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An Environmental Scan of the Human Resource Issues Affecting Medical Laboratory Technologists and Medical Radiation Technologists

2001

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An Environmental Scan of the Human Resource Issues Affecting Medical Laboratory Technologists and Medical Radiation Technologists

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Table of Contents

Acknowledgment

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Executive Summary

This report presents the combined findings of two different studies: an environmental scan that was performed in 1998 and an update completed in 2001. It provides the most current statistics as well as a description of new issues or factors that have emerged since 1998. For the most part, the two sets of findings are integrated so as to provide a unified picture of the situation in 2001.

In 1998 the Advisory Committee on Health Human Resources (ACHHR) asked the Allied Health Working Group to perform an environmental scan of the human resource issues affecting medical laboratory technologists and medical radiation technologists. Health Canada, on behalf of the Working Group, contracted the services of Assessment Strategies Inc. (ASI) to perform the study.

The environmental scan presented the ACHHR with information as well as a number of recommendations to help it determine appropriate strategies to address human resource issues affecting medical laboratory technologists and medical radiation technologists.

The scan reviewed the human resource situation for the following groups:

1. Medical laboratory technologists
2. Medical laboratory technicians or assistants
3. Medical radiation technologists
4. Diagnostic medical sonographers

The methodology used for the environmental scan was based on the gathering of information from key stakeholders across the country. It included a series of interviews, teleconferences and a review of relevant documentation. A similar method was used for the 2001 update.

In 1998 a number of issues were identified that impact on the two groups. The major conclusion of the first report was that serious shortages could be anticipated in both groups of technologists and that a national strategy was needed. In general, most of the issues identified in 1998 are still current and relevant in 2001. In some cases, new factors or events have developed that could modify the impact on the issues. These factors have been integrated into this report. Nevertheless, it has become apparent that shortages have worsened in the past 2 years.

The Health Care Needs of the Canadian Population

According to Statistics Canada (2001), Canada's demographic future will be characterized by slow population growth and an aging population, largely due to a low birth rate and the aging of the baby boom generation. As a consequence of these two factors, we may expect a higher prevalence of diseases common to older Canadians such as heart disease, stroke and cancer. As the diagnosis and treatment for these conditions rely heavily on medical technologies, an increase in demand for these services is to be expected. In addition, with improved health care, people will live longer but, because of their age, will be more likely to suffer from chronic illnesses that require diagnosis, long-term care and monitoring.

A Diminishing Workforce

The workforce in the groups being reviewed has been declining steadily since the early 1990s. This decline can be explained mainly by layoffs due to health care reform and laboratory restructuring during the last few years. Another reason for this decline is the attrition rate, with many technologists attaining retirement age.

Declining Enrolment in Canadian Programs

Between 1993 and 2001, there was a 60% decrease in enrolment in medical laboratory technology programs in Canada. The number of medical radiation technologist graduates has also diminished significantly with many program closures. Program closures or enrolment reductions were made in response to a decline in employment opportunities for graduates. For both groups, the difficulty of attracting new recruits has been mentioned as well as the health technology field not being seen as an attractive choice for many high school graduates.

Technological Advances

The field of medical technology is continually evolving with new instruments, increased computerization and new tests being developed. Technologists have to adapt to changing methods, technologies and equipment. As new tests become available, the demand for testing increases, thus increasing the workload. There is a need for ongoing training and a high potential for burnout among workers. Finally, the constant introduction of new technology also contributes to creating an ever-shifting work environment where the distribution of tasks may change geographically, among different groups of workers or between the private and public sectors.

Workplace Changes

The last few years have seen many changes to the delivery infrastructure resulting, for example, in the creation of core labs and the transfer of routine testing to private sector labs. Patients spend fewer days in hospital, which means tighter schedules for performing laboratory or imaging services. This results in longer hours and a high incidence in repetitive stress injuries. Morale is reported to be low with an increase in absenteeism and burnout.

Employer Needs

Several trends are reported where employer needs are concerned:

Use of Generalists

In laboratory technology, there is a need to employ laboratory technologists who are trained in many sub-disciplines. Similarly, for medical radiation technologists, having them trained in more than one specialty is felt to increase the effectiveness and flexibility of services.

Cross-training

There is increased interest in using cross-trained personnel (e.g. combined lab/X-ray technician [CLX)]. Most provinces reported using cross-trained personnel in rural and small communities.

Use of Technicians

The use of technicians or assistants instead of technologists is on the rise. The technician or aide is becoming more attractive to the employer mainly in high-volume areas because of lower wages and the development of a number of automated tests.

Type of Work

Casual and part-time work represent increased flexibility for employers and as a result, many new graduates are limited to casual, temporary or part-time assignments thus further decreasing the attractiveness of the profession.

New Skills Required

Employers are looking for skills such as communication skills, team building, problem-solving skills, computer literacy as well as the ability to troubleshoot on the new instruments and to manage the technology.

Conclusion

It is apparent that there are several concurrent and sometimes conflicting forces that are influencing the medical laboratory and medical radiation workforce. The supply of technologists has diminished significantly as a result of limited employment opportunities, high attrition, retirement rate and reduced enrolment. Even though program seats have been increased in many provinces, recruitment remains a serious problem with many newly opened seats remaining vacant.

A national concerted strategy and swift action are required if Canadians are to continue receiving the same degree of medical care to which they have been accustomed in the past.

Section A: Introduction

1. Purpose of the Scan

This report presents the findings from two different studies: an environmental scan that was performed in 1998 and an update completed in 2001.

In response to concerns brought forward by the Canadian Society for Medical Laboratory Science (CSMLS), the Advisory Committee on Health Human Resources (ACHHR) formed the Allied Health Working Group, which was tasked to perform an environmental scan of the human resource issues affecting medical laboratory technologists and medical radiation technologists. Health Canada and the Working Group commissioned Assessment Strategies Inc. (ASI) to assist in gathering relevant data and to draft a report. In 1999 the Working Group submitted its report to the ACHHR with a series of recommendations. The major conclusion of the report was that serious shortages existed in both groups and that a national concerted effort was necessary to address the problems.

In 2001, the ACHHR felt that more information was needed regarding the various specialties among medical laboratory technologists and medical radiation technologists. As a result, the Allied Health Working Group decided to prepare an update and to provide additional information regarding the sub-specialties within the two groups. ASI was contracted by Health Canada on behalf of the Working Group to update the environmental scan and to perform the study.

The report begins with background information on the environmental scan and a summary of the anticipated health care needs of Canadians. This is followed by the presentation of the issues affecting medical laboratory technologists and medical radiation technologists. In general, the information obtained in 1998 and 2001 is presented in an integrated fashion so as to provide a unified picture of the situation in 2001.

2. The Scope of the Environmental Scan

The environmental scan addressed persons employed and those certified and eligible for employment in the fields of medical laboratory and medical radiation technology in Canada. Persons with some technical training (from college or on-the-job) and those with college diplomas or university degrees were included in the project. The scope was limited to persons employed in service delivery; staff in research laboratories were excluded. Occupations covered by this study fall under the following groups:

1. Medical laboratory technologist (may include cytotechnology, molecular genetics or cytogenetics technology)
2. Medical laboratory technician or assistant (including certified combined laboratory/X-ray technicians (CLXT)
3. Medical radiation technologist
   - Radiographer, radiological technologist or X-ray technologist (including other diagnostic imaging such as CT scan, and mammography)
   - Radiation therapist
   - Nuclear medicine technologist
   - Magnetic resonance technologist
4. Diagnostic medical sonographers (ultrasound technologists)

   It was decided at the outset to examine the two groups separately to avoid making any overgeneralizations from one group to the other. Even within each group, it was expected that there could be significant variability across the provinces and an effort was made to highlight the differences so that the ACHHR could better decide on the appropriateness of a national or regional approach.

3. Methodology for the 1998 Environmental Scan

The methodology used for the environmental scan capitalized on the gathering of information from key stakeholders across the country in the two groups of interest. The Working Group first invited two of the key professional/certifying bodies to join them in data-gathering activities. The CSMLS represented medical laboratory technologists and the Canadian Association of Medical Radiation Technologists represented medical radiation technologists. The Canadian Society of Diagnostic Medical Sonographers was also contacted for information and data on sonographers. Following some initial data compilation and gathering, ASI began in December 1998 to lead focus group sessions and to undertake individual interviews.

Local Meetings and Teleconference Meetings

A number of meetings with a cross section of stakeholders were held to obtain relevant data to explore major issues identified in the literature review and to identify issues that had not been addressed to date. Four half-day meetings, each with 10 to 15 invited participants, were conducted in Edmonton and Toronto. A total of four teleconference meetings (2 hours) with 8-10 invited participants were held for Quebec and the Atlantic provinces. For each location, one meeting dealt with medical laboratory technology and the other with medical radiation technology.

Interviews

Based on the meeting results, 52 semi-structured telephone interviews were conducted. The purpose of the telephone interviews was to further explore issues identified at the meetings, to validate the findings, and to build on information already identified. A stratified sample was established, which included representatives from each province, from each discipline within the two groups, employers, provincial professional associations, educators, unions and government. Given the purpose of the environmental scan, a particular emphasis was placed on obtaining the views of employers.

The information gathered from all sources was consolidated and summarized in this report for the Working Group to the ACHHR. The report concluded that serious shortages of qualified workers in the two groups of professions existed or could be anticipated in the near future and made a number of recommendations for a national strategy to address the shortages.

4. Methodology for the 2001 Update

At the outset, the project to update the scan involved the following activities: gathering and reviewing relevant documentation that had not been reviewed in the 1998 report; updating all statistical information with the most current information (up to 2001 when available) using the same sources as in 1998, i.e. Statistics Canada, the Canadian Institute for Health Information, the Canadian Society for Medical Laboratory Sciences, the Canadian Association of Medical Radiation Technologists and the Canadian Society of Diagnostic Medical Sonographers.

Based on leads provided by the members of the Allied Health Working Group, informants from each province were contacted to obtain their participation in the initial teleconference or if not possible, to obtain names of other potential participants. In this manner, informants were obtained for every province but two (New Brunswick and Newfoundland and Labrador). The recruited informants held various positions, such as educators, managers of hospital departments, heads of recruitment, directors or managers in regional health authorities, provincial government representatives. The list of informants is found in Appendix A.

A teleconference was organized to explore the human resource situation for the two groups of technologists. Due to summer holidays, it was impossible to have a representative from each province attend the teleconference. Individual telephone interviews were, therefore, organized to complete the provincial representation. The participants in the teleconferences and the interviewees were sent a memorandum describing the project and a number of questions in advance to consider before the teleconference. They were also sent a copy of the relevant section from the "Environmental Scan" (Health Canada, 1999) that addressed the situation regarding the particular group.

The purpose of the teleconference was two-fold as follows:

1. To obtain an update on the issues affecting medical laboratory technologists and medical radiation technologists.
2. To discuss and identify if there are any specialties within the medical laboratory technology and medical radiation technology fields that are more particularly affected by the current shortages. Another question that was considered is whether there are medical specialities (e.g. cardiology or oncology) where the shortages in technologists are more acute.

Following the teleconferences, the findings were summarized and sent to the informants for validation. The report for Phase 1 was then submitted to the Allied Health Working Group and after its feedback was received, the findings were integrated into this report.

Section B: The Canadian Health Care Context

According to Statistics Canada (2001), Canada's future will be characterized by slow population growth and an aging population, largely due to a low birth rate and the aging of the baby boom generation. In 2000 Canada's population was estimated at 30.8 million, an increase of 13.8 million since 1966.

Table 1 presents the ages of the Canadian population from 1990 to 2000.

Table 1
Canadian Population Statistics by Age Group (1990-2000)
(Source: Statistics Canada)

Year	Age 0-17	Age 18-64	Age 65+	Total Population
1990	6,895,450	17,778,180	3,116,965	27,790,595
1991	6,968,880	17,940,170	3,211,015	28,120,065
1992	7,039,275	18,201,870	3,301,070	28,542,215
1993	7,095,740	18,461,905	3,389,120	28,946,765
1994	7,132,750	18,650,630	3,472,220	29,255,600
1995	7,169,335	18,889,955	3,558,160	29,617,450
1996	7,198,080	19,127,410	3,643,715	29,969,205
1997	7,216,280	19,344,485	3,725,835	30,286,600
1998	7,185,052	19,333,124	3,729,773	30,247,949
1999	7,143,308	19,559,844	3,790,281	30,493,433
2000	7,109,003	19,791,187	3,849,897	30,750,087

The annual rate of population growth is expected to drop to 0.9% by 2016 from 1.4% in 1993. Based on a medium-growth scenario, the population is projected to increase to 37 million by 2016. In addition to slow population growth, Statistics Canada expects the median age of the population (the point in the age distribution where half of the population is older and the other half is younger) to increase to 40.4 years in 2016 from 33.9 years in 1993.

