for these jurisdictions may not represent the entire population of the profession. However, it is estimated that a high percentage of the workforce does register.
- The point-in-time data collection approach may invite an under-coverage issue. This approach may not capture the entire year-end totals equally in every province and territory, as each jurisdiction can have varying start dates to its registration period.
- According to CIHI's methodology for identifying primary/secondary registrations, records in the MRTDB for medical radiation technologists who live outside Canada are excluded from publications for the workforce, since they are identified as secondary registrations. Under-coverage occurs with registrants who work in the profession in Canada but live in another country. However, such instances are not often observed across the country.

Over-Coverage

Over-coverage is the inclusion of units on the frame beyond the population of reference.

Over-coverage may occur when a medical radiation technologist does not work in the profession but is included in the database or publication.

- The Employment Status data element has values defined in the *Medical Radiation Technologist Database Data Dictionary*, that is, *employed in medical radiation technology*, *employed in medical radiation technology but on leave*, *employed outside of medical radiation technology*, *retired*, *unemployed*, *not collected* and *unknown*. Each record was assigned one of the values when data was provided, and only the records that are of the first value—that is, *employed in medical radiation technology*—are included in the publication. Nevertheless, the data providers for New Brunswick, Quebec, Alberta, British Columbia and the territories (the Yukon, the Northwest Territories and Nunavut) were not able to distinguish Employment Status. Consequently, all records are included for the workforce. The number of records that are assigned other Employment Status values which would normally be excluded from this publication is believed to be very small and the impact of their inclusion should be limited for any analysis for the affected jurisdictions.
- British Columbia's data is received from the CAMRT at an aggregate level. For this reason, the counts for workforce may include secondary registrations, which may result in over-coverage for this publication.
- According to CIHI's methodology for identifying primary/secondary registrations, records in the MRTDB with unknown or not collected values for Location of Residence and Province/Territory of Primary Employment are classified as primary registrations. If these records are true secondary registrations, over-coverage would occur.

Missing Values

Missing values are values attributed in instances where a data provider is unable to provide information for a registrant for a specific data element. This involves three potential situations:

- *Not collected*—when the information is not collected by the data provider on the registration form or a data provider cannot submit the information;
- *Unknown*—when the information was not provided by the registrant; and
- *Not applicable*—when the data element is not relevant to the situation of the registrant. (For example, when a medical radiation technologist resides in the United States, the Province of Residence is *not applicable*.)

For the missing values *unknown* and *not applicable*, CIHI implemented the following validation and correction methodology:

- When a registrant provided data that was not any of the missing values to one or more data elements within the same education, certification or employment grouping, and when other related elements are missing values, the value *unknown* (rather than *not applicable*) for these data elements is appropriate.
- When a registrant did not provide any data for all data elements within the same education, certification or employment grouping, it is likely that the data element does not apply to the registrant and therefore the value *not applicable* (rather than *unknown*) is appropriate.
- Records for medical radiation technologists who are not currently employed in medical radiation technology or who are retired or unemployed are excluded from this publication, regardless of whether employment data in the MRTDB was provided.

Some of the results with a large percentage of missing values were not included in this publication because their questionable accuracy limits their usability and allows for erroneous interpretation. In other cases, the number of missing values is clearly identified in the analysis and noted for explanation when necessary. As a criterion for publishing the current information in this report, a basic quality standard of less than 15% missing values was implemented to maintain a balance between accuracy and offering a variety of information.

Not Collected and Non-Response

In the MRTDB, *not collected* for a data element refers to information that is not collected or submitted by the data provider. The item *non-response* refers to the percentage of *unknown* responses for each data element. Appendix E shows *not collected* and *non-response* rates by data element.

Data Limitations

Data for the Province and Territories Submitted by the CAMRT (2008)

Data in the MRTDB for British Columbia and the territories (the Yukon, the Northwest Territories and Nunavut) is received from the CAMRT and captures only those medical radiation technologists who voluntarily register with the CAMRT. According to the letter of agreement with data providers, the CAMRT is limited to provide record-level data for the three territories only. Consequently, although the CAMRT is able to provide record-level data for B.C., CIHI requested aggregate-level data only. Without record-level information, which is necessary to identify secondary registrations, some secondary registrations may be included in the counts for the workforce. For the territories, the workforce data is filtered from the records and included in this publication. Due to voluntary registration, statistics for B.C. and the territories do not represent the full population of the profession or workforce in these jurisdictions. In addition, only registered medical radiation technologists who reside and work in the territories are included for the territorial data in the database.

Area of Practice in New Brunswick

New Brunswick was unable to collect all Areas of Practice defined in the *Medical Radiation Technologist Database Data Dictionary*. The Areas of Practice that are collected by the province pass the data quality standard of less than 15% missing values and have therefore been published. Please note that in so doing, comparability of the data element Area of Practice for New Brunswick with other jurisdictions may be limited; therefore, results should be interpreted with caution.

Privacy and Confidentiality

The Privacy and Legal Services Secretariat at CIHI has developed a set of guidelines to safeguard the privacy and confidentiality of data received by CIHI. These policies govern the release of data in publications and media releases, on the CIHI website and through ad hoc requests and special studies. The documents entitled *Privacy and Confidentiality of Health Information at CIHI: Principles and Policies for the Protection of Personal Health Information* and *Medical Radiation Technologist Database Privacy Impact Assessment* can be found on the CIHI website (www.cihi.ca).

MRTDB Workforce Products and Services

The following publications relevant to the current report may be downloaded in electronic (PDF) format, free of charge, at www.cihi.ca:

- *Medical Radiation Technologist Database Data Dictionary—Version 1.0* (for data elements and definitions)
- *Medical Radiation Technologist Database Data Submission Specifications Manual—Version 1.1* (for file specifications for the data elements)

Request for Services

CIHI completes ad hoc requests and special analytical projects on a cost-recovery basis using data from the MRTDB. Requests that are short queries can generally be handled through standard reports and do not require major programming resources, while special analytical projects require project planning and the commitment of extra resources.

For further information on CIHI's data request procedure associated with these products and services, including process and pricing, please visit our website at www.cihi.ca/requestdata.

Methodological Notes: Part 2 of Report

Comprehensiveness of the Data in This Report

In this CIHI publication, the MIS data that is included represents the fiscal year 2007–2008. Additionally, the data includes only the financial and statistical data from submitting hospitals whose data is housed in the CMDB. The data excludes data from Quebec and Nunavut. The data also excludes data from all private/community diagnostic imaging services. At this time, these latter organizations do not submit data to the CMDB.

