Primary care physician use across the breast cancer care continuum

CanIMPACT study using Canadian administrative data

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Abstract

Objective To describe primary care physician (PCP) use and continuity of PCP care across the breast cancer care continuum.

Design Population-based, retrospective cohort study using provincial cancer registries linked to health administrative databases.

Setting British Columbia, Manitoba, and Ontario.

Participants All women with incident invasive breast cancer from 2007 to 2012 in Manitoba and Ontario and from 2007 to 2011 in British Columbia.

Main outcome measures The number and proportions of visits to PCPs were determined. Continuity of care was measured using the Usual Provider of Care index calculated as the proportion of visits to the most-often-visited PCP in the 6 to 30 months before a breast cancer diagnosis (baseline) and from 1 to 3 years following a breast cancer diagnosis (survivorship).

Results More than three-quarters of patients visited their PCPs 2 or more times during the breast cancer diagnostic period, and more than 80% of patients had at least 1 PCP visit during breast cancer adjuvant treatment. Contact with the PCP decreased over time during breast cancer survivorship. Of the 3 phases, women appeared to be most likely to not have PCP contact during adjuvant treatment, with 10.7% (Ontario) to 18.7% (British Columbia) of women having no PCP visits during this phase. However, a sizable minority of women had at least monthly visits during the treatment phase, particularly in Manitoba and Ontario, where approximately a quarter of women saw a PCP at least monthly. We observed higher continuity of care with PCPs in survivorship (compared with baseline) in all provinces.

Conclusion Primary care physicians were generally involved throughout the breast cancer care continuum, but the level of involvement varied across care phases and by province. Future interventions will aim to further integrate primary and oncology care.

EDITOR'S KEY POINTS

• Community-based primary care is the first point of contact for cancer patients during most phases of cancer care. Although many primary care physicians (PCPs) have expressed willingness to be involved in the ongoing care of their patients with cancer, their role throughout the cancer care continuum is not clear. This study aimed to elucidate PCP use and continuity of PCP care for women with breast cancer.

• There is variation in primary care involvement across provinces along the breast cancer care continuum. In the survivorship phase there was a decreasing trend in PCP visits over time but an increase in continuity of care compared with baseline in all provinces. Primary care physicians were least involved during the treatment phase, but they are playing a key role with patients in all phases of cancer care.

Le rôle des médecins de première ligne tout au long du traitement du cancer du sein

Une étude de CanIMPACT à l'aide de données administratives canadiennes

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Résumé

Objectif Décrire le rôle du médecin de première ligne (MPL) et la continuité des soins qu'il prodigue tout au long du traitement du cancer du sein.

Type d'étude Étude de cohorte rétrospective de nature démographique utilisant des registres du cancer provinciaux reliés à des bases de données administratives sur la santé.

Contexte La Colombie-Britannique, le Manitoba et l'Ontario.

Participantes Toutes les femmes présentant un cancer invasif du sein au Manitoba et en Ontario de 2007 à 2012, et en Colombie-Britannique de 2007 à 2011.

Principaux paramètres à l'étude Le nombre et la proportion des visites aux MPL ont été déterminés. La continuité des soins a été mesurée à l'aide de l'index Usual Provider of Care, qui est basé sur la proportion des visites effectuées auprès du MPL le plus souvent consulté au cours des 6 à 30 mois précédant le diagnostic du cancer (le niveau de base) et au cours des 1 à 3 années suivant ce diagnostic (la période de survie).

Résultats Plus des trois-quarts des patientes ont consulté leur MPL à au moins 2 reprises durant la période du diagnostic et plus de 80% d'entre elles l'ont fait au moins une fois durant la période du traitement associé. Durant la phase de survie, les contacts avec les MPL ont diminué avec le temps. C'est durant la phase du traitement associé que les patientes étaient le moins susceptibles de consulter un MPL, alors qu'une proportion des patientes, qui variait entre 10,7% (Ontario) et 18,7% (Colombie-Britannique), n'avaient eu aucune rencontre avec un MPL. Il y avait toutefois une minorité assez importante de patientes qui avaient consulté un MPL au moins une fois durant cette phase, notamment au Manitoba et en Ontario, où environ le quart des patientes voyaient un MPL au moins une fois par mois. On a observé que la continuité des soins dispensés par des MPL était meilleure durant la phase de survie (par rapport au niveau de base), et ce, dans toutes les provinces.

Conclusion En général, les MPL participaient au traitement du cancer du sein dans toutes les phases de son évolution, mais le niveau de leur participation variait selon les phases du cancer et selon les provinces. Les interventions futures auront pour but de mieux intégrer les soins primaires avec ceux des oncologues.

POINTS DE REPÈRE DU RÉDACTEUR

• La plupart du temps, c'est un établissement communautaire de soins primaires qui est le premier point de contact d'un patient cancéreux avec des soignants, et ce, à toutes les phases du traitement. Même si de nombreux médecins de première ligne (MPL) se sont dits prêts à participer à toutes les phases du traitement de leurs patients cancéreux, leur rôle durant toute cette période n'est pas clair. Cette étude voulait élucider le rôle des MPL et la continuité de leur participation au traitement des femmes présentant un cancer du sein.