In addition, the declining mortality rate has resulted in increased life expectancy for Canadians. In 1993 a baby boy was expected to live to age 75 (compared to 66.3 in 1951) and a baby girl to age 81 (compared to 70.8 years in 1951). By 2016, life expectancies forecasted by Statistics Canada are to reach 78.5 and 84.0 years for men and women respectively. Figures 1a and 1b show the age shift expected to occur in the male and in the female populations respectively by 2016.

Figure 1a
Canada's Estimated and Projected Male Population by Age Group
(Source: Statistics Canada 2001)

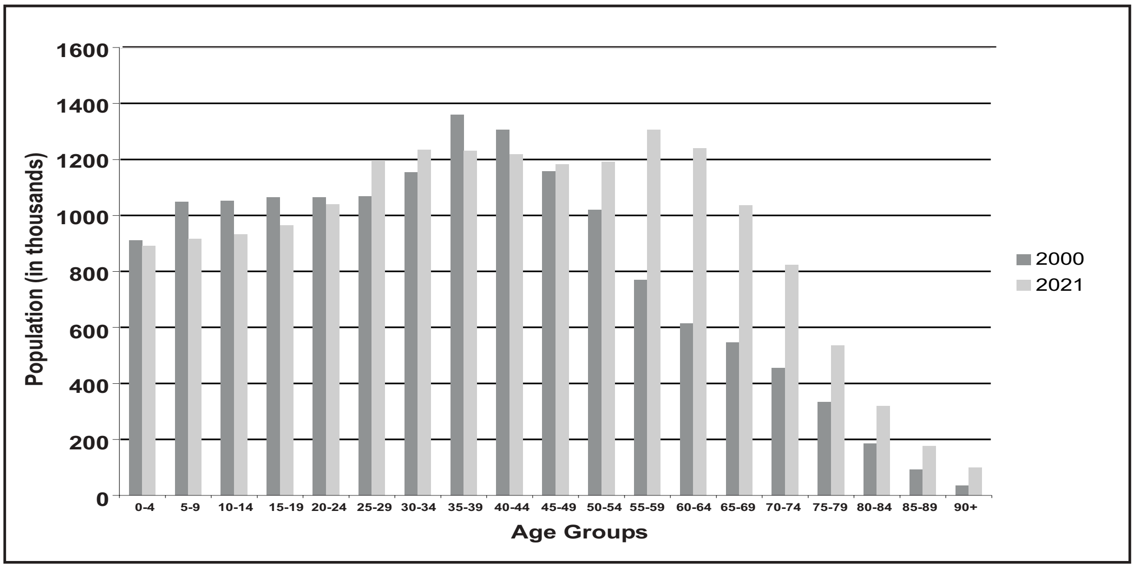


Figure 1b
Canada's Estimated and Projected Female Population by Age Group
(Source: Statistics Canada 2001)

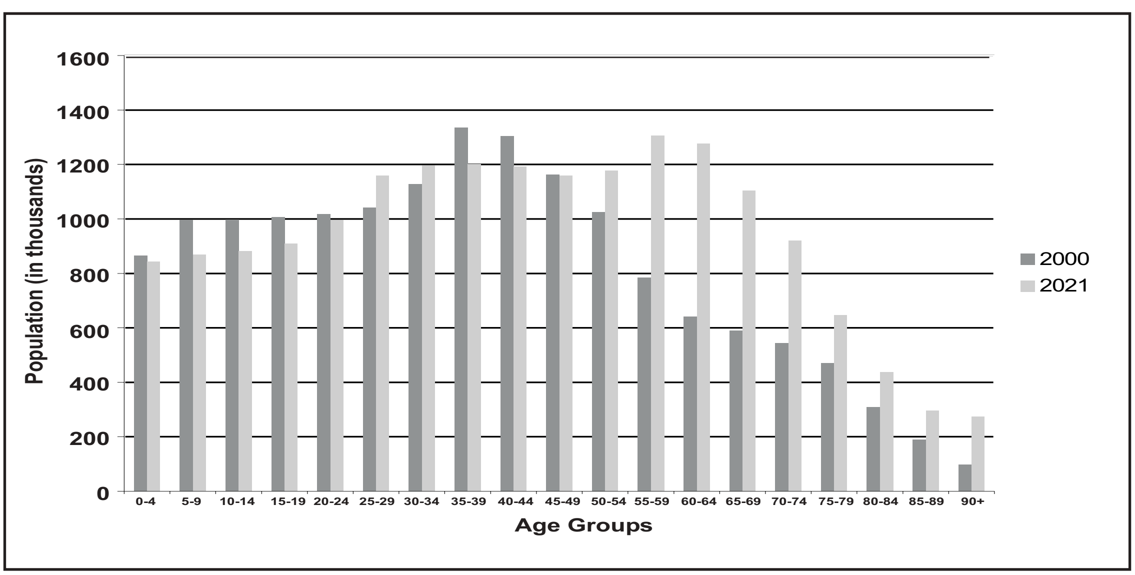


Table 2a and Table 2b show the leading causes of death for Canadian men and women. Diseases common to older Canadians include heart disease, stroke and cancer. Diagnosis and treatment for these conditions rely heavily on the medical technologies that are the focus of the scan.

Table 2a
Leading Causes of Death for Men (1990-1997)
(Per 100,000 persons)*
(Source: Statistics Canada, Health Canada, National Cancer Institute of Canada, Canadian Cancer Society)

Cause of Death	1990	1991	1992	1993	1994	1995	1996	1997
Cancer	246.4	247.2	244.6	242.6	241.6	238.7	236.2	229.5
Lung	79.5	78.8	77.5	77.9	75.5	73.2	72.9	69.9
Colorectal	25.7	25.1	25.9	24.7	25.0	25.1	24.3	23.5
Prostate	30.1	31.2	31.0	31.0	30.7	31.0	29.0	28.4
Heart Diseases	269.1	263.7	256.8	255.9	244.8	239.2	232.5	230.8
Cerebrovascular Diseases	58.2	55.8	54.3	56.2	54.3	53.6	51.1	52.8
External Causes**	69.1	68.7	66.9	67.4	64.9	65.0	63.0	57.3

* Age-standardized to 1991 population.
** Includes events such as suicide, poisoning, and motor vehicle and other types of accidents.

Table 2b
Leading Causes of Death for Women (1990-1997)
(Per 100,000 persons)*
(Source: Statistics Canada, Health Canada, National Cancer Institute of Canada, Canadian Cancer Society)

Cause of Death	1990	1991	1992	1993	1994	1995	1996	1997
Cancer	153.0	153.5	153.1	154.8	155.0	151.8	155.1	148.7
Lung	27.6	29.5	29.6	31.7	31.9	31.3	33.6	32.3
Colorectal	17.7	16.8	16.6	16.6	16.1	16.2	15.7	15.2
Breast	31.3	30.1	30.4	29.4	30.0	28.7	28.9	27.4
Heart Diseases	150.1	147.6	140.8	140.4	137.9	134.9	131.7	129.7
Cerebrovascular Diseases	46.8	46.3	46.1	47.3	45.2	44.0	43.1	43.9
External Causes**	26.5	26.5	25.7	26.6	25.0	25.4	25.1	22.8

* Age-standardized to 1991 population.
** Includes events such as suicide, poisoning, and motor vehicle and other types of accidents.

With improved health care, people will live longer but, because of their age, will be more likely to suffer from chronic illnesses that require diagnosis, long-term care, and monitoring. At the same time, the coming generation of seniors will generally be healthier than previous generations with more advanced technology to detect illnesses earlier, more effective treatment options, and healthier lifestyles.

Over the years, the combined effects of low birth rate and mortality levels in Canada have resulted in an age structure with a larger proportion of older Canadians than younger. This aging of the population is expected to continue due to improved longevity and the aging of the baby boom generation. Population aging and longevity have an impact on health care needs that are likely to result in a greater demand for laboratory services and radiation and diagnostic imaging services.

Section C: Findings on Medical Laboratory Technologists

1. The Medical Laboratory Technologist

As a member of the health care team, medical laboratory technologists can perform a range of laboratory tests on human tissue and specimens. They practise in hospital laboratories, private medical laboratories, public health laboratories, transfusion service laboratories, government laboratories and research laboratories. The laboratory disciplines include the following:

Clinical Chemistry: the measurement of chemical components of blood and body fluids, including hormones and drugs.

Clinical Microbiology: the study of bacteria, fungi, viruses, and parasites, which invade the body.

Diagnostic Cytology: the study of cells for the detection of cancer.

Clinical Genetics *(including cytogenetics and molecular biology):* the study of chromosomes, DNA and RNA from cells of body fluids and tissues to diagnose genetic diseases.

Electron Microscopy: highly magnified photographs of cells are prepared to capture details ordinary microscopes cannot detect.

Hematology: the structure of diseases in blood cells and the clotting mechanisms of the blood.

Histotechnology: the preparation of body tissues for examination under the microscope.

Immunology: the study of the body's defence mechanisms against disease.

Transfusion Science: the determination of blood types and cross-matching for transfusion.

Other personnel who work in the laboratory may collect and transport specimens, set-up for laboratory tests, or perform laboratory tests. The three most common groups of workers who give support to technologists are laboratory assistants, laboratory aides, and laboratory technicians. In addition, CLXTs are employed in several provinces.

2. Education and Certification

Most medical laboratory technologists possess a diploma-level certificate from a college or institute of technology. Programs may be 2 or 3 years in duration, depending on the type of high school diploma and include a clinical practise component. The disciplines covered in the general training program include clinical chemistry, clinical microbiology, hematology, histotechnology, and transfusion science. There is a separate specialized program in most provinces for cytotechnology and there are programs in clinical genetics in British Columbia and Ontario.

Following satisfactory completion of the educational program, graduates are eligible to write the examination offered by the CSMLS to obtain national certification, which is recognized throughout Canada.

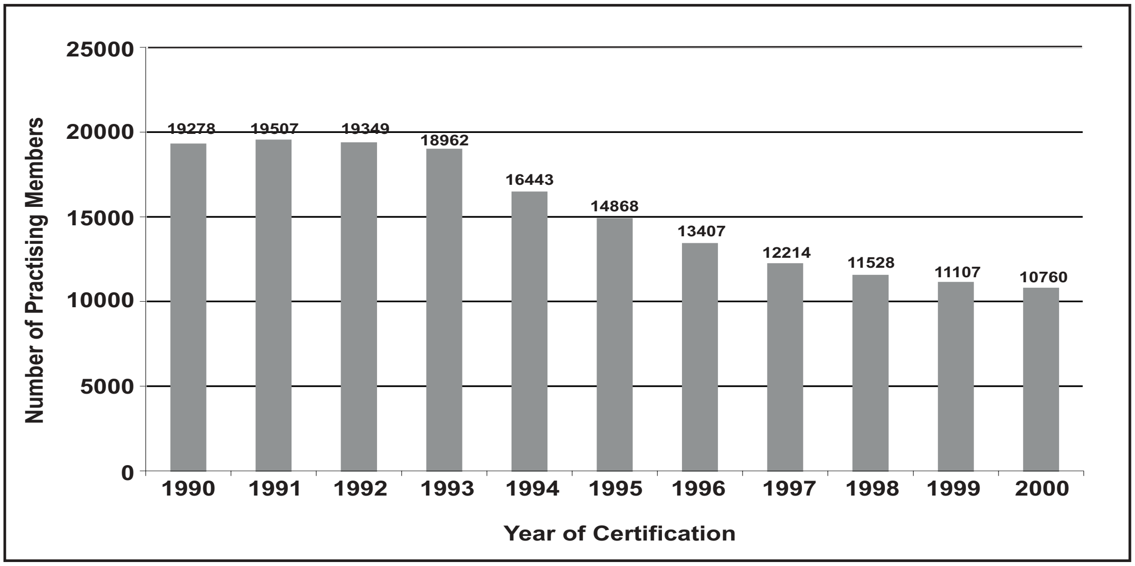
The training for laboratory aides, assistants, technicians and CLXTs varies considerably across the country from on-the job training to community college courses or certificates.

3. The Current Workforce

The medical laboratory technologist workforce is the third largest health care group in Canada, following nurses and physicians. In 2000 the CSMLS membership, representing approximately 60% of the medical laboratory technologist workforce, was 10,760.

Figure 2 shows the number of CSMLS members from 1990 to 2000. During that time, there was a 44% decline in membership. Some of this decrease is attributable to changes in the regulatory requirements in Ontario, Alberta and Saskatchewan. However, the decline can be explained mainly by layoffs due to health reform and laboratory restructuring during the last few years (e.g. Alberta reportedly saw the greatest proportion of layoffs with a loss of almost 50% of its laboratory technologist positions). An equal reduction in the number of new medical laboratory technologist graduates has kept the number low.

