



Context

Positron emission tomography (PET) is a nuclear diagnostic imaging tool. PET scanners require a cyclotron or a positron emitter generator to manufacture the isotopes that are used in PET scans. PET represents a nuclear imaging alternative to single photon emission computed tomography (SPECT). Both technologies operate on the same basic design principles by providing images of the structure and function of tissue and organs that reflect biochemical and metabolic processes, blood flow, or receptors distribution.

The recent shortages of technetium-99m (^{99m}Tc), the medical isotope used in SPECT scans, mobilized the medical community to look for alternative imaging techniques. In 2009, the Government of Canada appointed an independent Expert Review Panel on Medical Isotope Production to assess more reliable ways of supplying isotopes. Amongst its recommendations, the Panel suggested that the government invest in PET to reduce demand for ^{99m}Tc over the short and long term.¹ The government responded by confirming its support to the continued diversification of advanced medical imaging technologies, including PET.²

PET availability in Canada is mostly limited to facilities in large urban centres.³ While the necessary infrastructure is not yet sufficient for PET to replace the work of SPECT, PET is one of the most rapidly expanding imaging technologies in Canada. The number of PET scanners has increased by 121% from 2003 to 2007.⁴

Objectives

The purpose of this report is to provide information regarding the extent of PET usage across Canada. The following questions will be specifically addressed:

1. What is the number of publicly and privately funded PET scanning services in each Canadian jurisdiction?
2. What is the number of annual PET scans funded by each jurisdiction?
3. What are the publicly approved indications for PET in each jurisdiction?

Findings

The findings of this environmental scan are not intended to provide a comprehensive review of the topic. The results of this report are based on a limited literature search and communications with key informants. This report is based on information gathered as of November 30, 2010.

This environmental scan uses the term PET to refer to all PET modalities, including PET/Computed Tomography(CT), unless specifically indicated.

Publicly funded PET scanners and number of annual scans

There are approximately 31 centres performing publicly funded PET scans in seven Canadian provinces. The provinces are: British Columbia, Alberta, Manitoba, Ontario, Quebec, New Brunswick, and Nova Scotia. Table 1 provides additional information on the location of PET scanning facilities.

British Columbia has a single publicly funded PET scanner located in Vancouver, with a second PET scanner expected to be

operational in the spring of 2011. It is estimated that for the period January 1, 2010 to December 31, 2010, approximately 3,100 PET scans will be publicly funded in British Columbia and performed at the BC Cancer Agency. The second PET scanner will perform an additional 3,100 PET scans, bringing the total annual capacity to 6,200 publicly funded scans.

Alberta has three publicly funded PET scanning facilities that are used for clinical purposes: two in Edmonton and one in Calgary. There is also a PET scanner in Edmonton that is used exclusively for research purposes. During the period 2009 to 2010, approximately 4,900 clinical PET scans were performed in Alberta. PET has been publicly funded for clinical use since 2005.

Manitoba has one PET scanning facility located in Winnipeg. For the period 2010 to 2011, up to 2,000 PET scans will be publicly funded in the Winnipeg Regional Health Authority. Manitoba's first cyclotron was installed in November 2010 and is expected to double capacity to provide PET scanning services.⁵ PET became operational in Manitoba in 2005.

There are currently 11 PET scanning facilities in Ontario, with 12 publicly funded PET scanners: six in Toronto, two in Hamilton, one in London, two in Ottawa, and one in Thunder Bay. As of October 2009, PET scans became an insured physician service in Ontario. Ontario currently provides funding for approximately 6,000 insured PET scans per year. Uninsured PET scans are also available through PET registries, clinical trials, and the PET Access Program.

There are currently 14 publicly funded PET scanning facilities in Quebec, with 16 PET scanners. There are eight in Montreal, two in Sherbrooke (publicly and research funded), and one each in the following cities: Quebec City, Trois-Rivières, Rimouski, Chicoutimi, Laval, and Gatineau. For the period 2010 to 2011, approximately

22,400 PET scans will be publicly funded in Quebec. Quebec first started publicly funding PET scans in 2003.

New Brunswick currently has a PET scanner located in Saint John. Another PET scanner is scheduled to be in operation by the summer of 2011, in the city of Moncton. For the period 2010 to 2011, New Brunswick will fund approximately 600 PET scans. The number of PET scans is expected to double when the second PET scanner becomes operational.