• Au cours de l'évolution d'un cancer du sein, la participation des soins de première ligne varie selon les provinces. Durant la phase de survie, les visites des MPL avaient tendance à diminuer avec le temps; par ailleurs, on notait une augmentation de la continuité des soins par rapport au niveau de base dans toutes les provinces. C'est durant la phase du traitement que la participation des MPL était la plus faible, mais ces médecins jouaient quand même un rôle crucial dans toutes les phases du traitement de leur patientes cancéreuses.

Cancer is a considerable public health concern with substantial economic and psychosocial consequences. Breast cancer is the most frequently diagnosed cancer and the second leading cause of cancer deaths in Canadian women, representing 26% of all incident female cancer cases and 13.6% of female cancer deaths.[1] The Canadian Cancer Society estimates that 25 000 women were diagnosed with breast cancer and 5032 women died of the disease in 2015.[1] As most breast cancer patients are diagnosed at an early stage[2] and will therefore be long-term survivors, breast cancer is increasingly recognized as a chronic disease with multiple phases. Community-based primary health care is the first point of contact for cancer patients during most phases of cancer care. Although many primary care physicians (PCP) have expressed willingness to be involved in the ongoing care of their patients with cancer,[3,4] their role throughout the cancer care continuum is not clear.

Traditionally, PCPs have been primarily responsible for cancer detection and the diagnostic process, as most cancer patients first present to a PCP with symptoms,[5] while oncology specialists often take the lead in managing cancer patients during treatment and survivorship. This role allocation has been challenged by 2 randomized controlled trials that showed that PCPs provide equally safe survivorship follow-up care compared with oncologists[6] and that patients express higher satisfaction with follow-up care provided by PCPs.[7] There is also growing support for more PCP involvement during the active cancer treatment phase.[8] Evidence shows that patients with colorectal cancer have increased visits to their PCPs in the first year after cancer diagnosis, suggesting that PCPs are likely involved in managing treatment side effects and psychological distress.[9] Moreover, PCPs play a dominant role in the management of comorbid conditions and the provision of preventive services. The fact that two-thirds of cancer patients have coexisting chronic conditions[10] heightens the need for primary care engagement in achieving comprehensive care and better outcomes for cancer patients.

To our knowledge, there is a lack of information and understanding regarding current primary health care involvement across the breast cancer care continuum in Canada. The objectives of this study, using data from 3 Canadian provinces, were to describe the use of primary care services during the diagnosis, treatment, and survivorship phases of breast cancer within and across provinces and to describe the continuity of care with PCPs before and after breast cancer diagnosis.

METHODS

Study design, cohort, and follow-up
This study was conducted as part of a large population-based retrospective cohort study, CanIMPACT (Canadian

Team to Improve Community-Based Cancer Care along the Continuum),[11] that provides an overall breast cancer diagnostic, treatment, and survivorship health care status assessment using linked administrative health data in British Columbia, Manitoba, and Ontario. For the purpose of this study, the breast cancer diagnostic phase was defined as the 6 months before the cancer diagnosis date, the treatment phase was defined as the 6 months following the initiation of adjuvant chemotherapy, and the survivorship phase was defined as 1 to a maximum of 5 years after the cancer diagnosis date depending on the censor date. Slightly different populations were included in each phase because of interest in phase-specific issues in distinct populations.

Diagnosis phase. The diagnosis phase included all women diagnosed with incident invasive breast cancer (ICD-9 code 174.x) between January 1, 2007, and December 31, 2012, in Manitoba and Ontario and between January 1, 2007, and December 31, 2011, in British Columbia, identified from the cancer registries of each participating province. Breast cancers in men were excluded because their cancer care pathways are expected to differ from those of women, and the number of cases is small. Women were excluded if they did not have a valid health card number or were living outside of their home province at the time of diagnosis; if they had a history of in situ breast cancer or any nonmelanoma cancer; or if they had a nonsolid breast tumour with a histology code specified in **Box 1**, because those tumours behave differently and can differ in initial presentation from solid breast tumours. The remaining women comprised the diagnosis phase cohort, which was used as the base cohort for the other 2 phases.

Treatment phase. The treatment phase was limited to women diagnosed with stage I to III breast cancer who underwent potentially curative breast surgery (ie, lumpectomy or mastectomy) and received adjuvant chemotherapy in the absence of neoadjuvant chemotherapy. This decision was made because of interest in the quality of chemotherapy in the CanIMPACT study and the consideration of interprovincial comparability.