Figure 2
Certified CSMLS Members Practising in Canada (1990-2000)
(Source: Canadian Society of Medical Laboratory Science)



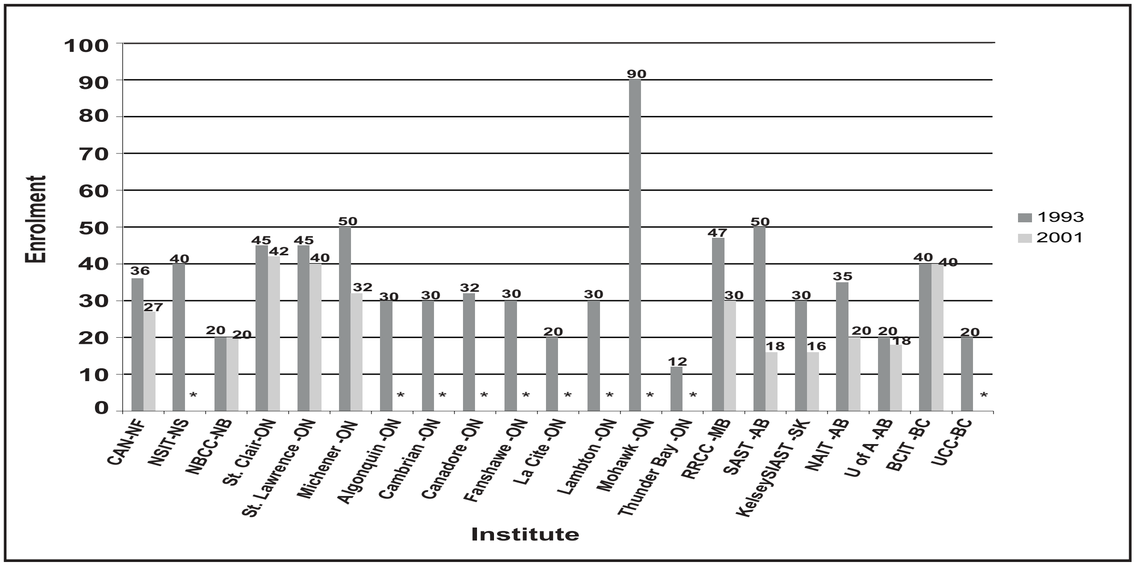
4. Enrolment in Canadian Programs

In 1993, 752 students (excluding Quebec) enrolled in 21 programs in Canada. With the health care reform initiatives, budgets were cut back and laboratories were consolidated. This, in turn, resulted in a significant reduction in employment opportunities for graduates. To respond to a diminishing demand for technologists and the simultaneous increase in the use of technicians, a large number of educational programs were closed and/or enrolment reduced across the country.

The 2001 update indicates that a number of programs have been reinstated and in other programs, the number of seats was increased. However, some of the newly created seats are remaining vacant due to problems in the recruitment and retention of students. This issue will be addressed in a later section.

Figure 3 shows the enrolment in the various programs from 1993 to 2001. It illustrates the dramatic shift in training programs offered in medical laboratory technology. The current enrolment level defines the supply of new medical laboratory technologists that will be available to meet future demand.

Figure 3
Canadian Medical Laboratory Technologist
Training Program Enrolment in 1993 and 2001
(Source: Canadian Society of Medical Laboratory Science)



∗ Indicates program closure.

5. Number of Examinations

Table 3 shows the number of candidates writing the General Certificate Examination. In the past 10 years, the total number of candidates writing the English version of the examination has declined by approximately 80%. The total number of French-speaking candidates has remained stable. Programs in Nova Scotia, in the Western provinces, and English programs in Ontario have suffered the greatest reductions. The number of candidates writing the Diagnostic Cytology and Cytogenetics specialty examinations also declined from 46 to 20 and 38 to 6 respectively from 1990 to 1998. These numbers are not included in Table 3.

Table 3
Number of Exam Candidates by Province – General Certificate (1990-2000)
(Source: Canadian Society for Medical Laboratory Science)

Province	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
NL	22	30	29	15	29	26	28	20	22	22	20
NS	39	32	41	31	32	26	30	3	0	0	0
NB	9	16	18	20	18	10	14	14	8	8	11
QC English	22	29	23	28	30	22	19	17	22	15	19
QC French	187	176	175	182	201	193	189	188	182	188	180
ON English	280	269	202	274	211	180	186	158	75	55	41
ON French	–	–	8	6	9	5	5	8	8	0	0
MB	32	27	31	36	28	22	24	23	0	0	0
SK	56	38	46	44	49	35	24	5	0	14	0
AB	116	122	107	115	107	64	53	27	19	24	29
BC	66	63	70	60	73	51	18	36	8	0	0
Total English	642	626	567	623	577	436	396	303	154	138	120
Total French	187	176	183	188	210	198	194	196	190	188	180

6. Entry-Level Requirements

In early 1999, the CSMLS Task Force to Re-examine the Entry-level to the Profession published a discussion paper to determine the support from members and other stakeholders for raising the educational standard for entry-level medical laboratory technologists to a university degree. As the professional organization and the certifying body for medical laboratory technologists, it is currently working toward achieving consensus on this issue with all key stakeholders. No position has yet been adopted by the CSMLS or the Task Force. Based on the information-gathering that was conducted for the environmental scan, there appears to be a variety of viewpoints on the issue, with some believing that a diploma exit option should be maintained. Because the subject was not the main focus of the environmental scan, more investigation would be needed to fully evaluate the costs associated with a higher educational standard for entry-level technologists in relation to the benefits to be gained.

7. The Aging Workforce

Figure 4 presents the number of practising CSMLS members by year of certification from 1953 to 1999. As membership is voluntary, these numbers reflect only part of the medical laboratory technologist workforce. An analysis of this information reveals that, as expected, the baby boomers are approaching the age of eligibility for retirement.

Figure 4
Active CSMLS Members by Year of Certification
(Source: Canadian Society of Medical Laboratory Science)

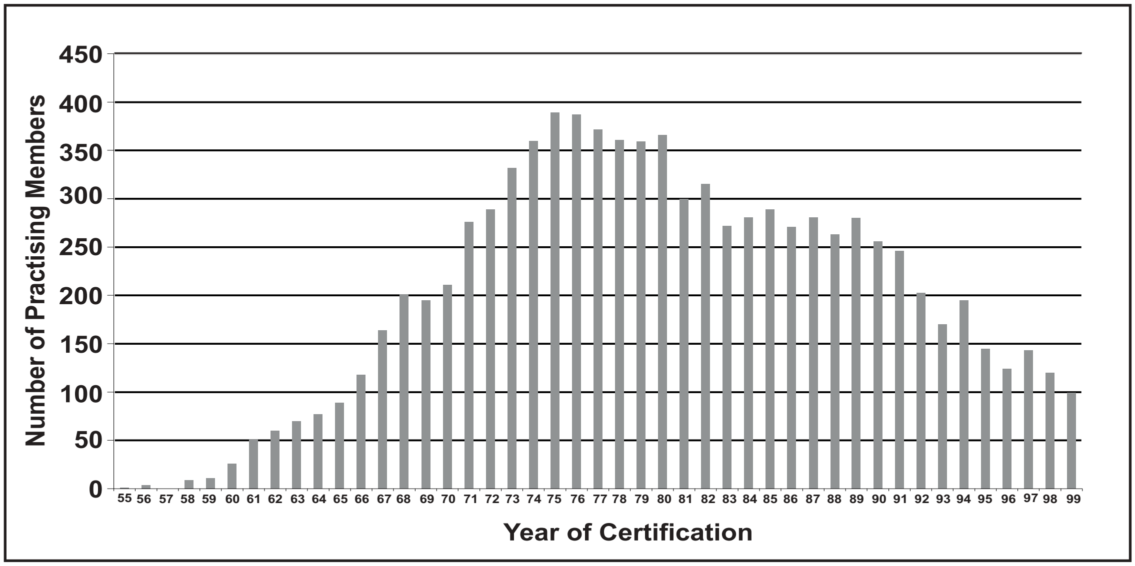


Table 4 indicates the number of active CSMLS members by year of certification (between 1955 and 1977) and their estimated age in 2001, 2006 and 2011.

Based on the data provided in Table 4, it is possible to estimate the number of CSMLS members eligible to retire over the next 10 years. Assuming early retirement eligibility at 55 years of age and an average age of 21 years at initial certification, approximately 680 individuals would have retired in 2001. This value is generated by summing the numbers of currently active members who were initially registered between 1955 and 1967. By 2006, an additional 1172 members may choose to retire early (those registered between 1968-1972). By 2011, another 1840 individuals may elect to take early retirement (initial registration between 1973 and 1977).

Table 4
Estimated Number of Medical Laboratory Technologists Retiring in 2001, 2006, and 2011
(Source: Canadian Society for Medical Laboratory Science)

Year of Initial Certification	Number of Members	Age in 2001	Age in 5 Years (2006)	Age in 10 Years (2011)
1955	1	67	72	77
1956	0	66	71	76
1957	4	65	70	75
1958	9	64	69	74
1959	11	63	68	73
1960	26	62	67	72
1961	51	61	66	71
1962	60	60	65	70
1963	70	59	64	69
1964	77	58	63	68
1965	89	57	62	67
1966	118	56	61	66
1967	164	**55**	60	65
1968	201	54	59	64
1969	195	53	58	63
1970	211	52	57	62
1971	276	51	56	61
1972	289	50	55	60
1973	332	49	54	59
1974	360	48	53	58
1975	389	47	52	57
1976	387	46	51	56
1977	372	45	50	**55**

Assumptions:
1. Average age of 21 years at initial certification.
2. Early retirement eligibility at 55.

Boldfaced type indicates early retirement age reached in 2001, 2006, and 2011.

As membership is voluntary, these numbers represent approximately 60% of the medical laboratory technologist workforce. Note also that individuals who have part-time or casual employment would be ineligible to retire early by age 55. Yet if age 65 is used as a cut-off instead of 55, retirements are delayed, but not eliminated.

In a recent provincial survey of medical laboratory technologists (NSDH 1999), the respondents indicated when they anticipated retiring. In this sample 11.7% reported plans to retire in the next 5 years, and an additional 21.4% over the following 5 years. These data correspond very closely to the CSMLS figures derived from Figure 4.

Assuming the number of medical laboratory technologist positions remains constant, and all eligible individuals actually take early retirement, a substantial increase in the number of graduates per year (i.e. an average of 370 graduates a year in the next 10 years for CSMLS) would be required to replace those lost to retirement or attrition.

These estimates are based on a number of assumptions such as age at initial certification, age at retirement and constancy in the number of available positions. Other human resource issues such as the increase use of technicians or assistants and the continued consolidation of laboratory services also influence these assumptions. Some of these issues are discussed in the following sections.

8. Technological Advances

The field of medical laboratory technology is evolving toward increased computerization with new instruments and new tests being continually developed.

Automation in the laboratories could have a dramatic impact on the laboratory technologist. To the extent that the automated testing systems can be operated by a technician or assistant, the need for the technologist is reduced. There will always be a requirement for the technologist in the laboratory but the proportion of technologist to technician/assistant is shifting (in some cases significantly), at least in the larger centres. Robotics, which are now being implemented, are costly systems that are currently reserved for the high volume centres although some believe that eventually these systems will become cost-effective for the lower volume laboratories as well. It is assumed that automation will increase the productivity of laboratories, but so far, no objective evidence is available to confirm this.

With the increase in the number and complexity of laboratory testing, manufacturers have consolidated instruments so that multiple types of laboratory tests can be performed. This means that laboratory personnel must be effective in dealing with more complex equipment. It also reinforces the need for laboratory personnel to handle equipment malfunction.

New and emerging technology includes imaging analysis for the laboratory (e.g. Neo Path; Path Net) that is currently seen more in the United States. It is believed that it will eventually find its way to Canada and enhance quality assurance functions in laboratory work.

The most discussed advancement in technology relates to point-of-care testing instruments. These new instruments allow for testing at the hospital bedside, in the patient's home, in the physician's office, etc. The glucose meter is the instrument that has been most widely implemented although others are in use. With this type of testing, venipuncture can be avoided and a lesser volume of blood is removed from older and critically ill clients. Point-of-care testing can be performed by a number of health care professionals, but it is mainly performed by registered nurses. Despite general support for point-of-care testing, concerns about accuracy and quality control persist because testing is performed by personnel with no specialized training in testing protocol. The technologist's role is to establish quality assurance measures, including training the users on the proper procedures. The impact of these developments is to remove a small proportion of the testing from the laboratory.

At the same time as technologists need to learn how to operate new equipment, they also need to either maintain or acquire skills in the use of old equipment. As the older staff is retiring, the knowledge base in the use of older equipment is also disappearing.

