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Canadian Medical Imaging Inventory Service Report

PET-CT Exam Volumes: Comparison of Canada With Other Countries

Context

The increase in the adoption and use of PET-CT is attributed to its precision and ability to help save health care costs, particularly in the field of oncology.[1,2,3,4] This increase is evident in Canada, where a rise of 43% in PET-CT units was observed between 2010 and 2019-2020, and its use (based on per capita values in 2020 and projected population growth), is anticipated to expand by 16% over the next 20 years.[3,4]

While approved indications for PET-CT differ across publicly funded health care systems around the world, at least 80% of coverage across countries is for oncological indications,[3] while the remaining 20% is used for cardiac-, neurological-, and infection-related exams.[4] A previous report comparing PET-CT coverage between health systems in Australia, Scotland, the UK (England, Northern Ireland, and Wales), and Canada noted substantial similarities in publicly funded oncology indications.[4] It also found Australia to have the most restrictive PET-CT coverage.[4] Unlike Scotland, the UK, and Canada, apart from seizures, non-oncological indications are not publicly funded in Australia.[4] Canada, on the other hand, had the broadest coverage for all non-oncological indications, including cardiology, neurology, and infectious diseases.[4]

The annual volume of PET-CT exams varies across countries for reasons that are not related to population size. This may be an indicator that processes and resources may not be in place for clinicians to refer patients for PET-CT exams that could be of benefit to them.[5] The identification of different aspects of PET-CT service provisions that influence exam volumes may help improve health care efficiencies and patient-related outcomes.

Objective

This report summarizes information on the volume of publicly funded PET-CT exams performed in Australia, Scotland, England, and Canada, and considers factors beyond reimbursement that may influence these volumes. This report's key objectives are to determine the annual volume of PET-CT exams per 1,000 population for each country, and to identify other factors that may influence exam volume capacity beyond population.

This document builds upon work published by CADTH in April 2021, Publicly Funded PET-CT Indications: Comparison of Canada With Other Countries, which summarized information on the different types of publicly funded indications for PET-CT in Australia, Scotland, the UK (specifically, England, Northern Ireland, and Wales), and Canada.

Results

Exam Volumes

Data on exam volumes was collected for Australia, the UK (data were only available for England), and Canada for the period 2019-2020.[3,6,7] The most recent data available for Scotland was from 2015 to 2016.[8]

England performed the highest number of PET-CT exams in a 12-month period, at 199,585 exams,[9] followed by Canada at 125,775 exams,[3] Australia at 118,909 exams,[7] and Scotland at 6,725 exams.[8] Relative to population, Australia conducted the greatest number of PET-CT scans at 4.6 per 1,000 people, while England and Canada performed a comparable number of exams at 3.5 and 3.3 scans per 1,000 people respectively, and Scotland conducted 1.2 scans per 1,000 people.

Compared with the other countries, Australia conducted the greatest number of PET-CT scans per population, even though it has the most restrictive reimbursement coverage.[4,10] Oncological indications comprise the majority of publicly funded PET-CT for all countries, and almost exclusively in Australia (apart from seizures).[4]

Data for England was extracted from a study that focused on quantifying the impact of COVID-19 on fluorodeoxyglucose PET-CT exams during the first wave of the pandemic in 2020. A 30% decrease in fluorodeoxyglucose PET activity in England was observed during April and May of 2020.[6] Public health measures introduced in England to curb this wave of the pandemic may have impacted the number of individuals seeking health services that could increase their risk of contracting COVID-19, including diagnostic imaging.[6]

Table 1 provides more detailed information on the PET-CT exam volumes of each country. Information in the table was limited to data that were reported by organizations in each respective country. Coverage of specific cancers within the broad categories of oncological indications reported in the table may vary. The CADTH report Publicly Funded PET-CT Indications: Comparison of Canada With Other Countries provides details on the coverage for PET-CT indications in Australia, Scotland, the UK (England, Northern Ireland, and Wales), and Canada.