Coverage

Canadian MIS Database Frame

"Frame" refers to a list of entities that should supply data to a database. The CMDB contains financial and statistical data from hospitals across the country. CIHI maintains a list of Canadian hospitals reporting to the CMDB, referred to as the CMDB list of hospitals. The CMDB does not yet request data from long-term care facilities, community health centres or home care agencies. Most regionalized provinces, however, do submit non-hospital data.

Data Adjustments

The analysis prepared in this report uses hospital-level indicator values as its foundation. Calculating comparative indicators at the hospital level for hospitals in Canadian jurisdictions can be difficult due to differences in the way health care is administered across Canada. One such difference is the presence of regional health authorities. Regional health authorities are typically responsible for centralized services for the health service organizations in their purview. When reporting MIS data to the CMDB, jurisdictions are asked to distribute expenses, revenues and statistics of regional health authorities to their facilities to allow for full-cost comparisons with organizations from non-regionalized jurisdictions.

Not all jurisdictions distribute their regional health authority data in this manner. Accordingly, CIHI distributes each regional health authority's data to its facilities using a set methodology. By doing so, comparisons between health service organizations in regionalized and non-regionalized jurisdictions can be made. However, CIHI continues to encourage jurisdictions to make these distributions prior to submitting their data to CIHI.

Definitions

Benefit Contribution Expense—The health service organization's contribution to the cost of the various fringe benefits provided to its employees, such as provincial/territorial health insurance, Employment Insurance, Canada Pension Plan premiums and other benefit plans. Includes the fair market value of perquisites such as room and board, after deducting any charge, which may be recovered from the employee by the health service organization.

Benefit Hours—Hours of absence for which compensation is paid. These include vacation, statutory holiday, sick leave, education leave and the percentage of gross pay in lieu of benefits, which may be paid to part-time staff.

Benefit Salaries—The expense pertaining to employee benefit hours, such as vacation, sick leave, statutory holiday and education leave.

Casual—Employment Status that arises when persons are employed on a flexible basis and do not have a guaranteed fixed number of hours of work per pay period (hours usually do not equal or exceed full-time hours). Employment Status is based on the hiring practices of the employer and/or union contract.

Compensation Expense—The sum of gross salaries expense, benefit contribution expense, purchased compensation expense and fee-for-service expense arising from the remuneration of management and operational support personnel, unit-producing personnel and medical personnel employed by or under contract to the health service organization.

Earned Hours—Contains earned hour statistics for management and operational support, unit-producing and medical personnel of the functional centre who receive remuneration for their worked, benefit and purchased hours.

Exam—A defined technical investigation using an imaging modality to study one body structure, system or anatomical area that yields one or more views for diagnostic and/or therapeutic purposes.

Full Time—Employment Status that arises when persons are employed on a regular full-time basis and have a guaranteed fixed number of hours of work per pay period. Includes personnel whose employment may be time limited. Employment Status is based on the hiring practices of the employer and/or union contract.

Functional Centre—A subdivision of an organization used in a functional accounting system to record the budget and actual direct expenses, statistics and/or revenues, if any, which pertain to the function or activity being carried out.

Management and Operational Support Personnel (MOS)—Those personnel whose primary function is the management and/or support of the operation of a functional centre. Examples include directors, managers, supervisors, medical personnel fulfilling a management role and secretaries. Excluded are practising physicians, medical residents and interns and all types of students.

Medical Personnel—Those physicians who are compensated by the health service organization for their professional medical services on either a fee-for-service or salary basis. Examples include pathologists, psychiatrists, radiologists, respirologists, cardiologists, hospitalists, medical residents, interns and students. Also includes those personnel compensated by the health service organization for their medical-type services on a fee-for-service, sessional or salary basis. Examples include dentists and podiatrists.

Part Time—Employment Status that arises when persons are employed on a regular part-time basis and have a guaranteed fixed number of hours of work per pay period (hours usually do not equal or exceed full-time hours). Includes personnel whose employment may be time limited. Employment Status is based on the hiring practices of the employer and/or union contract.

Purchased Hours—The hours spent carrying out the mandate of the functional centre by personnel hired from a purchased third-party provider for which the external agency will receive remuneration for services provided.

Purchased Salaries—The compensation expense pertaining to services delivered by a purchased third-party provider. This may include a markup to cover expenses of the third party, such as administrative and support services and employee benefits. Excludes remuneration paid to the health service organization's employees or contracted-out third-party providers.

Service Activity—Service activity statistics describe and identify the volume of activities that are provided to or on behalf of service recipients. Service activity statistics supplement workload data in providing valuable management information on the resources required to provide specific services. Service activity statistics are intended to be used with the corresponding workload data to measure functional centre productivity and the resource consumption of specific service activities. They can also be used with functional centre statistics to cost service-recipient activities. The same category of service recipient should be used for service activity statistics as for workload units to identify the resource consumption of specific categories of service recipients.

Service Recipient—The consumer of service activities of one or more functional centres of the health service organization. Service recipients include individuals (such as inpatients, residents and clients) and their significant others, and others as defined by the health service organization.

Technologist—Those personnel who have completed the postsecondary college educational requirements required of a technologist working in a diagnostic/therapeutic functional centre; who may be required to undertake continuing education to remain current; who may be licensed with the province/territory in which they are employed; whose scope of practice is usually regulated by the province/territory where they are employed; who may be a member of their provincial and national professional organizations (such as the Canadian Association of Medical Radiation Technologists and the Canadian Society for Medical Laboratory Science); and who function independently within the bounds of their profession. Includes, but is not limited to, medical laboratory technologists, medical radiation technologists, medical diagnostic sonographers, EEG/ENG/EMG/registered evoked potential/neurophysiology/polysomnography technologists and cardiopulmonary technologists. Note: Includes those personnel who have been grandfathered as a member of this defined occupational class group.

Unit-Producing Personnel (UPP)—Those personnel whose primary function is to carry out activities that directly contribute to the fulfillment of the service mandate. Examples include RNs, RNAs, laboratory technologists, accounts payable clerks, pharmacists, housekeepers, home care workers and public health officers. Excluded are practising physicians, medical residents, interns and students and, in most cases, diagnostic, therapeutic, nursing and support services students.

