CANCER SYSTEM INDICATOR SNAPSHOTS

Use of PET in the management of non-small-cell lung cancer in Canada

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INTRODUCTION

Positron-emission tomography (PET) has emerged as an effective imaging method for diagnosing, staging, and treating lung cancer[1]. Studies show that information derived from PET has led to a change in the intended treatment plan in 36%–50% of cases[2].

At December 2011, approximately 31 centres were operating publicly funded PET scanners in 8 Canadian provinces (British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, and Nova Scotia)[3]. Historically, the number of PET scanners per million population has been reported to an indicator of diagnostic technology capacity in cancer care[2,4]. Although that number is an acceptable indicator for the availability of PET scanners in Canada, it provides no evidence about the actual utilization of the technology.

The goal of the present study was to describe the use of publicly funded PET in the diagnosis and staging of patients with non-small-cell lung cancer (NSCLC) in provinces with active publicly funded PET scanners. Analyzing utilization patterns can help to inform opportunities for increasing the evidence-based use of PET, while lowering use outside the evidence base; for developing meaningful PET utilization indicators; and for standardizing the manner in which PET technology is used to diagnose, stage, and manage the treatment of NSCLC across Canada. This is the first pan-Canadian analysis on the topic.

METHODS

Six provinces—British Columbia, Alberta, Ontario, New Brunswick, Nova Scotia, and Manitoba— participated in the study, although Manitoba's data were excluded from the results because of ongoing validation. No PET scanner was located in Saskatchewan during the period of the study, and Quebec was unable to participate.

The study population comprised 26,028 patients diagnosed with NSCLC during the calendar years 2009–2011. Cases of NSCLC were identified in provincial cancer registries using codes from the *International Classification of Diseases for Oncology,* 3rd edition (C34.0–C34.9), excluding small-cell, lymphoma, and neuroendocrine carcinomas and sarcomas. Also collected were the patient's age at diagnosis, sex, diagnosis date, and stage at diagnosis. British Columbia was unable to provide complete stage data.

The PET data, including patient identifiers and imaging dates, were extracted from hospital or PET centre information systems. Cancer registry and PET utilization data were linked by way of provincial health card numbers or the equivalent. Provinces were responsible for the extraction, linkage, and analysis of their own data using a standardized methodology coordinated by the Canadian Partnership Against Cancer.

The PET data were restricted to imaging performed within an index period defined as 3 months before diagnosis to 12 months after diagnosis. This restriction reflected an attempt to eliminate the possibility that the imaging was being used for an earlier or subsequent condition or occurrence.

Utilization was measured as the proportion of NSCLC patients who underwent PET imaging during their index period. Utilization rates are presented by province, by age group (18–69 years and 70+ years), and by stage at diagnosis.

RESULTS

From 2009 to 2011 in Canada, 33.3% of the 26,028 identified NSCLC patients (*n* = 8666) underwent PET

at least once during their index period (Figure 1). Of the five provinces whose data were analyzed, Ontario had the highest proportion of NSCLC patients undergoing PET [37.6% (4667 of 12,426 patients)], and New Brunswick had the lowest proportion [22.2% (375 of 1691 patients)].

The average proportion of patients who underwent PET was 35.3% in the 18–69 age group (4491 of 12,718 patients) and 31.4% in the group 70 years of age and older (4175 of 13,310 patients) (Figure 2). In all provinces except Ontario, the use of PET was lower for patients in the older age group.

The proportion of patients with stage I NSCLC who underwent PET ranged from 34% in New Brunswick to 62% in Alberta (Figure 3). The rates of PET utilization for patients with stage IV disease were expectedly lower, ranging from 14% in New Brunswick to 21% in Nova Scotia.

DISCUSSION

The data presented show some interprovincial variation in the use of PET for the management of NSCLC. On average, 33% of patients diagnosed with NSCLC underwent PET within 3 months before and up to 12 months after diagnosis.

The use of PET also varied between provinces by stage at diagnosis. As expected, PET utilization was highest in patients with stage I and II disease, intermediate in those with stage III disease, and lowest in those with stage IV disease, in which metastasis is often identified using conventional imaging modalities.

Provincial funding and guidelines for the use of PET technology differ from province to province. For example, compared with other provinces, Ontario has a short list of cancer indications for which PET is insured[2]. However, further investigation is required to assess whether any relationships might exist between funding, usage guidelines, and PET utilization rates.