9. Prescription Practices and Funding

As new testing devices become more readily available, there is a trend among physicians to prescribe more elaborate testing. Comments from participants in the 2001 update have indicated that at least a portion of the prescribed testing is unnecessary and that the information is either not essential or could be obtained by simpler, less technologically dependent means. At the same time, as medical knowledge about early signs of disease increases, governments are seeing the advantages of early detection and are allocating supplementary funds for detection and prevention programs. This again, creates a greater demand for medical laboratory technologists whose work is very crucial to detection programs.

10. Public and Private Sectors

There has been a shift in the distribution of work between the private and the public sectors. In private and public partnerships, such as that seen in Alberta, routine testing has moved from the hospital setting to the private domain while hospitals continue to perform specialized tests. British Columbia, Alberta, Ontario and Quebec have a mix of private and public laboratories. Saskatchewan and Manitoba have also moved to an exclusively public laboratory system and the eastern provinces continue to maintain only public laboratories.

Private sector laboratories are generally not unionized and can therefore have more flexibility in human resource policy. This has resulted in increased competition between the private and public sectors. Many technologists have moved to the private sector thus increasing shortages in the public sector.

11. Recruitment

In general, educators and employers believe that students do not consider medical laboratory technology as an attractive career choice. Aspects of the profession that may contribute to a negative image include high risk of contamination and exposure to disease (e.g. HIV testing), stress related to consequences of error, adverse working conditions such as shift work; lack of job security or promotion opportunities, and relatively low wages compared to other health professions.

Although laboratory technology is the third largest health care discipline and in spite of a very low unemployment rate, it appears that students are unaware of the possibilities in this field as they make their career choices.

Between 1998 and 2001, a number of provinces have either reopened programs or added seats to existing programs. However, many seats remain vacant. Some provinces have also reported a greater attrition rate among students who enter the programs. The proposed explanation for this phenomenon is that, due to difficult recruitment, programs have had to lower admission requirements, thus leading to a larger drop-out rate in the first years of study. The trend, however, is inconsistent across Canada and could not be confirmed by the national association.

It is interesting to point out that a significant proportion of students in the programs have already completed some university science courses, some even a full degree in a related discipline (e.g. biology). One source estimated that as many as 75% of the students in medical laboratory technologist programs had at least some completed university courses. In New Brunswick, there is now a recommendation to have one completed year of university before entering the program.

12. Clinical Training

The field of medical laboratory technology is heavily dependent on state-of-the-art technological devices that are too costly for programs to acquire and as a result, a portion of the training needs to be performed on site. Several provinces have reported a serious shortage of clinical training sites. A number of factors could be related to this problem: some institutional departments have closed; overworked medical laboratory personnel may be unavailable to offer training and supervision; experienced staff that can provide training may have retired; if some of the tasks have been transferred to the private sector, some of the previously available training opportunities may not be available any longer.

13. Evolving Employer Needs

Generalists

With the constraints on operating budgets and the establishment of core laboratories and rapid response laboratories, employers tend to require medical laboratory technologists who are trained in many sub-disciplines. Many have become generalists, with fewer maintaining or developing specialties and, as a result, it has become increasingly difficult to find candidates with the appropriate specialized experience.

Employers and medical laboratory technologists have no control over the laboratory service needs of the physicians as the number and diversity of tests will vary depending on the physician mix in the locality. This reinforces the need for technologists to be proficient in many areas to meet the demands of the requesting physicians.

Two exceptions are in the specialties of cytogenetics and molecular biology. There are limited positions in these specialties and few training opportunities. As a result, laboratories reportedly hire general medical laboratory technologists or university graduates with degrees in genetics or biology and provide them with the necessary training.

Cross-Training

There is increasing interest in having medical laboratory personnel cross-trained in X-ray. Cross-training is particularly relevant in smaller centres and rural areas where the volume of testing is too low to justify both a medical laboratory technologist and a medical radiation technologist. Most provinces reported using cross-trained personnel (especially the CLXT) in rural and small communities.

Workforce Mix

There is an obvious need for employers to make the most effective use of available laboratory personnel. With the increased automation of laboratory instruments and budgetary restrictions, the use of technicians or assistants in lieu of technologists is on the rise. A more detailed discussion of shifting workforce mix is presented later.

Rural and Urban Centres

In rural centres, there are usually no pathologists on site to oversee the testing as in urban centres; the scope is broader, thus requiring more independent decision-making and analytical skills. Paradoxically, work is more routine, with the specialized testing being sent to the larger urban laboratories. As a result, it is more difficult in the smaller communities and rural centres, to become familiar with evolving technology.

Part-time and Casual Work

As employers require flexibility in the medical laboratory technologist workforce, most new graduates can generally not expect more than part-time and casual work. Larger employers that hire across institutions can sometimes fill several casual positions with one medical laboratory technologist. Full-time employment as a medical laboratory technologist has declined from 67% in 1991 to approximately 63% in 1998. Part-time employment rose slightly from 27% to 30%.

Many medical laboratory technologists are unionized and seniority plays an important role in collective agreements. Labour contracts stipulate that full-time positions must be offered to employees according to seniority. As employers can rarely offer permanent work to the newly trained graduates, many of them are lost to other careers.

New Skills

In the past, the choice of a career as a medical laboratory technologist was often made because it offered a career in health care without having to deal directly with clients or other professionals. Today however, the medical laboratory technologist must possess strong interactive and communication skills as they are often called upon to teach or assist other professionals and to address complaints from patients or physicians. Also, with generalized access to the Internet and the growth of environmental medicine, technologists need to have knowledge beyond their specialty to respond to various requests for information coming from the public or from other health professionals. Finally, sound time management principles are required in order to meet the demands for immediate results that are coming from physicians.

Computerization

With the technological advances, it becomes necessary to manage the technology. Advanced computer literacy is now required by employers. There is a need to have information systems and laboratory personnel work more closely together. The needs of the laboratory services are not well known or understood by information technologists and therefore are not generally being effectively met. Technologists who possess these skills represent a valued asset for employers.

Troubleshooting

New technology has brought about the consolidation of instruments such that laboratories are running on a 24-hour basis. To keep laboratories operating, technologists need to troubleshoot on equipment malfunctions (especially in rural areas). Currently, this skill is learned on the job, but employers believe that this training should be part of the educational program.

14. Evolving Role of the Medical Laboratory Technologist

With changes to the laboratory systems and advances in technology, there is a greater focus on the clinical and cognitive aspects of the profession as opposed to the hands-on process. Technicians or assistants can perform the routine work and medical laboratory technologists are, therefore, becoming information

managers who validate information against other sources. This role requires a holistic view of the process and the client, as well as the ability to integrate many sources of information.

Currently, physicians are the gatekeepers of lab testing, but some participants believed that, in the future, the public might gain direct access to services. Others believed the laboratory walls are disappearing and that, in the future, the medical laboratory technologist will be seen more often in the community, in the home or in specialized clinics. Not all participants were convinced of the likelihood of this move to the community but if it did happen, it could lead to new demands in the skills needed such as the monitoring of blood pressure, respiration, etc.

15. Professional Issues

The reported initiatives were mostly provincial. In Ontario, reference was made to January 1, 1994, at which time, medical laboratory technologists became regulated and consequently became a "recognized" profession.

In the Western provinces, Alberta mentioned the new Health Professions Act which defines the scope of practice for the regulated professions. Continued competence requirements will be addressed within the next 5 years. In Saskatchewan, licensure is established for technologists (but not yet for technicians). The Saskatchewan government has begun to make all laboratories public as in Manitoba. Manitoba is also exploring registration, while British Columbia is establishing a college. Also in Alberta, the laboratory accreditation criteria are under review by the College of Physicians and Surgeons of Alberta. There is also a move toward establishing private hospitals, which would create a need for technologists and technicians.

In the Eastern provinces the focus of the discussion was on continued competence or continuing education. In Nova Scotia there is a licensing committee established to look at self-regulation (may take several years). New Brunswick is already self-regulated. Quebec participants reported work being done in the development of standards of practice. Also mentioned was the government's work in establishing laboratory requirements or criteria for both private and public institutions. Prince Edward Island will not be pursuing regulation in the near future.

There is the expectation that blood transfusion legislation may be introduced (either nationally or provincially), which will require more documentation and reporting and have an impact on the daily work of the technologist. Finally, there is some interest in establishing an interprovincial quality assurance program for laboratories.

16. Workforce Mix

All provinces except Prince Edward Island reported using laboratory technicians, or assistants, and/or aides and many also use CLXTs. The titles vary from province to province and training backgrounds range from on-the-job training to formal education. In Quebec, where assistants are not used, there are laboratory technicians who are fully trained technologists, but have chosen not to certify with the regulatory body. They receive the same salary as technologists and the only difference is they are not permitted to draw blood samples. In Ontario, extensive use is made of the technician or assistant, especially in the large automated laboratories. In Saskatchewan the technician or aide is trained on the job and has a much more limited role. In British Columbia, formal training is offered to become a laboratory assistant or aide. In New Brunswick, there are no technicians only assistants who are trained on the job. Newfoundland and Labrador laboratory assistants are no longer being trained and certified with this group slowly disappearing. However, the province makes use of aides in blood collection.

The technologist/technician ratio varies by province and by work setting within a province. In British Columbia for example, a ratio of one-to-one was reported. In Saskatchewan, there is also a one-to-one ratio in the urban centres, but with an increasing shift toward the technician. Also, rural laboratories are mainly staffed with technicians. In New Brunswick, the ratio tends to be one assistant to ten technologists. In Alberta, community collection services depend almost entirely on the use of assistants.

A 1999 CSMLS survey showed that, in most situations, the number of laboratory assistants reported appeared to be proportional to the number of technologists employed, with large laboratories employing more laboratory assistants. No past data was available for comparison.

Overall it can be said that there is a changing ratio of medical laboratory technologists to technician. The technician is becoming more attractive to the employer mainly in high volume areas because of the lower cost of this group and advances in technology that have automated a greater number of tests. This trend is not being seen in smaller labs. However, with the continued consolidation of laboratory services and technological advances, technicians will continue to be in high demand and the technologist/technician ratio is likely to change.

In Ontario and Alberta, some medical laboratory technologists are accepting jobs as technicians when their preference is to remain in their area. Generally, centralization of services leads to a lowered need for technologists and a greater justification for using assistants.

Nevertheless, in 2001, all provinces that use technicians, aides or assistants report shortages in those groups as well. It appears the same forces that affect technologists also affect these workers. It is felt that any initiative to address the shortages among technologists should consider human resource issues related to those groups as well. Issues such as the distribution of tasks, the specific skills and training required, need to be reviewed for technicians and aides in relation to the overall situation.

17. Work Demands

The need for laboratory testing appears to be growing. Employers reported an increase in the number of laboratory tests performed every year for the past 10 years. In part this is due to the large increase in the number of available tests. Although technological advances have improved the productivity of laboratories, there has also been an increase in the complexity of tests available.

With health care reform and re-structuring, in-patients are more acutely ill and hospital stays shorter. In general, almost all patients need some form of testing. In fact, much of the circulation of patients in and out of hospitals revolves around the results of tests. For example, admission and discharge criteria can be based on results of lab tests that are needed quickly. Early release of clients is also based on satisfactory laboratory results. As well, the monitoring of released clients is done in part through regular testing. Overall, there is an increase in the volume and diversity of tests with a rapid response time needed.

With the general aging of the population, it is expected that there will continue to be a growth in the need for health care services, leading to a corresponding increase in the laboratory services that will be required.

With current workloads, the work of medical laboratory technologists has become more physically demanding. In cytology for example, back and neck injuries are common because of the higher volume of work; technologists must spend 7½ hours bent over a microscope with few breaks to relieve the strain. The faster pace, with fewer breaks, is also taking a toll on the generalist technologist, particularly with the older employee. Also, the need to run laboratories on a 24-hour cycle has required much more shift work, which is an added physical stressor.

Stress among medical laboratory technologists is reported to be currently at a high level. Employers report seeing more burnout cases.

18. Labour Unrest and Wage Parity

Many medical laboratory technologists in Ontario are working on expired contracts which are currently in arbitration. Employees perceive that there is a lack of recognition of stress factors, which affect the morale of the workforce. Finally, the liability factor associated with the performance of accurate results is an added stressor given the high volume of tests performed (although limited litigation is seen in Canada).

In many provinces, other health professionals have been successful in obtaining new benefits or increased wages. Technologists have not been as successful as other groups and, as a result, the gap between their wages and those of other health professionals has increased. Compared to other health professionals who receive education and training of similar duration, the wages of medical laboratory technologists are not competitive.

19. Interprovincial and International Competition

There are inequalities in the wages received by medical laboratory technologists from province to province or even in some provinces, from one district to another, or between institutions. This has created fierce competition between institutions, health regions, as well as interprovincial competition for scarce medical laboratory personnel. Additionally, the United States is a powerful attraction and technologists in border regions often seek employment across the border.