Weighted Average—An average in which each observation to be averaged is assigned a weight. These weights determine the relative importance of each observation. In this report, weighted averages typically use the size of health service organizations whose observations are being averaged as the basis of weighting. The organization's size can be represented by metrics that represent inputs (such as expenses) or outputs (such as hours worked or workload).

The weighted average of a set of indicator values is calculated by summing the indicator numerators of all observations and dividing that value by the sum of the indicator denominators of all observations. The result is a weighted average for that indicator.

Worked Hours—Hours spent carrying out the mandate of the functional centre. Includes regular scheduled hours, overtime, call-back hours, coffee breaks and worked statutory holiday hours. Excludes lunch hour and standby hours.

Worked Salaries—The salary expense pertaining to worked hours, plus the salary expense for items excluded from the hours count, such as shift premium and standby.

Workload Units—Service-Recipient Activities—Diagnostic/Therapeutic—
A category used to express the workload of diagnostic imaging functional centres as measured by an appropriate workload measurement system. In diagnostic imaging, it represents the minutes measured retrospectively that unit-producing personnel spend performing the diagnostic/therapeutic service-recipient activities of the functional centre.

2007–2008 Indicator Methodology

Methodology for Identifying Outliers

An outlier is an indicator value that is greater than or less than a pre-determined range of acceptable indicator values. Indicator values identified as outliers are carefully reviewed. Unless there is a compelling reason for retaining the value, they are removed or "trimmed" from further analysis.

The general process for identifying outliers in this report was as follows:

1. Calculate the indicator at the hospital level.
2. Remove hospitals with nonsensical results (<0% or >100%), except where 0% or 100% is reasonable.
3. Of the remaining data, calculate trim points based on the following rules:
   - **Lower Trim:** 25th percentile minus 1.5 x the interquartile range
   - **Upper Trim:** 75th percentile plus 1.5 x the interquartile range
   - Where the interquartile range is defined as the difference between the 75th percentile and the 25th percentile. Hospitals with indicator values lower than the lower trim point and greater than the upper trim point are excluded from any further analysis.
4. Apply indicator-specific business rules to the remaining values, if such rules exist.
5. Calculate the weighted average for the jurisdiction.

Business Rules

Indicator 1

Diagnostic Imaging Compensation as a Percentage of Total Diagnostic Imaging Expenses—Excludes hospitals that do not report amortization from the indicator calculation.

Diagnostic Imaging Compensation as a Percentage of Total Diagnostic Imaging Expenses—An indicator that measures the percentage of hospital diagnostic imaging expenses related to compensation. Includes the compensation component for management and operational support personnel and unit-producing personnel but excludes medical personnel.

$$\frac{\text{Diagnostic Imaging Compensation} \times 100}{\text{Total Diagnostic Imaging Expenses}}$$

Included are all hospitals that report MIS secondary financial account 7 50 * (Amortization on Major Equipment—Distributed) in functional centre account 7 1 4 15 *. Hospitals that do not report this account were excluded because MIS secondary financial account 7 50 * is a major component of the denominator.

MIS account code used in the numerator includes the secondary financial account 3*, excluding 3 90 *.

MIS account codes used in the denominator include the secondary financial accounts 3*, 4*, 5*, 6*, 7*, 8* and 9*.

Indicator 2

Diagnostic Imaging Worked/Benefit/Benefit Contribution Compensation as a Percentage of Total Diagnostic Imaging Compensation—Total compensation (denominator) comprises three components: worked compensation, benefit compensation and benefit contribution compensation (the three numerators). Within a single organization, the sum of the three indicators should equal 100%. If an organization is removed for one indicator, it must be trimmed from the other two indicators.

Diagnostic Imaging Worked Compensation as a Percentage of Total Diagnostic Imaging Compensation—An indicator that measures the percentage of hospital diagnostic imaging compensation related to worked compensation. Includes the worked compensation component for management and operational support personnel and unit-producing personnel, but excludes medical personnel.

$$\frac{\text{Diagnostic Imaging Worked Compensation} \times 100}{\text{Total Diagnostic Imaging Compensation}}$$

Included are all hospitals that report data in MIS functional centre account 7 1 4 15 *.

MIS account codes used in the numerator include the secondary financial accounts 3 10 10, 3 50 10, 3 10 90 and 3 50 90.

MIS account codes used in the denominator include the secondary financial account 3*, excluding 3 90 * and 3 05 99.

Diagnostic Imaging Benefit Compensation as a Percentage of Total Diagnostic Imaging Compensation—An indicator that measures the percentage of hospital diagnostic imaging compensation related to benefit compensation. Includes the benefit compensation component for management and operational support personnel and unit-producing personnel, but excludes medical personnel.

$$\frac{\text{Diagnostic Imaging Benefit Compensation x 100}}{\text{Total Diagnostic Imaging Compensation}}$$

Included are all hospitals that report data in MIS functional centre account 7 1 4 15 *.

MIS account codes used in the numerator include the secondary financial accounts 3 10 30 and 3 50 30.

MIS account codes used in the denominator include the secondary financial account 3*, excluding 3 90 * and 3 05 99.

Diagnostic Imaging Benefit Contribution Compensation as a Percentage of Total Diagnostic Imaging Compensation—An indicator that measures the percentage of hospital diagnostic imaging compensation related to benefit contribution compensation. Includes the compensation benefit contribution component for management and operational support personnel and unit-producing personnel, but excludes medical personnel.

$$\frac{\text{Diagnostic Imaging Benefit Contribution Compensation x 100}}{\text{Total Diagnostic Imaging Compensation}}$$

Included are all hospitals that report data in MIS functional centre account 7 1 4 15 *.

MIS account codes used in the numerator include the secondary financial accounts 3 10 40 to 3 10 85 and 3 50 40 to 3 50 85.

MIS account codes used in the denominator include the secondary financial account 3*, excluding 3 90 * and 3 05 99.

Indicator 3

Diagnostic Imaging Percentage of Unit-Producing Personnel (UPP) Earned Hours (Technologist) by Full-Time/Part-Time/Casual Personnel—An organization may report 100% in one or two indicators, or it may report 0%, which are acceptable results. The sum of the three indicators should be 100%. If an organization is trimmed out for one indicator, it has been trimmed from the other indicators.