Table 1: Summary of the Publicly Funded Indications and Annual Exam Volumes for PET-CT in Australia, Scotland, England, and Canada

Number of Exams and Units Per Population	Australia (July 2019 to June 2020)[11]	Canada (April 2019 to March 2020)[3]	Scotland (April 2015 to March 2016)[8]	England (April 2019 to March 2020)[6]
Total number of scans	118,909	125,775	6,725	199,5859
Exams per 1,000 population	4.6	3.3	1.2	3.5
Number of PET-CT and PET scanners	92[12]	57	4	71[13]
PET-CT and PET units per 1,000,000 population	3.6	1.5	0.7	1.3
Population	25,693,059[10]	38,000,056[14]	5,404,700[15]	56,550,000[16]

Number of Exams and Units Per Population	Australia (July 2019 to June 2020)[11]	Canada (April 2019 to March 2020)[3]	Scotland (April 2015 to March 2016)[8]	England (April 2019 to March 2020)[6]
Number of oncology exams				
Lymphoma	NR	NR	854	6,850
Multiple myeloma	NR	NR	8[a]	NR
Brain tumour	NR	NR	2[a]	NR
Head and neck	NR	NR	380	2,452
Lung	NR	NR	2,982	9,399
Pleural malignancy	NR	NR	10[a]	NR
Thymic	NR	NR	3[a]	NR
Colorectal	NR	NR	666	NR
Esophageal[b]	NR	NR	523	1,367
Gastrointestinal stromal	NR	NR	38[a]	NR
Gynaecological[b]	NR	NR	286	NR
Hepato-pancreato-biliary[b]	NR	NR	37	NR
Neuroendocrine[b]	NR	NR	14	NR
Thyroid	NR	NR	14	NR
Breast	NR	NR	48	NR
Penile and anal[b]	NR	NR	41	NR
Testicular	NR	NR	24[a]	NR
Melanoma	NR	NR	152	1,465
Musculoskeletal	NR	NR	17[a]	NR
Unknown primary or occult	NR	NR	119[a]	NR
Paraneoplastic neurological syndromes	NR	NR	79[a]	NR
Number of cardiology exams				
Myocardial viability	NR	NR	0[a]	NR
Myocardial perfusion	NR	NR	0[a]	NR
Sarcoidosis	NR	NR	46[a]	NR
Vasculitis	NR	NR	157	NR

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Number of Exams and Units Per Population	Australia (July 2019 to June 2020)[11]	Canada (April 2019 to March 2020)[3]	Scotland (April 2015 to March 2016)[8]	England (April 2019 to March 2020)[6]
Number of infectious and inflammatory disease exams				
General	NR	NR	39[a]	NR
Number of other exams				
Pyrexia	NR	NR	47[a]	NR
Neurology[b]	NR	NR	24	NR

NR = not reported.

Note: Grey cells are publicly funded indications.

[a] = Publicly funded only in exceptional cases.

[b] = Coverage for specific diseases within the broad category of the indication may vary.

Potential Factors That Influence Exam Volumes

Given that the majority of exams are performed for oncological purposes for which there is significant overlap in coverage,[3,4] the differences in exam volumes per population between countries suggests that annual exam numbers are influenced by factors other than publicly funded reimbursement policies and population-related pressures. Some of the potential factors that may influence exam volumes are discussed briefly in the following sections.