20. Alternative Careers

At the national level, hospitals employ approximately 67% of the CSMLS members and the private laboratories 12%. This represents a decline of 4% and 8% respectively. A rise of 6% in the “other” employment areas is seen (i.e. outside medical laboratory) (CSMLS, 1996b). The difficulty in finding full-time work upon graduation has led to medical laboratory technologists taking other work. Those who are hopeful that the situation is temporary will accept work as technicians or assistants. Others in border cities will find work in the United States. More commonly, these individuals will find work in non-medical laboratory work, but in a laboratory setting. These opportunities are local or regional in nature. For example in Quebec, the agriculture and food industry is an option in the smaller centres. Elsewhere, manufacturing and pharmaceutical companies also value the training they bring and may hire them as research assistants. Other examples include the petrol-chemical industry and the veterinarian field.

21. Current Situation and Expected Future Demand

Based on the sources consulted for the update of the environmental scan, there is general agreement that serious shortages exist or will be a reality in the next few years. Below is a summary of the situation, as described by informants from all provinces.

- In British Columbia the shortage situation over the last few years is described as very unstable. There are currently significant vacancies in five different regions of British Columbia. Summer months are particularly difficult because of the non-existence of the casual pool. It is anticipated that shortages will become greater in the next few years as 30% of technologists are over 50 years old and 40% between 40 to 49 years of age.

- Alberta has reported that shortages are greater than anticipated in 1998. A survey was recently conducted to determine provincial needs in laboratory staff and the results were alarming. The situation described in the 1998 scan is a poor description of the actual situation in Alberta. Programs have increased the number of available seats, but the number of clinical training sites has not been increased to accommodate a larger number of trainees.

- Saskatchewan reported in 1998 that it was experiencing some difficulties in filling part-time and casual positions. It saw the employment requirements in the next 5 years (based on attrition and projected growth) exceeding the number of graduates produced. This projection included the CLXTs. In 2001, the informant for Saskatchewan reported that the situation is either as acute or more acute compared to 1998. It is felt that with the number of workers who will potentially retire in the next few years, the number of graduates needs to double the current workforce. Saskatchewan suffers from its proximity to Alberta, which pays the highest wages in Canada for medical laboratory technologists. As different unions represent the medical laboratory workforce in various areas of the province, there is actually no wage parity. Different health districts are therefore competing with one another to attract technologists.

- Manitoba is having some difficulties in recruiting (e.g. for summer relief). In the medium-term, the province will require a large number of new technologists to work in Northern centres and to replace the retiring workforce in the urban centres. In 2001, the Manitoba informant reported that 25% of technologists are expected to leave the workforce within 5 years. The workload has also increased. There are currently 12 vacancies in Winnipeg alone. Some hospitals in rural centres are considering closing their acute care units because of the shortage of lab services. There is also now a registry for Pap smears, which will require expanded services.

- Ontario reports that positions are starting to open up with the risk of shortages as the workforce begins to retire in higher numbers. In 2001 there is still a shortage, but this is mostly felt in the short-term or casual positions. There is also a new benefit from the Hospitals of Ontario Pension Plan program that provides for income to bridge the gap between early retirement and retiring at a normal age. This offer will hold until 2003. It is expected, as a result, that there will be a surge of retirements among the more experienced staff and the managers between now and 2003. Ontario reports a greater shortage in the private laboratories as salaries are better in the public sector. Program officials are finding it difficult to find sufficient funding for their programs, especially with the high cost of instruments.

- Quebec reports that there is no critical situation or serious shortages, but that a certain tension exists around recruitment and retention. Recall lists are extensively used to find staff for temporary or short-term assignments. It is felt that shortages could soon become more evident. There is also a change in nursing tasks that has created an increased demand for technologists and technicians. A detection program for cervical cancer has recently been approved that will lead to increased demand for testing.

- New Brunswick did not participate in the 2001 update. However, in 1998, it reported that there was a stable supply but expected a shortage in the coming 5 to 10 years due to attrition.

- Nova Scotia reported in 1998 that there would be too few graduates to meet future demands (especially with the aging workforce).

- Prince Edward Island sees the aging workforce as a major issue and will need more graduates. In 2001 the informant for Prince Edward Island reported that there were no major shortages and when full-time positions are offered, these can be filled. However, it is anticipated that shortages will develop within 3 to 5 years. The major problem for Prince Edward Island is not having its own training program and having to attract students from other provinces. This is difficult as it is not always possible to offer permanent or full-time positions. Many of the technologists are close to retirement age and it is expected that 12 to 15 technologists will be retiring within the next 4 years.

- Newfoundland and Labrador report that there are no immediate shortages. They have a stable but older workforce. There is a need to retain graduates.

- The CSMLS reports that the situation has worsened since 1998. In addition, there is increased competition between provinces, between the private and public sectors and also at the international level. There is also labour unrest in all fields and many unions are threatening strikes.

22. Initiatives Taken to Address Shortages

- Alberta

  The medical laboratory program at the Southern Institute of Technology has been reinstated and the quota in the medical lab program at the Northern Institute of Technology has been doubled. However, while programs have increased the number of available seats, the number of clinical training sites has not been increased to accommodate the larger number of trainees. Also, new incentives are being provided in the workplace such as full-time positions. Alberta is recruiting outside the province.

- Manitoba

  Some programs have reopened with 25 new trainees having started in September 2001. In addition, a combined program will be offered to 10 students by September 2002. The government is planning a reorganization of its laboratory system.

- Quebec

  The government has given instructions to increase the number of seats. There is more active recruitment of students.

23. Suggestions from Participants

- The National Association suggested that national certification should be instituted for laboratory assistants to enhance the quality of services and increase the protection of the public.

- There should be a greater focus on laboratory assistants. We need to redefine the respective responsibilities of assistants, technicians and technologists.

- Prescription practices need to be reconsidered to determine whether physicians are making the most appropriate use of tests and technology.

- There is a need to look at the possibility of a program to facilitate the immigration of qualified technologists such as the one that was implemented for nurses in British Columbia.

24. Conclusions, Trends, and Knowledge Gaps

Based on the information gathered for the environmental scan from a cross section of stakeholders across the country, it is apparent that there are several concurrent and sometimes conflicting forces that are influencing the medical laboratory workforce. In recent years, the supply of technologists has diminished significantly in response to the decline in employment opportunities. The anticipated rate of retirement in the baby boom technologist workforce in the next 5 to 10 years is expected to create a shortage. This situation is also affected by the age trend in the general population. As the large baby boom generation continues to age, its health care needs will grow, requiring laboratory testing to diagnose the health conditions commonly associated with aging (e.g. cancer, heart disease).

In the 1998 environmental scan, it was believed that the number of technologists graduating from the existing programs would be insufficient to replenish the workforce. In the 2001 update, this was confirmed as most provinces were experiencing serious shortages in medical laboratory technology.

Nevertheless, it is extremely difficult to accurately project the labour market needs of the future. This is partly attributable to the difficulty in anticipating the technological advances in this field. But clearly medical laboratory technology is strongly influenced by the developments of new technology and new scientific testing discoveries. The future health care or laboratory restructuring initiatives that will be undertaken in response to these developments are unknown. However, the trend of using technicians for routine or automated testing has been rooted and will continue. At least in some provinces, this can only reinforce the trend of having multi-skilled technologists who can respond more effectively to the changes that can be introduced in their role.

Another difficulty in scanning the environment of medical laboratory technology is in obtaining not only accurate projections, but also in gathering complete data on the workforce. The differences across Canada in the laboratory personnel used (e.g. aides, assistants) and the corresponding variations in the training requirements (e.g. on-the-job vs. certificate) make the analysis difficult. The incomplete databases for the technologist workforce are also a limitation.

Section D: Findings on Medical Radiation Technologists

1. The Medical Radiation Technologist

A brief description of each discipline within medical radiation technology is provided below to give a better understanding of the issues.

Radiological Technologists (or x-ray technologists) make up about 80% of the 10,500 members of the Canadian Association of Medical Radiation Technologists' (CAMRT). Their work covers a broad variety of procedures and specialties, including:

- plain film radiography – x-rays of the spine, chest, bones, joints, gastrointestinal system;
- mammography – to detect breast cancer in its earliest stages;
- angiography – to examine the heart, blood vessels and blood flow;
- fluoroscopy – real-time images that show movement;
- computerized tomography (CT scans) – detailed cross-sectional images of the body.

At a physician's request, the technologist uses equipment that emits x-rays to produce images of a body part or system. A radiologist studies the images and provides advice that helps the physician make a diagnosis and prescribe treatment. Some procedures require that barium and/or a dye (called contrast medium) be given to the client to highlight organs and structures that otherwise would not be seen.

Radiation Therapists work in hospitals or cancer clinics as members of the cancer treatment team. More than half of all cancer clients receive radiation treatments, which may be in conjunction with other forms of treatment. Radiation therapists use focussed beams of radiation to destroy tumours, while minimizing harm to healthy tissues. Alternatively, treatment may involve placing radioactive agents into the client's body. The therapist is also involved in counselling clients on possible side-effects of treatment and strategies to minimize them.

Nuclear Medicine Technologists carry out diagnostic imaging and some treatment procedures in hospitals or private clinics. They obtain images that help pinpoint the nature of a disease and how it affects the body. Nuclear medicine involves the use of radioactive drugs, called tracers, that concentrate in specific organs when introduced into the client's bloodstream. As the tracer emits radiation, a special detector (called a gamma camera) collects data. A computer processes the data and produces images of the organ from different angles. Cross-sectional images can be obtained if required. The images generally appear on a computer monitor or as a photograph or computer printout.

The main uses of nuclear medicine include:

- evaluating coronary disease;
- studying how the brain, heart, lungs, kidneys and other organs are functioning;
- determining the location of tumours or the nature of the disease;
- monitoring the progression of cancer and the results of cancer treatments;
- diagnosing of hormonal disorders.

Magnetic Resonance Technologists became a discipline in Canada following the introduction of the diagnostic medical imaging tool in the 1980s. Magnetic resonance uses magnetism, radio waves and computers to acquire images. Some magnetic resonance procedures require the use of contrast agents. The image obtained from a magnetic resonance scan generally appears on a computer monitor or as a photograph or computer printout.

Although recently developed, Magnetic Resonance Imaging is firmly rooted in medical practice, particularly for:

- studying the cardiovascular system;
- detecting tumours, especially in the brain and spinal column;
- studying body chemistry and functions;
- imaging soft tissues such as muscles, tendons or arteries.

A number of technician or assistant positions are found within diagnostic imaging services. These include x-ray assistants, diagnostic imaging assistants, technical assistants and CLXTs. References will be made to these groups throughout the report and a specific discussion about their interaction with technologists is provided in the section on "Cross-training".

The Diagnostic Medical Sonographer

Sonographers (ultrasound technologists) use non-ionizing high frequency sound waves to produce two-dimensional images of the body. The areas and structures of the body that can be examined using ultrasound include the infant head, the eyes, the neck, the chest, the heart, many of the abdominal, pelvic and reproductive organs, the developing fetus and the vascular systems. Most ultrasound examinations are non-invasive, but with the advances in technology, some procedures require the use of more invasive methods such as transvaginal, transrectal or transesophageal probes.

2. Education and Certification

Canadian programs in medical radiation technology grant either a college diploma or a university degree. Certification from the national certifying body, CAMRT is required for radiological technologists, radiation therapists, nuclear medicine technologists and magnetic resonance technologists. To be eligible to write the CAMRT certification examination, a candidate must have successfully completed an accredited education program. The candidate must also be registered with a provincial association of medical radiation technologists.

Upon certification, technologists are entitled to use the following designation:

RT – Registered Technologists through combined Radiological Technology / Radiation Therapy examinations

RTR – Registered Technologist in Radiological Technology

RTT – Registered Technologist in Radiation Therapy

RTNM – Registered Technologist in Nuclear Medicine

RTMR – Registered Technologist in Magnetic Resonance

(In Ontario, the designation used is MRT, with the specialty specified in brackets; for example: MRT [NM])

Upon further certification, technologists who become certified in other disciplines may use the applicable designation in the order they are acquired. After meeting the necessary educational requirements, technologists are entitled to use the following designations:

ACR – Advanced Certification in Radiological Technology

ACT – Advanced Certification in Radiation Therapy

ACNM – Advanced Certification in Nuclear Medicine

For sonography, there are eight Canadian programs (approximately 1 year in length) that grant a college diploma. The pre-requisite is a 2-year allied health diploma. The most common background is in radiological technology (about 65% of students) and the remainder includes nursing backgrounds, foreign medical training, etc. Sonographers can belong to the Canadian Society of Diagnostic Medical Sonographers (CSDMS). The Society has adopted as its certifying examinations, the American Registry of Diagnostic Medical Sonographers examination.