Percentage of Unit-Producing Personnel (UPP) Earned Hours (Technologist) by Full-Time Personnel—An indicator that measures the percentage of hospital diagnostic imaging earned hours related to full-time technologists.

$$\frac{\text{Diagnostic Imaging UPP Earned Hours – Technologist (Full Time)} \times 100}{\text{Total Diagnostic Imaging Clinical Laboratory UPP – Technologist Earned Hours}}$$

Included are all hospitals that report MIS secondary statistical account 7 50 * in primary functional centre account 7 1 4 15 *.

MIS account code used in the numerator includes the secondary statistical account 7 50 14 10.

MIS account code used in the denominator includes the secondary statistical accounts 7 50 14 *.

Diagnostic Imaging Percentage of Unit-Producing Personnel (UPP) Earned Hours (Technologist) by Part-Time Personnel—An indicator that measures the percentage of hospital diagnostic imaging earned hours related to part-time technologists.

$$\frac{\text{Diagnostic Imaging UPP Earned Hours – Technologist (Part Time)} \times 100}{\text{Total Diagnostic Imaging Clinical Laboratory UPP – Technologist Earned Hours}}$$

Included are all hospitals that report MIS secondary statistical account 7 50 * in primary functional centre account 7 1 4 15 *.

MIS account code used in the numerator includes the secondary statistical account 7 50 14 20.

MIS account code used in the denominator includes the secondary statistical account 7 50 14 *.

Diagnostic Imaging Percentage of Unit-Producing Personnel (UPP) Earned Hours (Technologist) by Casual Personnel—An indicator that measures the percentage of hospital diagnostic imaging earned hours related to casual technologists.

$$\frac{\text{Diagnostic Imaging UPP Earned Hours – Technologist (Casual)} \times 100}{\text{Total Diagnostic Imaging Clinical Laboratory UPP – Technologist Earned Hours}}$$

Included are all hospitals that report MIS secondary statistical account 7 50 * in primary functional centre account 7 1 4 15 *.

MIS account code used in the numerator includes the secondary statistical account 7 50 14 30.

MIS account code used in the denominator includes the secondary statistical accounts 7 50 14 *.

Though this indicator includes only technologists (7 50 14 **), a data quality analysis was performed to ensure that the UPP earned hours reported in 3 50 ** ** matched those reported for all UPP in 7 50 ** **.

Because there is no central tendency for these indicators, trim points were not applied. Only nonsensical data (<0% or sum of the three indicators >100%) was excluded from the remaining data.

Indicator 4

Diagnostic Imaging Inpatient Diagnostic/Therapeutic Workload as a Percentage of Total Diagnostic Imaging Diagnostic/Therapeutic Workload—There are no business rules applicable for this indicator. There is no business reason for there to be a central tendency. One should expect to observe variation across organizations.

Diagnostic Imaging Inpatient Diagnostic/Therapeutic Workload as a Percentage of Total Diagnostic Imaging Diagnostic/Therapeutic Workload—An indicator that measures the percentage of hospital diagnostic imaging diagnostic/therapeutic workload that is attributed to inpatients.

$$\frac{\text{Diagnostic Imaging Inpatient Diagnostic/Therapeutic Workload} \times 100}{\text{Total Diagnostic Imaging Diagnostic/Therapeutic Workload}}$$

Included are all hospitals that report service-recipient workload in diagnostic imaging in MIS secondary statistical account 1 07 * in functional centre account 7 1 4 15 *.

MIS account code used in the numerator includes the secondary statistical account 1 07 10 *.

MIS account code used in the denominator includes the secondary statistical account 1 07 **.

Appendix A—Regulation Status of Provinces and Territories, 2008

Regulation Status of Provinces and Territories, 2008	
Regulated Provinces	**Year of Regulation**
Quebec	1973
Ontario	1980/1993/2004‡
Alberta	1986/2005§
Non-Regulated Provinces With Mandatory Registration With Provincial and National Professional Associations	**Year of Mandatory Registration With the National Association (CAMRT)**
Newfoundland and Labrador	..
Prince Edward Island	1958**
Nova Scotia	1958
New Brunswick	1958
Manitoba	..
Saskatchewan	1983
Non-Regulated Provinces and Territories	
British Columbia	N/A
Yukon	N/A
Northwest Territories	N/A
Nunavut	N/A

Notes

.. Information is not available.

‡ Ontario has been regulated since the following dates according to certain areas: 1980—radiation therapy, radiography; 1993—nuclear medicine; 2004—magnetic resonance.

§ Alberta has been regulated since the following dates according to certain areas: 1986—radiological technology, nuclear medicine and radiation therapy; 2005—magnetic resonance.

** Prince Edward Island was regulated under a division of the New Brunswick Association of Medical Radiation Technologists prior to 1982.

N/A: not applicable.

CAMRT: Canadian Association of Medical Radiation Technologists.

Sources

Medical Radiation Technologist Database and Health Personnel Database, Canadian Institute for Health Information.

Appendix B—Data Providers for the MRTDB

Data Source	Corresponding Province/ Territory of Data Submission	Province/Territory Abbreviation
Newfoundland and Labrador Association of Medical Radiation Technologists	Newfoundland and Labrador	N.L.
Prince Edward Island Association of Medical Radiation Technologists	Prince Edward Island	P.E.I.
Nova Scotia Association of Medical Radiation Technologists	Nova Scotia	N.S.
New Brunswick Association of Medical Radiation Technologists	New Brunswick	N.B.
Ordre des technologues en imagerie médicale et en radio-oncologie du Québec	Quebec	Que.
College of Medical Radiation Technologists of Ontario	Ontario	Ont.
Manitoba Association of Medical Radiation Technologists	Manitoba	Man.
Saskatchewan Association of Medical Radiation Technologists	Saskatchewan	Sask.
Alberta College of Medical Diagnostic and Therapeutic Technologists	Alberta	Alta.
Canadian Association of Medical Radiation Technologists (CAMRT)	British Columbia* Northwest Territories Yukon Nunavut	B.C. N.W.T. Y.T. Nun.

Note

* Aggregate data was obtained for British Columbia from the Canadian Association of Medical Radiation Technologists.

Source

Medical Radiation Technologist Database, Canadian Institute for Health Information.