Nova Scotia currently has a PET scanner located in Halifax. The province funds approximately 1,500 PET scans annually. Nova Scotia first started publicly funding PET scans in 2008.⁶

The province of Newfoundland and Labrador is anticipating its first PET scanner and cyclotron in 2012 or 2013. For the period 2010 to 2011, Newfoundland and Labrador will fund approximately 104 out-of-province PET scans.

Prince Edward Island, Saskatchewan, and the three northern territories do not currently have plans to introduce PET scanners. Residents from these jurisdictions travel out of the province for PET scans. Prince Edward Island funds approximately 60 to 70 scans per year since the Nova Scotia facility opened in 2008. During the period of 2009 to 2010, Saskatchewan funded approximately 327 out-of-province PET scans.

Table 1: Location of Publicly Funded PET Scanners and Cyclotrons in Canada (2010)					
Province	Hospital or Centre	City	Type (Number of Scanners)	Number of PET Cyclotrons	Additional Information
British Columbia	BC Cancer Agency	Vancouver	PET/CT (1) 2 nd PET/CT anticipated	1	On-site BC Cancer Agency cyclotron operational in September 2010 for clinical and research use. Addition of second PET/CT scanner in early spring 2011.
				1	TRIUMF cyclotron operates principally for research.
Alberta	Cross Cancer Institute	Edmonton	PET (1 used for research only) PET/CT (1)	1	
	University of Alberta Hospital	Edmonton	PET/CT (1)		
	Foothills Hospital	Calgary	PET/CT (1)		
Manitoba	Health Sciences Centre	Winnipeg	PET/CT (1)	1	
Ontario	Hamilton Health Sciences	Hamilton	PET (1)	1	
	St. Joseph's Healthcare Hamilton	Hamilton	PET/CT (1)		
	The Ottawa Hospital	Ottawa	PET/CT (1)		
	University of Ottawa Heart Institute	Ottawa	PET/CT (1)	1	
	Centre for Addiction and Mental Health	Toronto	PET (1) PET/CT (1) (both scanners used for brain research only)		
	Princess Margaret Hospital	Toronto	PET/CT (2) (1 used for research only)		

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Province	Hospital or Centre	City	Type (Number of Scanners)	Number of PET Cyclotrons	Additional Information
	Sunnybrook Health Sciences Centre	Toronto	PET/CT (1)		
	St. Joseph's Health Care	London	PET/CT (1)	1	New on-site cyclotron is installed but is not currently producing PET isotopes for human use.
	Hospital for Sick Children	Toronto	PET/CT (1)		
	Thunder Bay Regional Health Sciences Centre	Thunder Bay	PET/CT (1)	1 (anticipated)	
Quebec	McGill University Health Centre (Montreal General Hospital)	Montreal	PET/CT (1)		
	Montreal Neurological Institute and Hospital	Montreal	PET (2)	1	Used for research purposes.
	Hôpital Notre Dame	Montreal	PET/CT (1)		Used for research purposes.
	Hôtel-Dieu de Montréal (Centre hospitalier de l'Université de Montréal)	Montreal	PET/CT (1)		
	Jewish General Hospital	Montreal	PET/CT (1)		
	Hôpital Maisonneuve-Rosemont	Montreal	PET/CT (1)		
	CHU Sainte-Justine Hospital	Montreal	PET/CT (1)		
	L'Hôtel-Dieu de Québec (Centre hospitalier universitaire de Québec)	Quebec City	PET/CT (1)		
	Université de Sherbrooke Hospital	Sherbrooke	PET/CT (2)	1 Second cyclotron anticipated in 2011	Current cyclotron operates principally for research and commercial ¹⁸ F production.
	Hôpital Laval	Laval	PET/CT (1)		