Successful candidates can use the designation in one of three specialty areas:

RDMS – Registered Diagnostic Medical Sonographers

RDCS – Registered Diagnostic Cardiac Sonographers

RVT – Registered Vascular Technologist

3. The Current Workforce

There are approximately 10,500 members of CAMRT and 1,700 members of CSDMS. The total workforce for medical radiation technologists is approximately 15,000 and for sonographers, 2,600.

Table 5 shows the current CAMRT membership by discipline and province. Membership in the CAMRT has remained relatively constant overall and across disciplines over the past several years.

Table 5
CAMRT Members by Discipline in Provinces and Territories (2000)
(Source: Canadian Association of Medical Radiation Technologists)

Province or Territories	Radiological Technology	Radiation Therapy	Nuclear Medicine	Magnetic Resonance	Total
NL	237	15	14	2	268
PE	60	3	5	2	70
NS	399	45	62	6	512
NB	398	31	42	6	477
QC	320	53	22	13	408
ON	2,974	499	477	125	4,075
MB	526	51	45	9	631
SK	369	47	30	14	460
AB	1,187	139	140	53	1,519
BC	1,352	196	186	49	1,783
NW/YT	259	42	32	6	339
Total	8,081	1,121	1,055	285	10,542

The distribution of sonographers across Canada in 2001 is as follows:

Newfoundland and Labrador	49	Manitoba	82
Prince Edward Island	4	Saskatchewan	73
Nova Scotia	97	Alberta	283
New Brunswick	71	British Columbia	362
Quebec	54	Yukon	4
Ontario	1,516	Northwest Territories	5

4. Issues Surrounding Educational Preparation

The CAMRT decided in February 1995 to require a university degree as the entry-level requirement for medical radiation technologists in Canada by 2005. This will apply only to new technologists. To date, mainly the Eastern provinces have begun the transition to the degree requirement with the support of stakeholders (e.g. professional provincial associations, colleges, ministries of education and health). Ontario also has initiatives under way. A number of other provinces have not yet agreed to support the degree requirement and some groups within these provinces are lobbying to maintain the diploma-exit option.

The 1998 report of the environmental scan contained a more complete analysis of the educational issue and the reader is referred to this document for more details. In the 2001 update, the informants felt that this matter had been given too much importance. The CAMRT representative stated that most students enrolled in medical radiation programs already have enough university credits to qualify for a university degree. In his opinion, 75% of Canadian programs would be in a position to comply with the new degree requirements by 2005. There was a consensus among informants that more important issues were the exponential growth of technology and the demand for the services related to this technology coupled with the diminishing workforce.

However, some concerns and/or suggestions were expressed in relation to the new educational requirements. Some expressed concern about the possibility of producing overskilled individuals. It was stated that many highly skilled individuals are spending too much time doing routine work and this, in turn, causes problems of retention. One person reiterated the need to obtain the right set of skills at the right level in the hierarchy of the delivery of services. Another informant suggested that several types of programs should be available such as a 2-year diploma and 4-year programs to accommodate different levels of responsibility and autonomy.

Nevertheless, what is currently not known is the future impact on the attractiveness (or lack of) of the medical radiation technology field. If the increased educational requirements bring a proportional increase in wages, this may attract competent individuals who are interested in a more challenging profession. However, if the traditional pool of candidates has been from individuals looking for a faster program, these individuals may be deterred from entering the profession.

5. Enrolment in Canadian Programs

Table 6 presents the number of graduates by province and discipline for the past 8 years. The number of graduates has remained relatively stable for the past 6 years, ranging between 505 and 666 per year and over the last 8 years, averaging 598 per year. This number represents approximately 4% of the medical radiation technologist workforce.

Table 6
Medical Radiation Technology – Number of Graduates, Provincial and Non-Provincial, by Discipline (1993-2000)
(Sources: Quebec data from the Ordre des Technologues en Radiologie du Québec; all other data from the Canadian Association of Medical Radiation Technologists)

	Year	NL	PE	NS	NB	QC	ON	MB	SK	AB	BC	NP	Total
Radiological Technology	1993	10	6	18	17	99	179	24	22	50	37	0	462
Radiation Therapy	1993	0	0	2	2	23	39	5	4	10	5	0	90
Nuclear Medicine	1993	0	0	6	2	24	31	0	0	13	16	0	92
All 3 Disciplines	1993	10	6	26	21	146	249	29	26	73	58	0	644
Radiological Technology	1994	10	0	16	17	114	163	28	17	39	42	0	446
Radiation Therapy	1994	1	0	3	4	26	56	3	6	11	9	0	119
Nuclear Medicine	1994	0	0	6	2	28	38	0	0	12	15	0	101
All 3 Disciplines	1994	11	0	25	23	168	257	31	23	62	66	0	666
Radiological Technology	1995	10	6	9	12	116	156	20	18	37	41	0	425
Radiation Therapy	1995	1	0	1	2	33	58	6	4	8	11	0	124
Nuclear Medicine	1995	1	0	10	1	46	9	1	0	10	9	0	87
All 3 Disciplines	1995	12	6	20	15	195	223	27	22	55	61	0	636
Radiological Technology	1996	14	0	9	12	111	118	20	17	32	25	0	358
Radiation Therapy	1996	0	0	4	0	35	18	4	3	6	7	0	77
Nuclear Medicine	1996	1	0	7	1	24	31	1	0	8	10	0	83
Magnetic Resonance	1996	1	0	2	0	0	32	4	2	18	9	0	68
All 4 Disciplines	1996	16	0	22	13	170	199	29	22	64	51	0	586
Radiological Technology	1997	12	0	5	9	94	137	20	13	24	27	0	341
Radiation Therapy	1997	1	0	1	3	24	44	5	4	4	6	0	92
Nuclear Medicine	1997	0	0	4	2	44	29	0	0	10	10	0	99
Magnetic Resonance	1997	1	1	1	1	0	34	3	3	7	18	0	69
All 4 Disciplines	1997	14	1	11	15	162	244	28	20	45	61	0	601

Note: The data reported represent the number of certification graduates. NP refers to non-provincial graduates.

Table 6
Medical Radiation Technology – Number of Graduates, Provincial and Non-Provincial, by Discipline (1993-2000)
continued

	Year	NL	PE	NS	NB	QC	ON	MB	SK	AB	BC	NP	Total
Radiological Technology	1998	8	6	1	8	114	171	3	7	20	38	0	376
Radiation Therapy	1998	2	0	2	1	21	30	2	4	6	5	0	78
Nuclear Medicine	1998	0	0	5	1	31	29	0	0	6	9	0	81
Magnetic Resonance	1998	0	0	3	0	0	23	3	2	8	5	0	44
All 4 Disciplines	1998	10	6	11	10	166	253	8	13	40	57	0	574
Radiological Technology	1999	12	0	3	5	70	146	19	12	25	32	3	327
Radiation Therapy	1999	1	0	2	2	16	21	2	2	4	13	7	70
Nuclear Medicine	1999	0	0	2	2	10	27	0	2	8	12	0	63
Nuclear Medicine	1999	0	0	0	0	0	24	2	2	8	9	0	45
All 4 Disciplines	1999	13	0	7	9	96	218	23	18	45	66	10	505
Radiological Technology	2000	10	0	7	15	63	120	13	1	28	43	5	305
Radiation Therapy	2000	2	0	0	0	27	3	8	2	2	9	69	122
Nuclear Medicine	2000	1	0	2	1	20	24	0	2	7	12	2	71
Magnetic Resonance	2000	0	0	1	6	0	42	1	3	15	8	1	77
All 4 Disciplines	2000	18	0	10	22	110	189	22	8	52	72	77	575

Note: The data reported represent the number of certification graduates. NP refers to non-provincial graduates.

No tables are available for sonography, but in this field, approximately 100 students graduate each year. This represents 4.4% of the sonographer workforce.

6. The Aging Workforce

Like the rest of the Canadian workforce, medical radiation technologists will be affected as the baby boom generation retires.

Figure 5 shows the age profile by province (except for Quebec: see Figure 6) for the medical radiation technologist population for 1996 and 2001.

Figure 5
National Age Profile of the CAMRT Members (1996 and 2001)
(Source: Canadian Association of Medical Radiation Technologists)

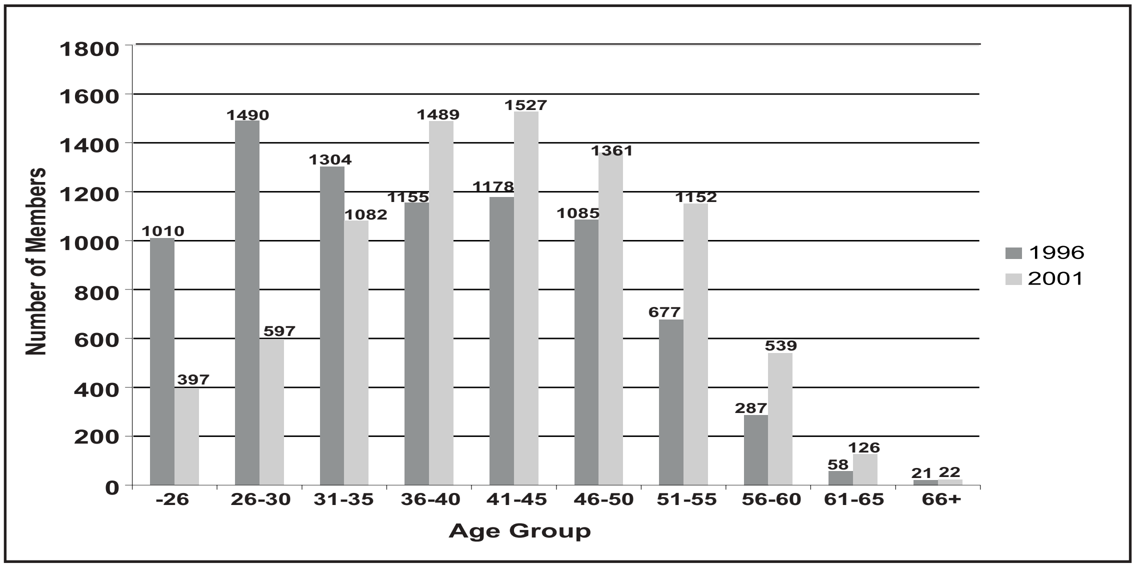


Figure 6 contains the data for the province of Quebec; it is presented separately because the age categories differed from those used in the CAMRT data. Also, Quebec data are for 1998 and 2001. Nevertheless, the age profile is relatively similar across the country.

Figure 6
Age Profile of Medical Radiation Technologists in Quebec (1998 and 2001)
(Source: Ordre des Technologues en radiologie du Québec)

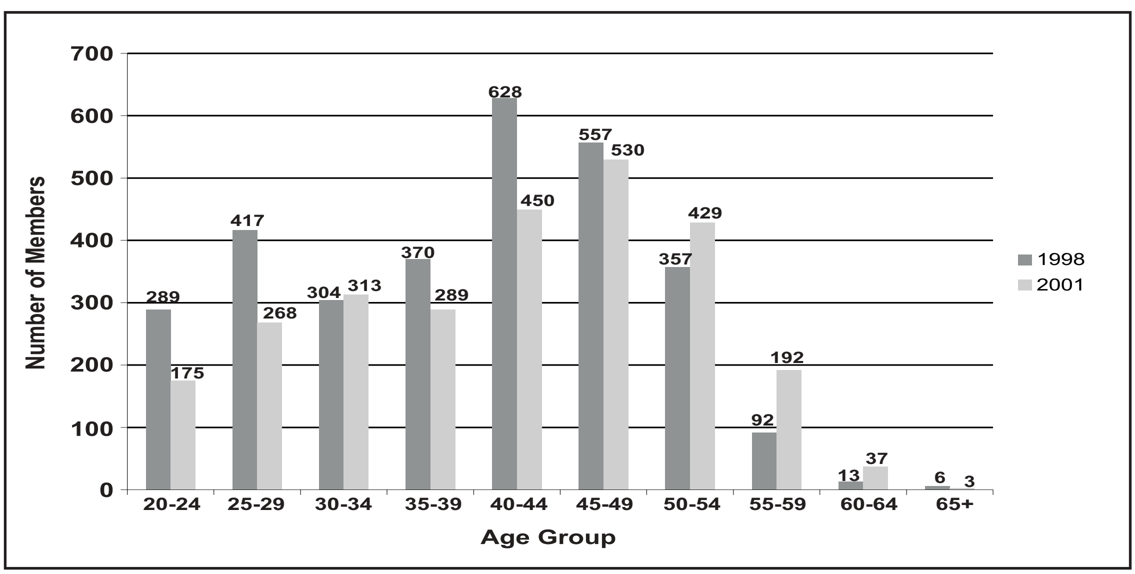


Table 7 shows the total number of Ontario technologists from 1993-1999. It is presented for information only as the numbers for Ontario shown in the CAMRT table are considerably lower than those of the College of Medical Radiation Technologists of Ontario. However, age data is not currently available from the College.