Appendix C—Twelve-Month Registration Periods by Province or the Territories, 2008–2009

Registration Period by Jurisdiction		2007		2008												2009		
		Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March
Dec. 1–Nov. 30	N.L.		xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx				
Nov. 1–Oct. 31	P.E.I.	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx					
Jan. 1–Dec. 31	N.S.			xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx			
Nov. 15–Nov. 14	N.B.	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx				
Apr. 1–Mar. 31	Que.						xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Apr. 1–Mar. 31	Ont.						xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Feb. 1–Jan. 31	Man.				xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx		
Apr. 1–Mar. 31	Sask.						xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Jan. 1–Dec. 31	Alta.			xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx			
Jan. 1–Dec. 31	B.C.			xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx			
Jan. 1–Dec. 31	Territories			xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx			

Notes

Territories include the Yukon, the Northwest Territories and Nunavut.

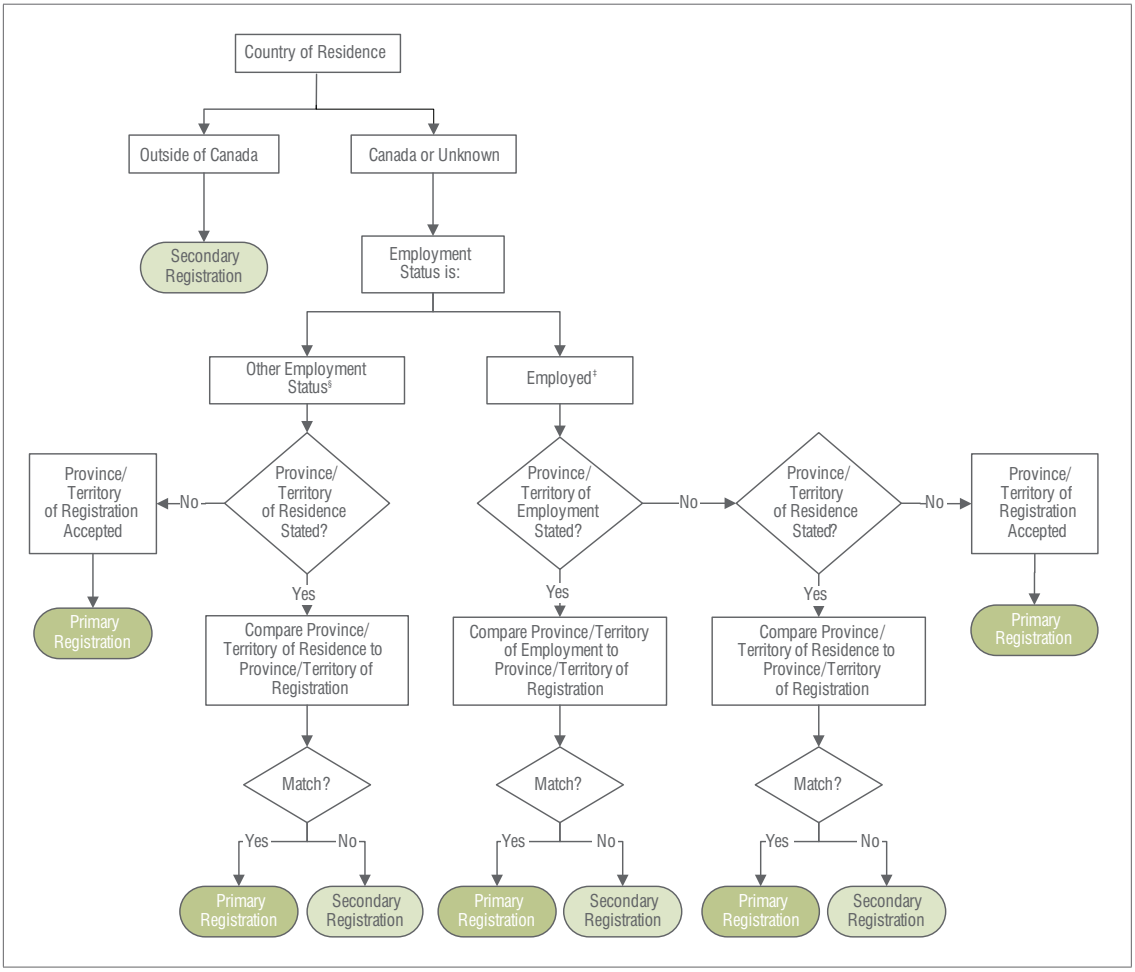
xxx denotes that the month is included as part of the jurisdiction's 12-month registration period.

Registration periods for medical radiation technologists in British Columbia and the territories (the Yukon, the Northwest Territories and Nunavut) are represented by voluntary registrations with the Canadian Association of Medical Radiation Technologists.

Source

Medical Radiation Technologist Database, Canadian Institute for Health Information.

Appendix D—Identification of Primary/ Secondary Registrations



Notes

‡ Employed in profession
Employed in profession either working or on leave

§ Other employment statuses
Employed outside of the profession
Retired
Unemployed
Unknown

Source

Medical Radiation Technologist Database, Canadian Institute for Health Information.

Appendix E—Medical Radiation Technologist Records Where Data Is Not Collected and Percentage of Records With Unknown Responses, by Data Element and Province or Territory of Registration, Canada, 2008

Data Element	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nun.
Provincial/Territorial Unique Identification/ Registration Number													
Gender								98%					
Year of Birth	2%		1%	0.6%			0.5%	99.8%		1%			
Province/Territory of Residence					0.1%			21%					
Country of Residence						0.2%		20%	0.05%				
Province/Territory of Registration													
Level of Basic Education in Medical Radiation Technology			x	x	7%	14%		99.7%	x	96%			
Year of Graduation for Basic Education in Medical Radiation Technology			x	x	6%	26%	0.5%	99.7%	0.05%	100%			
Institution of Graduation for Basic Education in Medical Radiation Technology	4%		x	x	2%	21%	3%	99.7%	0.3%	95%			
Province/Territory of Graduation for Basic Education in Medical Radiation Technology	0.4%		x	x	3%	28%		99.7%	0.3%	95%			
Country of Graduation for Basic Education in Medical Radiation Technology	0.4%		x	x	2%	27%		99.7%	0.3%	95%			
Level of Post-Basic Education in Medical Radiation Technology 1	1%		x	x	96%	93%		99.7%	x		100%	86%	75%
Year of Graduation for Post-Basic Education in Medical Radiation Technology 1	1%		x	x	95%	94%		99.7%	x		100%	86%	75%
Institution of Graduation for Post-Basic Education in Medical Radiation Technology 1	1%		x	x	96%	92%		99.7%	x		100%	86%	75%
Province/Territory of Graduation for Post-Basic Education in Medical Radiation Technology 1	1%		x	x	95%	93%		99.8%	x		100%	86%	75%