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Province	Hospital or Centre	City	Type (Number of Scanners)	Number of PET Cyclotrons	Additional Information
	Centre hospitalier régional de Trois-Rivières	Trois-Rivières	PET/CT (1)		
	Centre de santé et de services sociaux de Rimouski-Neigette	Rimouski	PET/CT (1)		
	Centre de santé et de services sociaux de Chicoutimi	Chicoutimi	PET/CT (1)		
	Centre de santé et de services sociaux de Gatineau	Gatineau	PET/CT (1)		
New Brunswick	Saint John Regional Hospital	Saint John	PET/CT (1) 2 nd PET/CT anticipated		Another PET/CT scanner anticipated to be operating at the Dr. Georges-L. Dumont Regional Hospital in Moncton summer 2011.
Newfoundland and Labrador	Bliss Murphy Cancer Centre, Health Sciences Centre	St John's	PET/CT (1) anticipated	1 (anticipated)	PET/CT and cyclotron expected to be operational by 2012 or 2013.
Nova Scotia	Queen Elizabeth II Health Sciences Centre	Halifax	PET/CT (1)	1	

CT = computed tomography; 18-F = florpiramine; PET = positron emission tomography; TRIUMF = Canada's National Laboratory for Particle and Nuclear Physics.

Privately funded PET scanners

There are currently four sites offering private PET scans in Canada. Two of these are located in the province of Quebec (Montreal and Quebec City). Ontario has one fee-based PET scanning facility based in Mississauga. British Columbia has a PET scanning facility in Burnaby.

esophageal, breast, colorectal, and thyroid cancers. PET is used less widely for cardiology and neurology disorders. Table 2 provides additional information on the publicly funded clinical indications for PET scanning in each jurisdiction.

Publicly funded applications of PET scanners

The main application of PET scanning is in oncology, where it is used for the diagnosis, staging and/or detection of recurrent disease. Across Canada, the most popular uses of PET in oncology are for lung,

Table 2: Publicly Funded Uses of PET Scans											
Indication	BC	AB	SK	MB	ON	QC	NB	NL	PE	NS	
Cancer											
Solitary pulmonary nodule		•			•	•		•	•	•	
Lung	Non-small cell	•	Evaluated for approval by the Ministry's Medical Consultants on a case by case basis	•	Non-small cell Limited disease small cell	•	•	•	Requests from oncologists	•	
Head and neck	•			•		•	•	•		•	
Esophageal		•		•		•	•	•			•
Breast cancer		•		•		•	•	•			•
Germ cell tumours		•			•	*					
Colorectal	•	•		•	•	•	•	•			•
Lymphoma				•	•	•	•	•			•
Melanoma		•		•		•	•	•			•
Myeloma				•		*					
Thyroid		•		•	•	*	•	•			•
Testicular	•			•		•	•				
Gynecologic	•	•		•		•	•				
Occult				•		*					
Sarcoma	Pediatric only	•		•		•					
Brain	Pediatric only	•		•			•				
Neuroblastoma	Pediatric only						*				
Pancreatic						•	•				
Neuroendocrine							*	•			
Musculoskeletal							**	•			
Gall bladder				•			*				
Gastric			•			*					
Kidney						•					
Other	Case by case		•					Case by case	Case by case		
Cardiology											
Myocardial viability assessment					•	•					
Myocardial perfusion assesment						•					

Table 2: Publicly Funded Uses of PET Scans									
Neurology									
Refractory seizure		•		•		•			
Radionecrosis						•			
Dementia				•		•			
Other				•					
Other									
Lymphadenopathy								•	

AB = Alberta; BC = British Columbia; MB = Manitoba; NB = New Brunswick; NL = Newfoundland and Labrador; NS = Nova Scotia; ON = Ontario; PE = Prince Edward Island; QC = Quebec; SK = Saskatchewan.

* Performed when specific conditions are met (when other imaging modalities failed to characterize a lesion, to exclude unsuspected metastatic disease, or when clinical information is required).

** Funded in Quebec during isotope shortage.

Conclusion

There are approximately 31 centres performing publicly funded PET scans in seven Canadian provinces. There are four centres performing privately funded PET scans in Canada, two of which are in the province of Quebec and one each in Ontario and British Columbia.

There were approximately 40,000 publicly funded PET scans performed in Canada during the period 2009 to 2010. This represents a 19% increase from the previous year. This increase may partially be a result of the reduced use of SPECT during the 2009 isotope crisis, but may also be due to the more widespread adoption of PET scanning technology generally.

The most popular application of PET across Canada is for oncology, although it is also being used for cardiac and neurological imaging. In late 2011, an updated PET scan report will be produced by CADTH that will include PET scanners and cyclotrons that are used for research purposes.

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