Table 7
Number of Medical Radiation Technologists in Ontario (1993-1999)
(Source: College of Medical Radiation Technologists of Ontario)

Year	Radiography	Radiation Therapy	Nuclear Medicine	Total
1993	4,594	424	525	5,543
1994	4,398	463	573	5,434
1995	4,346	473	577	5,396
1996	4,319	493	572	5,384
1997	4,198	469	593	5,260
1998	4,158	495	604	5,257
1999	4,133	526	604	5,263

Note that Magnetic Resonance Imaging is not a registered health profession in Ontario.

No age data was available for sonographers and, therefore, no analysis was conducted on the expected rate of retirement of this workforce. However, as sonography is a well-established specialty, the typical baby boom age profile is likely to be found within this group, although this was not confirmed.

Table 8 shows the estimated number of the CAMRT members that are eligible to retire in 2001, 2006 and 2011.

Assuming early retirement eligibility at 55 years of age and an average age of 22 years at initial certification, approximately 687 individuals could retire in 2001. This value is generated by summing the numbers of members with a median age of 58 or more in 2001 (i.e. 539 individuals in the 56-60 age group, 126 between 61 and 65, and 22 over 65 years of age). By 2006, an additional 1152 members may choose to retire early, (i.e. those presently in the 51-55 age group). By 2011, another 1361 individuals may elect to take early retirement. In 2001 approximately 5% of the CAMRT medical radiation technologist population was over 55 years old. With the number of graduates that have been produced historically, attrition due to retirement can be replaced.

Table 8
Estimated Number of the CAMRT Members Eligible to Retire in 2001, 2006, and 2011
(Source: Canadian Association of Medical Radiation Technologists)

Age	Number of Members in 2001	Median Age in 2001	Median Age in 2006	Median Age in 2011
-26	397	—	28	33
26-30	597	28	33	38
31-35	1082	33	38	43
36-40	1489	38	43	48
41-45	1527	43	48	53
46-50	1361	48	53	**58**
51-55	1152	53	**58**	63
56-60	539	**58**	63	65+
61-65	126	63	65+	—
66+	22	—	—	—

Assumptions: 1. Average age of 22 years at initial certification.
2. Early retirement eligibility at 55.

Boldfaced type indicates early retirement age reached in 2001, 2006, and 2011.

Performing a similar analysis on the Quebec data shows that in 1998 approximately 4% of the workforce in the province was 55 or over. However by 2001 an additional 11% would have retired early. By 2006 another 17% could be considering early retirement for a total of 32% since 1998.

If all other variables were to remain constant, a corresponding percentage of new graduates would need to join the ranks of medical radiation technologists to stabilize the population. Data on the breakdown by specialty was unavailable.

7. Technological Advances

Technological advances were cited often as greatly influencing the role of the technologist. The last two decades have seen the development of magnetic resonance imaging, the computerization of equipment, the development of remote and mobile equipment (laptop scanners), and the implementation of electronic imaging to replace film. More recent developments affecting the role of the technologists include:

- Advances in ultrasound technology have increased the uses of sonography beyond obstetrics where it had mainly a measurement purpose. Today, with improved images, it is used for varied diagnostic testing in neurology, vascular disease, ophthalmology and cardiology.

- With expanded responsibilities for sonographers and a shift to more complex tasks, diagnostic imaging sessions can be two to three times longer. As a result, fewer clients can be seen. Concurrently, there has been an increase in the number of requests for imaging sessions.

- With digital data storage and management, imaging is becoming filmless. As well, many settings have implemented or will be implementing the Client Archiving Communication System. Electronic image storing has at least two effects: the need for darkroom personnel is reduced and the imaging session can be accelerated. It is still too soon to say whether this will translate in fewer hours of work for the technologist or more clients processed by each technologist. Another impact of this new technology is the need for skills in the selection and electronic storage of images.

- Teleradiology (remote imaging) is present to some extent in many provinces. The use of teleradiology may encourage a centralization of the services of radiologists. In one New Brunswick health region for example, there are now seven imaging centres and three radiologists. Although the same technical skills are required, this calls for technologists who can function more independently.

- The increased computerization of all activities in medical radiation technology is an ongoing trend. For example, computers now perform measurements that used to be manually calculated and the technologist validates and manages the information produced by the computer. Some of the more experienced technologists accustomed to a manual approach have found this shift to be a challenge.

8. Changes in the Workplace

Health care reforms have meant shorter hospital stays and therefore, tighter deadlines for the delivery of services. Diagnostic imaging services are needed at the beginning of a hospital stay and also for discharge. Much of the circulation in and out of the hospital is regulated by the results of tests, many of which are performed by medical radiation technologists.

Morale in the workplace is reported to be low everywhere. This is evidenced by a high incidence of absenteeism and burnout. The reasons cited for the extremely low morale include:

- budget pressures do not allow for any buffers such as coffee breaks or replacements for sick staff;
- continued cutbacks;
- increased client flow;
- job insecurity, e.g. rumours of instruments replacing the technologists;
- retiring full-time employees being replaced by casual positions;
- lack of leadership;
- limited career opportunities with a flattened organization.
- At the same time, a number of factors have made the work more physically demanding:
- Clients requiring services are often sicker and need to be lifted and positioned for the imaging session.
- In sonography, a common ailment is repetitive strain injuries (RSI). Some employers are actively addressing this issue by introducing improved ergonomic positioning and adjustable tables and chairs. The sufferer of RSI would generally have to retrain to move back to the radiological technologist role (if this was their original training). Alternatively, some choose to reduce their hours of work and others simply retire earlier than planned.
- The volume of work is greater and the technologist has limited opportunity for breaks and this causes long-term physical stresses.

9. Prescription Practices

As new testing devices become more readily available, there is a trend among physicians to prescribe more elaborate testing. One of the participants in the 2001 update indicated that at least a portion of the prescribed testing may be unnecessary and that some of the information obtained may be either not essential or could be obtained by simpler, less technologically dependent means. At the same time, as medical knowledge about early signs of disease increases, governments are seeing the advantages of early detection and are allocating supplementary funds for detection and prevention programs. This again, creates a greater demand for medical laboratory technologists whose work is crucial to detection programs. One informant suggested that prescription practices needed to be reviewed to ensure the best use of the technology and the services of technologists.

10. Recruitment

The attractiveness of the health care professions in general has diminished because of negative publicity due to budgetary reductions and associated working conditions. This reduces the number of applicants in medical radiation technology programs. It is debatable whether the best candidates are still being attracted. It is felt that the information technology field is draining the pool of talented students who are attracted to its prestige and higher wages. One participant suggested that promotion efforts should capitalize on the fact that medical radiation technology uses sophisticated imaging software and on the opportunities for participating in the development of new software.

In addition, there is a shortage in of clinical placements which limits the number of students that can be accepted into a program. A number of factors could be related to this problem: some institutional departments have closed; overworked personnel may be unavailable to offer training and supervision; experienced staff who can provide the training may have retired; if some of the tasks have been transferred to the private sectors, some of the previously available training opportunities may not be available any longer.

11. Wage Parity

Wages are not standardized across Canada or even within provinces. Provinces that are close to those with higher salaries suffer from increased competition. In addition, there is fierce competition and resultant ‘raiding’ of technologists between institutions, districts or provinces. The United States also presents attractive employment options for many technologists.

12. Public and Private Sectors

Many specialties have shifted from the public sector to the private. There are many advantages drawing technologists to the private sector. It is easier to obtain equipment in the private sector; patients are less acute and, as a result, the workload is less daunting. Hospitals have lost much of their experienced staff resulting in layered levels of knowledge and experience no longer being available in these institutions.

13. Evolving Employer Needs

New Skills

To meet the challenges presented by a rapidly changing health environment, employers are looking for additional skills such as higher accountability, team-building skills and more developed critical-thinking and communication skills. Generally, medical radiation technologists need a stronger understanding of the process and principles of delivery of service. Analysis and critical decision-making are required to ensure that an accurate diagnosis can be made without having to repeat the scans.

X-rays services, for example, are moving away from film archives and the technologist must select what images to store. This requires critical-thinking skills and on-the-spot decision-making abilities. Another example is the move toward teleradiology, which means that more tasks will be delegated by the radiologists to the technologist.

Other relevant skills include client-service orientation. Clients are more informed and taking an active role in the management of their health. The medical radiation technologist needs to be able to explain to the client what is being done and why. They may need to respond to questions about procedures, which fall outside their own domain of competence, hence the need for a more comprehensive, global knowledge.

Multi-Skilling

Employers have a greater need for multi-skilled or multi-credentialled technologists. For example, when there is a restriction in the availability of certain services (e.g. MRI), other services may be requested by physicians. Also, the specialty of the clinicians requesting imaging services within an institution influences the usage of the different types of services. Employers need to continually adjust the mix of skills to meet the demands for services.

The combined X-Ray and ultrasound (i.e., sonographer) technologist exists in a number of provinces (e.g. British Columbia, Saskatchewan, Ontario, Nova Scotia, Newfoundland and Labrador). New Brunswick is looking at opportunities to use and create positions for radiological technologists cross-trained in nuclear medicine, or MRI. Newfoundland and Labrador is also examining opportunities for using more multi-skilled personnel. In this province, sonographers are required to be registered radiation technologists. In this way there is the option to work in the radiology department, if the need arises.

From an employer's perspective, multi-skilled technologists have obvious benefits (e.g. cost-effectiveness, staff flexibility and efficiencies) (Billey, 1994). From a technologist's perspective, the benefits are in job security, job satisfaction, increased marketability and security but at the cost of having to maintain expertise in more than one specialty.

Cross-Training

All provinces except Quebec and New Brunswick make use of a CLXT, mainly in rural areas where it is not feasible to have a technologist in each discipline. Often they are trained in performing electrocardiograms (EKGs) and electroencephalograms (EEGs) as well. However, many of the programs that provided cross-training are no longer available and the current pool of cross-trained personnel is fast approaching retirement age. With the increased need for ultrasound scanning, the Alberta Government is looking at adding ultrasound training to the skill set of these individuals. Newfoundland and Labrador has introduced a new program to cross-train technologists and is dealing with union concerns. However, technologists who are dedicated to a single field have issue with the ability of the cross-trained technologist to be equally proficient in the two or more separate fields. They believe that a cross-trained person will always be more proficient in one of the two fields.

Some employers have begun to see a developing trend toward dual certification across professions (e.g. nurses certified in radiological technology) especially in rural areas and in private industry.

Computer Literacy

Employers now expect more developed computer skills. In any setting, equipment is software-specific with different icons, labels, and language and, as a result, the transfer of skills is sometimes difficult. From the point of view of employers, it is important for beginning technologists have advanced computer skills. In the education system, however, the equipment may be 30 years old and it is only during their clinical training that students can gain experience with current systems.

Casual/Part-Time Work

Employers require flexibility to meet service demands, which often means evening and weekend work to reduce waiting lists. For a number of reasons, casual and part-time work is seen by employers as an effective approach to delivery of service: casual employees are less costly as they do not receive benefits; also, full-time technologists are unionized which means that employers must offer full-time work to the senior staff. As a result, a new graduate may have to wait several years to obtain permanent work and then it may only be part-time. With part-time work, the technologist may need to hold more than one job, which affects availability and loyalty to any one site.

14. A Changing Role and Scope of Practice

Due to the greater workload, technologists are less available to engage in research or to attend conferences, with a resulting decrease in new developments in the field. A few medical radiation technologists are involved in clinical trials and in the development of new techniques, although work demands limit these activities.

For radiological technology there is a growing trend in community and urban hospitals to have invasive procedures done away from the operating room. This is more cost-effective and efficient (more procedures can be scheduled more quickly). The traditional role of the medical radiation technologist is expanding to include duties, which were traditionally the responsibility of other health care professionals, e.g. nursing duties during the diagnostic session or during the radiation therapy session, monitoring of blood pressure, etc.

There are currently some international initiatives looking at expanding the role into nursing and medicine in response to the shortage of radiologists. In Canada, possible advanced or expanded roles for technologists ("radiation technologist practitioner" and "radiation therapist practitioner") are being considered. Legislative change would be approximately 4 years away (in Ontario), if these were pursued.

With the increased use of mobile services (e.g. travelling breast-screening clinics), the environment of the medical radiation technologist requires independent, autonomous individuals and more complex decision-making.

The medical radiation technologists will have an increased involvement in computer technology (e.g. storing imaging records). Some believe that the archival function may be transferred out of the responsibility of the technologist (although not for the radiation therapists) and become an information management function.

15. Professional Issues

In Ontario, the existing legislation limits the ability of the licensing body to expand the scope of practice. If any true change in scope is to occur, the legislation must first change. In the Western provinces, Alberta mentioned the Health Professions Act (Bill 45 in particular), which will establish restricted acts (i.e. specified acts that can be performed only by specified health care professionals). Regulation will occur in 2 years. Interest in the Agreement on Internal Trade was mentioned in terms of formalizing mobility criteria and having a national standard. In Quebec, changes are occurring in training programs with some upcoming reform of the legislation expected affecting professionals. In the Eastern provinces, the focus is on the degree requirement for 2005.