Data Element	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nun.
Country of Graduation for Post-Basic Education in Medical Radiation Technology 1	1%		x	x	95%	93%		99.7%	x		100%	86%	75%
Level of Post-Basic Education in Medical Radiation Technology 2	x		x	x	99.6%	93%	x	x	x		100%	100%	100%
Year of Graduation for Post-Basic Education in Medical Radiation Technology 2	x		x	x	99.6%	93%	x	x	x		100%	100%	100%
Institution of Graduation for Post-Basic Education in Medical Radiation Technology 2	x		x	x	99.8%	93%	x	x	x		100%	100%	100%
Province/Territory of Graduation for Post-Basic Education in Medical Radiation Technology 2	x		x	x	99.6%	93%	x	x	x		100%	100%	100%
Country of Graduation for Post-Basic Education in Medical Radiation Technology 2	x		x	x	99.6%	93%	x	x	x		100%	100%	100%
Level of Post-Basic Education in Medical Radiation Technology 3	x		x	x	99.9%	92%	x	x	x		100%	100%	100%
Year of Graduation for Post-Basic Education in Medical Radiation Technology 3	x		x	x	99.9%	92%	x	x	x		100%	100%	100%
Institution of Graduation for Post-Basic Education in Medical Radiation Technology 3	x		x	x	100%	93%	x	x	x		100%	100%	100%
Province/Territory of Graduation for Post-Basic Education in Medical Radiation Technology 3	x		x	x	99.9%	93%	x	x	x		100%	100%	100%
Country of Graduation for Post-Basic Education in Medical Radiation Technology 3	x		x	x	99.9%	93%	x	x	x		100%	100%	100%
Initial MRT Certification			x	x						1%			
Initial MRT Certification Discipline			x		0.1%	12%		99.7%		1%			
Year of Initial MRT Certification	0.4%		x	47%		36%	0.3%	99.7%					
Issuer of Initial MRT Certification	0.4%		x	x	x	13%		99.7%					
Post-Initial Certification 1			x	22%	x	11%		99.7%			100%	86%	75%
Post-Initial Certification Discipline 1			x	x	x	86%		x			100%	86%	75%
Year of Post-Initial Certification 1			x	x	x	86%	0.6%	x			100%	86%	75%
Issuer of Post-Initial MRT Certification 1			x	x	x	86%		x			100%	86%	75%
Post-Initial Certification 2			x	x	x	11%		x			100%	100%	100%

Data Element	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nun.
Post-Initial Certification Discipline 2			x	x	x	46%		x			100%	100%	100%
Year of Post-Initial Certification 2			x	x	x	46%		x			100%	100%	100%
Issuer of Post-Initial MRT Certification 2			x	x	x	46%		x			100%	100%	100%
Post-Initial Certification 3			x	x	x	11%		x			100%	100%	100%
Post-Initial Certification Discipline 3			x	x	x	39%		x			100%	100%	100%
Year of Post-Initial Certification 3			x	x	x	39%		x			100%	100%	100%
Issuer of Post-Initial MRT Certification 3			x	x	x	39%		x			100%	100%	100%
Specialty Certificate 1			x	99%	x	80%		x	x		83%	71%	100%
Year of Completion of Specialty Certificate 1	1%		x	x	x	82%		x	x		83%	71%	100%
Issuer of Specialty Certificate 1	1%		x	x	x	81%		x	x		83%	71%	100%
Specialty Certificate 2			x	x	x	80%		x	x		100%	100%	100%
Year of Completion of Specialty Certificate 2			x	x	x	80%		x	x		100%	100%	100%
Issuer of Specialty Certificate 2			x	x	x	80%		x	x		100%	100%	100%
Specialty Certificate 3			x	x	x	80%		x	x		100%	100%	100%
Year of Completion of Specialty Certificate 3			x	x	x	80%		x	x		100%	100%	100%
Issuer of Specialty Certificate 3			x	x	x	80%		x	x		100%	100%	100%
Medical Sonography Certification Indicator	0.4%		x	x	x	97%		x			100%	100%	100%
Year of Completion of Medical Sonography Certification	0.4%		x	x	x	97%		x	x		100%	100%	100%
Issuer of Medical Sonography Certification	4%		x	x	x	97%		x			100%	100%	100%
Level of Education in Other Than Medical Radiation Technology 1	0.4%		x	x	88%	72%	0.2%	x	x		100%	100%	100%
Field of Study for Education in Other Than Medical Radiation Technology 1	x		x	x	89%	72%		x	x		100%	100%	100%
Year of Graduation for Education in Other Than Medical Radiation Technology 1	0.4%		x	x	88%	72%	0.8%	x	x		100%	100%	100%
Province/Territory of Graduation for Education in Other Than Medical Radiation Technology 1	3%		x	x	87%	76%		x	x		100%	100%	100%
Country of Graduation for Education in Other Than Medical Radiation Technology 1	2%		x	x	88%	100%		x	x		100%	100%	100%
Level of Education in Other Than Medical Radiation Technology 2			x	x	97%	71%		x	x		100%	100%	100%

Data Element	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nun.
Field of Study for Education in Other Than Medical Radiation Technology 2	x		x	x	98%	71%		x	x		100%	100%	100%
Year of Graduation for Education in Other Than Medical Radiation Technology 2			x	x	98%	72%	0.3%	x	x		100%	100%	100%
Province/Territory of Graduation for Education in Other Than Medical Radiation Technology 2	0.4%		x	x	97%	72%		x	x		100%	100%	100%
Country of Graduation for Education in Other Than Medical Radiation Technology 2	0.4%		x	x	97%	74%		x	x		100%	100%	100%
Level of Education in Other Than Medical Radiation Technology 3			x	x	99%	72%		x	x		100%	100%	100%
Field of Study for Education in Other Than Medical Radiation Technology 3	x		x	x	99%	72%		x	x		100%	100%	100%
Year of Graduation for Education in Other Than Medical Radiation Technology 3			x	x	99%	72%		x	x		100%	100%	100%
Province/Territory of Graduation for Education in Other Than Medical Radiation Technology 3			x	x	99%	72%		x	x		100%	100%	100%
Country of Graduation for Education in Other Than Medical Radiation Technology 3	0.4%		x	x	99%	72%		x	x		100%	100%	100%
Initial Province/ Territory of Canadian Employment in Medical RadiationTechnology	x	5%	x	x	25%	18%	0.5%	x	x		100%	100%	100%
Year of Initial Canadian Employment in Medical Radiation Technology	x	5%	x	x	25%	100%	1%	x	x		100%	100%	100%
Employment Status					6%	12%			4%				
Activity Status if Not Employed in the Occupation					6%	13%							
Total Usual Weekly Hours of Work	4%	1%	x	x	41%	15%	21%	18%	x				
Employment Category (for Primary Employment)	1%		x	x	7%	15%	2%	99.7%	x		100%	100%	100%
Full-Time/Part-Time Status (for Primary Employment)	1%		x	x	9%	16%	2%	99.7%	x		100%	100%	100%
Province/Territory of Primary Employment			x	2%	6%	24%		99%			100%	100%	100%
Country of Primary Employment			x	2%	6%	24%		99%	2%		100%	100%	100%
Postal Code of Employment (for Primary Employment)	20%		x		6%	24%	3%	x	2%		100%	100%	100%