Rates of PET utilization appear to be higher in the United States than in Canada for some patients with NSCLC. A recent report showed that, during 2005–2007, 65.3% of U.S. Medicare patients 66 years of age and older who were diagnosed with NSCLC underwent PET imaging 1 or more times[5]. Factors that might have contributed to that relatively high utilization rate include broad health coverage for the use of PET in diagnosing, staging, and re-staging lung cancers.

CONCLUSIONS

Lung cancer is a major cause of death in Canada. Reports show that most lung cancers are detected at stage IV when survival rates are low. The present work provides a basis for discussion about how an emerging health care technology—PET—is being used in Canada for the diagnosis, staging, and management of patients with NSCLC.
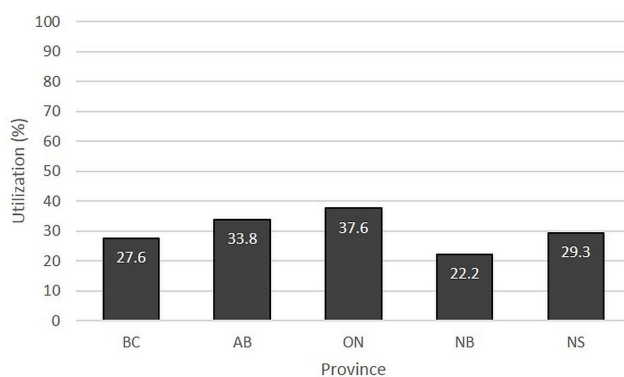

FIGURE 1 *Percentage of patients diagnosed with non-small-cell lung cancer during 2009–2011 who underwent positron-emission tomography at least once within 3 months before and up to 12 months after diagnosis, by province.*
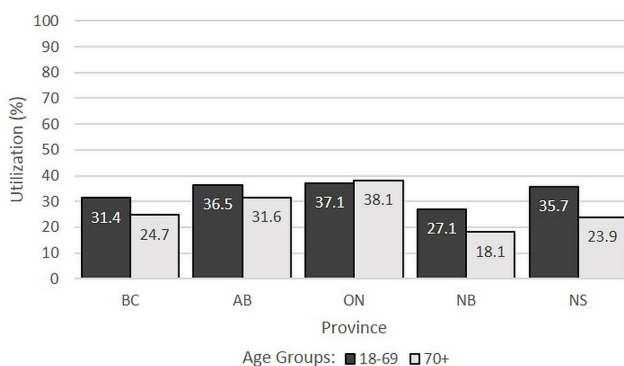

FIGURE 2 *Percentage of patients diagnosed with non-small-cell lung cancer during 2009–2011 who underwent positron-emission tomography at least once within 3 months before and up to 12 months after diagnosis, by province and age group.*
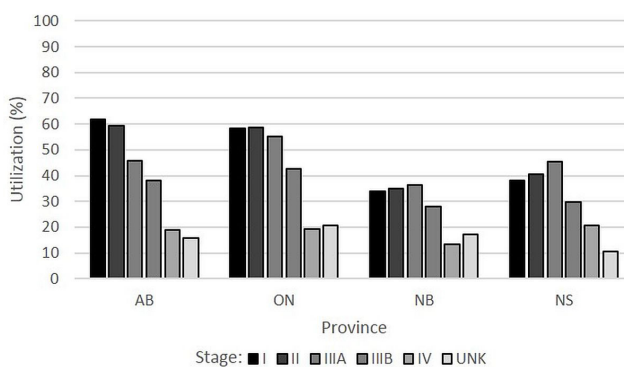

FIGURE 3 *Percentage of patients diagnosed with non-small-cell lung cancer during 2009–2011 who underwent positron-emission tomography at least once within 3 months before and up to 12 months after diagnosis, by province and stage at diagnosis.* UNK = *unknown.*

Provinces are making efforts to maintain an evidence-based approach to the use of PET for managing NSCLC. Continuous revision of the evidence can ensure that patients receive the right test at the right

time, thereby minimizing a patient's unnecessary exposure to radiation, reducing false-positive and –negative results, and ensuring the most efficient use of health system resources.

Additional data from the present study will be posted online at http://www.systemperformance.ca/ as it becomes available.

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CONFLICT OF INTEREST DISCLOSURES

The authors have no financial conflicts of interest to declare.

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