Subindication Reimbursement

Because Australia has the highest number of exams per 1,000 population, it may be that oncological exams for approved indications are performed more frequently compared to other countries for clinical scenarios beyond the initial diagnosis, such as for grading, staging, therapeutic guidance, monitoring response to treatment, restaging, or follow-up.[17] This level of detail cannot be assessed in this report due to the variation in reporting standards across countries.[4]

Evidence suggests that PET-CT may be more effective in certain subindications than in others.[18] For instance, PET-CT is reported to be ineffective in diagnosing early-stage breast cancer, for which mammography, ultrasound, and MRI are the main imaging tools,[18] but has been observed to add value when used in conjunction with standard breast cancer imaging techniques in the detection of distant metastases.[18]

There may be a lack of clarity around which imaging modality should be used for subindications, potentially resulting in greater use with some modalities, depending on the setting, patient characteristics, available imaging modalities, and wait times.[17,19] For example, for non–small cell lung cancer, CT, MRI, and PET-CT are all considered good tests for diagnosing malignancy,[20] but it is still unknown which modality provides the better diagnostic accuracy and efficacy, as well as when the optimal time to introduce exams with each of these modalities is.[20]

Clinical Guidance

Sources of evidence-based guidance are not always in agreement[17] and these differences may contribute to variations in the number and type of examinations that are performed within and between countries.[5] A systematic review of evidence-based indications noted that for 8 cancer indications (anal canal cancer, brain cancer, testicular cancer, renal cancer, penile carcinoma, esophagus cancer [except restaging], and pancreatic carcinoma, and bone and soft-tissue tumours), there is contradictory and equivocal recommendations for PET-CT use from different evidence-based sources.[17]

Unit Capacity

Countries with larger inventories of PET-CT scanners may perform increased exam volumes because they are less likely to be limited by long wait lists, allowing for a greater annual throughput of patients. Australia has the highest volume of PET-CT scanners per 1,000,000 population at 3.6, followed by Canada at 1.5, England at 1.3, and Scotland at 0.7.

Regulatory Requirements

Regulatory requirements and funding infrastructures may also influence physician referral preferences for certain imaging modalities. For example, in Australia, MRI is the only imaging modality that operates under a licensing system. This licensing system can limit patient access to MRI because, unlike other imaging modalities, not all types of MRI exams are publicly reimbursed.[21] Limited access to MRI may result in increased referrals for other imaging modalities, such as PET-CT.[9] This may occur more frequently in instances where it is unclear which modality provides the better diagnostic accuracy and efficacy.[9]

Workforce

The availability of trained personnel to conduct, read, and interpret imaging exams may not be sufficient across all countries. This is a noted concern in Canada,[22] the UK,[23,24] and Scotland,[25] specifically for nuclear medicine staff.

Access to PET-CTs

Because PET-CT is concentrated in densely populated urban centres, travel burden may be a barrier, particularly for patients who are too sick to travel, have mobility limitations, or are unwilling or unable to travel long distances.[26] Populations in rural and remote communities incur out-of-pocket travel expenses when travelling to urban centres for imaging.[27] Costs are also incurred by patients and their caregivers through work absenteeism and other incidentals, and may present a disincentive to seeking a diagnosis.[21]

Radiopharmaceutical Supply

Disruptions in the supply of radiopharmaceuticals, particularly if a PET-CT site depends on a single supplier, can increase the risk of service interruption and result in the cancellation of exams.[28]

Conclusion

Relative to population, Canada and England are comparable in terms of the number of PET-CT exams performed, in addition to having around the same number of units per 1,000,000 population. Nonetheless, England's exam volume data are unique in that the country specifically covers part of the pandemic period when exam numbers were known to have declined. Data on examinations conducted by clinical indication were not available, except from Scotland and England.

While Australia has the most restrictive publicly funded PET-CT coverage, when accounting for population differences, it conducts the highest number of scans compared to England, Scotland, and Canada. Potential factors that may contribute to exam volume beyond population size include shorter wait lists, limited access to other imaging modalities, greater unit capacity, staffing, a more secure radiopharmaceutical supply, and differences in evidence-based guidance. However, without detailed data available, these factors remain assumptions because it is not possible to identify clear associations and draw robust conclusions. It is noted that differences in exam volumes may also be attributed to variations in how exams are counted from country to country.

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ABOUT CADTH

CADTH is an independent, not-for-profit organization responsible for providing Canada's health care decision-makers with objective evidence to help make informed decisions about the optimal use of drugs and medical devices in our health care system.

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