Data Element	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nun.
Place of Employment (for Primary Employment)	1%		x		6%	24%	2%	x			100%	100%	100%
Position (for Primary Employment)	1%		x		6%	15%	2%	x	x		100%	100%	100%
Clinical Education/ Preceptor Activity Indicator (for Primary Employment)	4%		x	x	6%	13%	2%	x	x		100%	100%	100%
Major Function (for Primary Employment)	0.4%		x	x	100%	15%	2%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Magnetic Resonance Imaging (General)	0.4%		x		x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Nuclear Medicine (General)	0.4%		x		x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Radiation Therapy (General)	0.4%		x		x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Radiological Technology (General)			x		x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Angiography/ Interventional	0.4%		x		x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Bone Mineral Densitometry	0.4%		x		x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Brachytherapy	0.4%		x	x	x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Breast Imaging	0.4%		x		x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Computed Tomography (CT)	0.4%		x		x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Computed Tomography Simulator (CT–Sim)	0.4%		x	x	x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Positron Emission Tomography (PET)	0.4%		x	x	x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Positron Emission Tomography/Computed Tomography (PET/CT)	0.4%		x	x	x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Simulation	0.4%		x	x	x	13%	1%	x	x		100%	100%	100%

Data Element	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nun.
Area of Practice for Primary Employment—Single Photon Emission Computed Tomography (SPECT)	0.4%		x	x	x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Single Photon Emission Computed Tomography/Computed Tomography (SPECT/CT)	0.4%		x	x	x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Treatment Planning	0.4%		x	x	x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Ultrasound/Diagnostic Medical Sonography	0.4%		x		x	13%	1%	x	x		100%	100%	100%
Area of Practice for Primary Employment—Other Area of Practice	0.4%		x	x	x	13%	1%	x	x		100%	100%	100%
Main Area of Practice for Primary Employment			x		x	17%	1%	x	x		100%	100%	100%
Employment Category (for Secondary Employment)			x	x	85%	24%		x	12%		100%	100%	100%
Full-Time/Part-Time Status (for Secondary Employment)			x	x	87%	24%		x	12%		100%	100%	100%
Province/Territory of Secondary Employment			x	x	84%	24%		x			100%	100%	100%
Country of Secondary Employment			x	x	84%	24%		x	0.4%		100%	100%	100%
Postal Code of Secondary Employment			x	x	84%	24%	0.3%	x	0.4%		100%	100%	100%
Place of Employment (for Secondary Employment)			x	x	84%	24%		x			100%	100%	100%
Position (for Secondary Employment)			x	x	84%	24%		x	12%		100%	100%	100%
Clinical Education/Preceptor Activity Indicator (for Secondary Employment)	14%		x	x	14%	13%	x	x	x		100%	100%	100%
Major Function (for Secondary Employment)	0.4%		x	x	x	24%		x	12%		100%	100%	100%
Area of Practice for Secondary Employment—Magnetic Resonance Imaging (General)			x	x	x	24%		x	x		100%	100%	100%
Area of Practice for Secondary Employment—Nuclear Medicine (General)			x	x	x	24%		x	x		100%	100%	100%
Area of Practice for Secondary Employment—Radiation Therapy (General)			x	x	x	24%		x	x		100%	100%	100%

Data Element	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nun.
Area of Practice for Secondary Employment—Radiological Technology (General)			x	x	x	24%		x	x		100%	100%	100%
Area of Practice for Secondary Employment—Angiography/ Interventional			x	x	x	24%		x	x		100%	100%	100%
Area of Practice for Secondary Employment—Bone Mineral Densitometry			x	x	x	24%		x	x		100%	100%	100%
Area of Practice for Secondary Employment—Brachytherapy			x	x	x	24%		x	x		100%	100%	100%
Area of Practice for Secondary Employment—Breast Imaging			x	x	x	24%		x	x		100%	100%	100%
Area of Practice for Secondary Employment—Computed Tomography (CT)			x	x	x	24%		x	x		100%	100%	100%
Area of Practice for Secondary Employment—Computed Tomography Simulator (CT–Sim)			x	x	x	24%		x	x		100%	100%	100%
Area of Practice for Secondary Employment—Positron Emission Tomography (PET)			x	x	x	24%		x	x		100%	100%	100%
Area of Practice for Secondary Employment—Positron Emission Tomography/ Computed Tomography (PET/CT)			x	x	x	24%		x	x		100%	100%	100%
Area of Practice for Secondary Employment—Simulation			x	x	x	24%		x	x		100%	100%	100%
Area of Practice for Secondary Employment—Single Photon Emission Computed Tomography (SPECT)			x	x	x	24%		x	x		100%	100%	100%
Area of Practice for Secondary Employment—Single Photon Emission Computed Tomography/ Computed Tomography (SPECT/CT)			x	x	x	24%		x	x		100%	100%	100%
Area of Practice for Secondary Employment—Treatment Planning			x	x	x	24%		x	x		100%	100%	100%