Finally, the provinces of Alberta, Ontario and New Brunswick are exploring the possibility of regulation for sonographers.

16. Workforce Mix

In hospitals, the middle-management level has suffered reductions and generic managers who often do not have a medical radiation technology background are now found more frequently. This creates new challenges for the technologist who must meet service quotas established by a management team that may have limited understanding of the process and the changing demands. With an older client population and more acute conditions, the diagnostic imaging session can be lengthier and more complex. This underlines a need for the establishment of measurement standards so that the human and financial resources required to meet service demands can be more realistically estimated.

There is considerable variability in the use of technicians or assistants in the medical radiation technology field. All provinces except Alberta and New Brunswick use some type of technical support such as aides, assistants or technicians. These two provinces see the need to have these health care workers to alleviate the workload of the technologist. Saskatchewan, Prince Edward Island and Newfoundland and Labrador use a CLXT. Informally, Ontario uses a radiology assistant and Manitoba, a diagnostic imaging assistant (with a health care aide certificate). Prince Edward Island and Ontario have dark room attendants who are diminishing in number because of the move away from film. In Nova Scotia, the newly created position of 'imaging attendant' includes the duties of receiving clients, looking up imaging electronic files, etc.

For the employer, the greater use of aides represents significant cost savings as they can be used most effectively for routine procedures; technologists continue to be needed for the more complex or demanding work associated with the aging population and higher acuity of clients' conditions.

However, in 2001 informants stated that there was also a shortage of aides, technicians or assistants and that the increase use of this group could not be seen as an immediate solution. A global review of the division of tasks and the skills required to deliver the services, at various steps of the service delivery process, needs to be performed for the groups involved.

17. Current Situation and Expected Future Demands

The following reports were made by the informants from the various provinces:

- British Columbia - There is still a shortage of medical radiation technologists, which is slowly becoming more acute. There is also an increase in the use of mobile technology, but there is uncertainty about its impact. The shortages are worse among sonographers.

- Alberta - Shortages have worsened exponentially. The order of magnitude of shortages is in radiotherapy, nuclear medicine, sonography and magnetic resonance.

- Saskatchewan - Shortages are acute. The Saskatchewan Institute of Applied Science and Technology (SIAST) has doubled its intake of students, i.e. taking students each year as opposed to every second year. Also, the possibility of going into MRI and sonography training directly after high school is now being offered. In the longer term, it is felt that general radiology was going to experience the worse shortages.

- Manitoba - Shortages are extremely acute. New programs have been funded, for example, for testing bone density, which make the needs greater. The most affected areas are sonography, echocardiography, radiation therapists and radiology.

- Ontario - The shortages appear to have become more acute since 1998. The province will have current data in the fall to confirm this trend. The most affected are sonography and echocardiology.

- Quebec - The shortages have become accentuated especially in imaging. Shortages are especially acute during holidays where recall lists are basically empty and casuals are unavailable. No new full-time positions are being advertised and casual lists are used to fill shortages. Some departments that expected to open have been unable to do so due to shortages. The most affected specialties are radiotherapy for oncology, MRI and echocardiology.

- Prince Edward Island - It is felt that shortages have become more acute. The province has a small program for training radiation technologists, but its impact will not be seen before 3 or 4 years. The most affected are echocardiology, general technologists, ultrasound and radiation therapists.

- Nova Scotia - Shortages are acute. It is felt that during the transition years to a degree program (2001 to 2003), the only ones who will graduate are those who have opted for the certificate-type diploma. This represents about 30% of the population. Another relevant factor is that while nurses have obtained a raise in their salaries, technologists are lagging behind and as a result, the gap between technologists and other health professions is widening, thus further decreasing the attractiveness of the profession. In Nova Scotia, radiation therapy is experiencing particularly serious shortages.

- CAMRT - Shortages are worse and will continue to become more acute. The federal government has recently allocated $1.6 billion for the purchase of new equipment. It is anticipated that at least 1,500 new technologists will be required to handle the new equipment. Shortages of technologists will become accentuated due to the fact that policies for maternity and paternity are now more generous. As many technologists are of childbearing age, many of them will be taking advantage of the benefits, thus increasing the shortage. Also mentioned was the increased competition between countries and provinces for scarce technology personnel. Incentives and bonuses are now being offered by hospitals but these seem to be having little impact. According to the CAMRT statistics, the worse shortages are in the following areas: radiation therapy, mammography, MRI and nuclear medicine.

In all cases, it was felt that shortages were more acute than in 1998. Overall, sonographers and radiotherapists are mentioned most often as suffering the worse shortages.

18. Initiatives Undertaken to Reduce Shortages

The following initiatives were undertaken in the provinces that participated in the consultation:

- British Columbia – The British Columbia Institute of Technology has developed a fast-track program and new machines have been acquired to train students. This should relieve the shortage, but not eliminate it.

- Alberta - The province has decided not to opt for the degree program and will continue with its 2-year diploma programs.

- Saskatchewan – The SIAST has doubled its intake of students and is now offering the possibility of going into MRI and sonography training directly after high school.

- Manitoba - The province has started a restructuring process and is looking at the imaging responsibility in a broader way.

- Quebec - Efforts toward foreign recruitment have been made. There is also a fast-track program and 40 to 50 students are expected to graduate by 2004.

- Nova Scotia - The government has given the responsibility of addressing shortages to regional health districts.

- Prince Edward Island - A small program for radiation technologists is now being offered, however they will only graduate in 3 to 4 years.

19. Suggestions from the Participants

- Prescription practices should be reviewed to ensure that physicians are using the technology in the most efficient manner. One may question whether the information obtained is always necessary and whether it could not be obtained with simpler and less costly ways.

- There should be a global review of multi-skilling, cross-training and the distribution of work. What is appropriate cross-training? What constitutes routine work? How much of routine work is skilled or unskilled? Multi-skilling could be useful in certain areas but not in others.

- Different types of programs should be allowed to coexist: diploma-type programs and degree programs. Both types have their usefulness.

- We need to think of new models of service delivery that are not necessarily based on the present division of work. We should look at the hierarchy of skills and look at the other components of the imaging departments.

- We need to develop a long-term approach to training and workload so as to reduce burnout and improve retention.

20. Conclusions, Trends, and Knowledge Gaps

A number of factors were identified that will have an impact on the future of medical radiation technologists and sonographers. Like the field of medical laboratory technology, technological advances can have a direct influence on the future. However, in this case, the trend is toward the increased use of technology for diagnosis and treatment. As with the medical laboratory technologist, there is an impact associated with the aging Canadian baby boom population. This growing proportion of older Canadians will be accessing more diagnostic tests and cancer treatments that are commonly associated with the elderly.

The workforce is aging and in all specialties, there is concern about the ability to replace the retiring technologists in the coming 5 to 10 years. In the case of MRI, sonography, and radiation therapy, there is already a supply shortage and the impact of the retiring baby boom workforce can only aggravate the situation.

In the 2001 update, shortages were being felt in all specialties, but especially among sonographers and radiation therapists.

Finally, a limitation that is associated with this scan is the incomplete data that is available on the entire workforce. Added to this are the difficulties inherent in projecting labour needs of the future especially in the health care environment, which is continually evolving in response to the health care needs of the population and the developments in health sciences and associated technologies.

Section E: Overall Conclusions

In the 1998 Environmental Scan, several recommendations were made to facilitate national concerted action to address shortages and human resource issues. In particular, it was suggested that a national database of human resources and service demands be established to permit more precise prediction of future needs. It also suggested that further discussion and study at the national level be undertaken regarding the numerous issues identified in the environmental scan. The reader is referred to the 1998 report for the complete list of recommendations.

One of the goals of the 2001 update of the scan was to gather additional information on the various specialties within the medical laboratory technology and the medical radiation technology groups. The intention was to identify the specialties that were most seriously affected and to address shortages. However, the information gathered in this update has shown that there is much variability across Canada as to the specialties that are most affected. Furthermore, it has become apparent, for both groups, that a global review of skills and division of tasks in relation to a comprehensive model of service delivery may be necessary for both groups, a review which could not be achieved with an analysis by sub-specialty.

Many of the issues identified are common to both groups of technologists and, as a result, similar conclusions are drawn for the two groups. For this reason, it is felt that the human resource shortage should be addressed jointly for the two groups and that common strategies should be developed. This is particularly relevant in the context of crossovers from one discipline to another and the need for greater employment flexibility in the new medical environment.

It has become apparent that individual provincial initiatives may be insufficient to address this problem and that concerted national action will be required. Furthermore, short- and long-term strategies need to be identified. It is recommended that the next phase of this project involve the developing and exploring of a number of short- and long-term strategies to address shortages and to implement a plan of action.

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Appendix A

Informants for Medical Laboratory Technologists

Province	Informant	Affiliation and Position
British Columbia	Lee Frost	BC Ministry of Health (position to be confirmed)
Alberta	Val Billey	Northern Alberta Institute of Technology (position to be confirmed)
Saskatchewan	Doug Calder Corinne Benedict	Regina Health Authority Vice-President of Operations
Manitoba	John Wirtanen	Winnipeg Regional Health Authority Technical Director
Ontario	Martha Bennett	The Michener Institute Division Director, Laboratory and Radiation Sciences
Quebec	Alain Colette	Ordre professionnel des technologistes médicaux du Québec Executive Director
Prince Edward Island	David Schneider	Regional Health Authority Director, Laboratory Medicine
National Association	Kurt Davis	Canadian Society for Medical Laboratory Science Executive Director

Informants for Medical Radiation Technologists

Province	Informant	Affiliation and Position
British Columbia	Lee Frost	BC Ministry of Health (position to be confirmed)
Alberta	Glen Heggie	Capital Health Authority Coordinator for Clinical Positions
Saskatchewan	Doug Calder Lorena Cabral	Regina Health Authority Vice-President of Operations
Manitoba	Ron van Dennaker	Winnipeg Regional Health Authority Technical Director, Diagnostic Imaging
Ontario	Ricki Gruschcow	Ontario Hospital Association Director of Hospital Human Resources, Policy and Research
Quebec	Alain Cromp	Ordre des Technologues du Québec Executive Director
Prince Edward Island	Calvin Joudrie	Regional Health Authority Manager, Radiation Services
Nova Scotia	Jim Clark	Queen Elizabeth Health Centre Senior Director, Diagnostic Imaging
National Association	Richard Lauzon	Canadian Association of Medical Radiation Technologists Executive Director

Table B-1
CAMRT Age Profile by Province (2001)
(Source: Canadian Association of Medical Radiation Technologists)

Province	-26	%	26-30	%	31-35	%	36-40	%	41-45	%	46-50	%	51-55	%	56-60	%	61-56	%	66+	%	Total
NL	14	6	24	10	29	12	40	16	49	20	41	17	38	16	8	3	0	0	0	0	243
PE	2	4	4	7	5	9	12	21	12	21	6	11	10	18	3	5	1	2	1	2	56
NS	9	2	13	3	73	17	83	19	96	22	56	13	66	15	30	7	8	2	1	<1	435
NB	32	8	47	12	63	16	70	18	55	14	47	12	50	13	25	6	1	<1	0	0	390
QC	15	4	45	12	57	16	56	15	59	16	67	18	42	11	22	6	3	1	0	0	366
ON	171	5	249	8	405	12	581	18	602	19	556	17	436	13	200	6	41	1	10	<1	3251
MB	12	2	18	4	53	10	107	21	99	19	80	16	94	18	36	7	6	1	6	1	511
SK	16	5	19	6	52	15	71	21	41	12	58	17	45	13	28	8	11	3	2	<1	343
AB	60	5	76	6	153	12	203	16	247	20	232	19	168	14	72	6	30	2	1	<1	1242
BC	66	5	102	7	192	13	266	18	267	18	218	15	203	14	115	8	25	2	1	<1	1455
Total	397		597		1082		1489		1527		1361		1152		539		126		22		8292
Average		5		7		13		18		18		15		15		6		1		<1	

Note: The data presented has been adjusted for unknowns and members in territories and does not include out-of-country members.

Table B-2
Age Profile of Medical Radiation Technologists in Quebec (1998 and 2001)
(Source: Ordre des Technologues en radiologie du Québec)

Year	20-24	%	25-29	%	30-24	%	35-39	%	40-44	%	45-49	%	50-54	%	55-59	%	60-64	%	66+	%	Total
1998	289	9	417	13	403	13	470	15	628	19	557	17	357	11	92	3	13	>1	6	>1	3,232
2001	175	7	268	10	313	12	289	11	450	17	530	20	429	16	192	7	37	1	3	>1	2,686