Data Element	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nun.
Area of Practice for Secondary Employment—Ultrasound/Diagnostic Medical Sonography			x	x	x	24%		x	x		100%	100%	100%
Area of Practice for Secondary Employment—Other Area of Practice			x	x	x	24%		x	x		100%	100%	100%
Main Area of Practice for Secondary Employment			x	x	x	24%		x	x		100%	100%	100%
Employment Category (for Third Employment)			x	x	98%	30%	x	x	0.4%		100%	100%	100%
Full-Time/Part-Time Status (for Third Employment)			x	x	98%	30%	x	x	0.4%		100%	100%	100%
Province/Territory of Third Employment		2%	x	x	97%	30%	x	x			100%	100%	100%
Country of Third Employment			x	x	97%	30%	x	x			100%	100%	100%
Postal Code of Third Employment	0.4%		x	x	97%	30%	x	x			100%	100%	100%
Place of Employment (for Third Employment)			x	x	97%	30%	x	x	x		100%	100%	100%
Position (for Third Employment)			x	x	97%	30%	x	x			100%	100%	100%
Clinical Education/ Preceptor Activity Indicator (for Third Employment)			x	x	100%	29%	x	x	x		100%	100%	100%
Major Function (for Third Employment)			x	x	100%	30%	x	x	0.4%		100%	100%	100%
Area of Practice for Third Employment—Magnetic Resonance Imaging (General)			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Nuclear Medicine (General)			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Radiation Therapy (General)			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Radiological Technology (General)			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Angiography/ Interventional			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Bone Mineral Densitometry			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Brachytherapy			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Breast Imaging			x	x	x	30%	x	x	x		100%	100%	100%

Data Element	N.L.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Y.T.	N.W.T.	Nun.
Area of Practice for Third Employment—Computed Tomography (CT)			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Computed Tomography Simulator (CT–Sim)			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Positron Emission Tomography (PET)			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Positron Emission Tomography/ Computed Tomography (PET/CT)			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Simulation			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Single Photon Emission Computed Tomography (SPECT)			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Single Photon Emission Computed Tomography/ Computed Tomography (SPECT/CT)			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Treatment Planning			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Ultrasound/Diagnostic Medical Sonography			x	x	x	30%	x	x	x		100%	100%	100%
Area of Practice for Third Employment—Other Area of Practice			x	x	x	30%	x	x	x		100%	100%	100%
Main Area of Practice for Third Employment			x	x	x	30%	x	x	x		100%	100%	100%
Registration Type													

Notes

x Not collected/submitted. Marked items indicate the items that are not collected primarily according to form mapping of data elements in the Medical Radiation Technologist Database. If additional information is collected beyond the registration form, the marks will be removed from the table.

Blank cells represent that non-response rates for the items are 0.

Percentages indicate the unknown rate in the Medical Radiation Technologist Database.

Aggregate data was submitted for British Columbia by the CAMRT. Grey areas indicate that data elements were not collected.

Source

Medical Radiation Technologist Database, Canadian Institute for Health Information.

References

1. Canadian Association of Medical Radiation Technologists, *Graduates of Canadian Accredited Programs*, last updated 2009, accessed on July 15, 2009, from <http://www.camrt.ca/english/certification/Canadian/canadian_educated.asp>.

2. Canadian Association of Medical Radiation Technologists, *Magnetic Resonance Technologists*, last updated 2009, accessed on July 15, 2009, from <http://www.camrt.ca/english/profession/mrt.asp>.

3. Canadian Association of Medical Radiation Technologists, *Nuclear Medicine Technologists*, last updated 2009, accessed on July 15, 2009, from <http://www.camrt.ca/english/profession/nmt.asp>.

4. Canadian Association of Medical Radiation Technologists, *Radiation Therapists*, last updated 2009, accessed on July 15, 2009, from <http://www.camrt.ca/english/profession/rad_therapy.asp>.

5. Canadian Association of Medical Radiation Technologists, *Radiological Technologists*, last updated 2009, accessed on July 15, 2009, from <http://www.camrt.ca/english/profession/rad_tech.asp>.

6. Ontario Job Futures, *Medical Radiation Technologists*, last updated 2005, accessed on July 15, 2009, from <http://www.ontariojobfutures.ca/profile3215.html>.

7. Government of Manitoba, *Medical Radiation Technologists*, last updated 2009, accessed on July 15, 2009, from <http://www.gov.mb.ca/labour/immigrate/asset_library/en/work/qrprofessions/MedRadTechno.pdf>.

8. Community Health Careers, *Radiation Technologist*, last updated 2009, accessed on July 15, 2009, from <http://www.communityhealthcareers.com/careers_radiationtech.htm>.

9. Canadian Institute for Health Information, *Standards for Management Information Systems in Canadian Health Service Organizations* (CD), last updated 2008, accessed on June 30, 2009, from <http://www.cihi.ca/cihiweb/dispPage.jsp?cw_page=mis_e>.

10. Job Futures, *Medical Radiation Technologists—At a Glance*, last updated 2009, accessed on July 15, 2009, from <http://www.jobfutures.ca/noc/3215.shtml>.

11. Canadian Medical Association, *Accreditation*, last updated 2009, accessed on July 15, 2009, from <http://www.cma.ca/index.cfm/ci_id/19316/la_id/1.htm>.

12. Canadian Association of Medical Radiation Technologists, *CAMRT Report on Recommendations for Internationally Educated Medical Radiation Technologists*, last updated 2010, accessed on January 22, 2010, from <http://www.camrt.ca/english/publications/ReportMRT/MRT2.asp>.

13. Manitoba Association of Medical Radiation Technologists, *Career Information*, last updated 2009, accessed on July 15, 2009, from <http://www.mamrt.ca/?q=node/6>.

14. Canadian Institute for Health Information, *Medical Radiation Technologist Database Data Submission Specifications Manual—Version 1.1* (Ottawa, Ont.: CIHI, 2008), pp. 1–60, accessed on July 16, 2009, from <http://www.cihi.ca/cihiweb/en/downloads/MRT_dss_v11_e.pdf>.

15. Ontario Immigration, *Working in Ontario—Medical Radiation Technologist*, last updated 2009, accessed on July 15, 2009, from <http://www.ontarioimmigration.ca/English/how_work_medradiation.asp>.

16. Canadian Institute for Health Information, *Medical Imaging in Canada, 2007* (Ottawa, Ont.: CIHI, 2008), accessed on December 17, 2009, from <http://www.cihi.ca/cihiweb/products/MIT_2007_e.pdf>.

17. Canadian Institute for Health Information, *National Health Expenditure Trends, 1975 to 2009* (Ottawa, Ont.: CIHI, 2009) accessed on December 17, 2009, from <http://www.cihi.ca/cihiweb/products/National_health_expenditure_trends_1975_to_2009_en.pdf>.

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