Box 1. The International Classification of Diseases for Oncology–3 histology exclusion criteria

Patients with the following codes were excluded:
8543, 8540, 8710, 8800, 8801, 8802, 8803, 8804, 8810, 8811, 8812, 8813, 8814, 8832, 8840, 8850, 8851, 8852, 8853, 8854, 8858, 8890, 8891, 8895, 8896, 8900, 8901, 8902, 8910, 8920, 8930, 8963, 8964, 8980, 8981, 8990, 8991, 9040, 9041, 9042, 9043, 9044, 9120, 9124, 9130, 9140, 9170, 9180, 9182, 9190, 9220, 9221, 9231, 9250, 9260, 9270, 9330, 9471, 9480, 9481, 9530, 9539, 9540, 9560, 9581, 9593, 9662, 9684, 9740, 9930

Survivorship phase. The survivorship phase was limited to women who had had a lumpectomy or mastectomy, who had no evidence of metastatic breast cancer within 1 year of the breast cancer diagnosis, and who had no evidence of a new primary cancer or breast cancer recurrence within 27 months of the diagnosis. Women were censored in the survivorship follow-up if they died, developed a new primary cancer, or had a breast cancer recurrence. The censor date was 6 months before the date of death or the last known vital status date, or 90 days before the date of new primary cancer or breast cancer recurrence. Women were excluded if their censor date was within 2 years of the breast cancer diagnosis or if they did not have continuous provincial health care coverage throughout the survivorship phase.

Data sources

Table 1 lists the administrative health databases used in this study.[12-15] All databases were linked at the individual level in each province through an encrypted individual health insurance number. Provincial cancer registries provided information about cancer diagnosis date, histology, stage, and histologic grade, and were used to identify the study cohort. Physician billing claim data that capture all physician services covered under the provincial health insurance plan were linked to provincial physician databases to identify PCP visits. The Discharge Abstract Database maintained by the Canadian Institute for Health Information provided disease diagnosis information for all hospitalizations. Health insurance plan client registry data provided demographic information including age, sex, and postal code.

Measures and analysis

A *PCP visit* was defined as a visit to a general practitioner or family physician at an office, home, or long-term care facility or by telephone according to physician billing claim data. The PCP visits by telephone were excluded during the survivorship phase because these visits were unlikely to be associated with follow-up care. The total numbers of PCP visits per patient were quantified during each phase of care using frequency counts. For the survivorship phase, PCP visits were measured on a yearly basis only for those who had complete follow-up in that year. Means and medians were used to measure central tendency and standard deviations and interquartile ranges were used to measure variation. The PCP visits were further categorized based on frequency distributions and clinical importance. Continuity of care was measured using the Usual Provider of Care (UPC) index.[16] The UPC index was calculated as the proportion of visits to the most-often-visited PCP during a 2-year time period and was only calculated for patients with at least 3 visits.[17,18] High continuity was defined as a score of greater than 0.75, and a score of 1 indicates perfect continuity of care.[19] The baseline UPC index score was measured in the 6 to 30 months before a breast cancer diagnosis, and survivorship continuity of care was measured in the 1 to 3 years after a breast cancer diagnosis. Other variables measured included age, comorbidity using the Johns Hopkins Aggregated Diagnosis Groups,[20] and tumour-node-metastasis (6th edition) cancer stage.[21,22]

In order to compare results across provinces and to ensure that confidentiality requirements by government data stewards were met, data were not combined across provinces. Instead, analyses were conducted separately at designated research centres in each province using SAS, version 9.2. This study was approved by the University of Manitoba's Health Research Ethics Board and Manitoba Health's Health Information and Privacy Committee in Manitoba, the Health Sciences and Affiliated Hospitals Research Ethics Board at Queen's University in Ontario, and the BC Cancer Agency and University of British Columbia Research Ethics Board in British Columbia. Data access approvals were obtained from all data stewards in each province.

RESULTS

A total of 65 380 patients from 3 provinces were included in the diagnosis phase. Patient characteristics in each province are displayed in **Table 2**. Overall, the mean (SD) age at breast cancer diagnosis was 62 (14) years and 78.2% were diagnosed at age 50 or older. Ontario had slightly fewer patients aged 50 and older (77.6%)

Table 1. Data sources by province

DATABASE TYPE	BRITISH COLUMBIA[12-15]	MANITOBA	ONTARIO
Provincial cancer registry	BC Cancer Registry	Manitoba Cancer Registry	Ontario Cancer Registry
Health insurance plan client registry	MSP registry	Manitoba Health Population Registry	Registered Persons Database
Provincial physician databases	MSP claims database	Manitoba Health medical claims database	ICES Physician Database
Physician billing claim data	MSP claims database	Manitoba Health medical claims database	Ontario Health Insurance Plan data
Hospital inpatient data	CIHI Discharge Abstract Database and same-day surgery data	CIHI Discharge Abstract Database and same-day surgery data	CIHI Discharge Abstract Database and same-day surgery data

CIHI—Canadian Institute for Health Information, ICES—Institute for Clinical Evaluative Sciences, MSP—Medical Services Plan.

than Manitoba (80.4%) or British Columbia (79.3%) did. Approximately 70% of breast cancer patients had at least 4 comorbidities, with higher proportions of sicker patients (>3 Aggregated Diagnosis Groups) in Ontario and Manitoba compared with British Columbia. Most breast cancers were diagnosed at early stages (stage I to II), with the proportion ranging from 72.6% to 78.0% across provinces. Women included in the treatment phase were younger and had fewer comorbid conditions compared with those in the diagnosis and survivorship phases (**Tables 3** and **4**).

Table 5 shows the level of PCP involvement during breast cancer diagnosis by province. Women in each province visited PCPs a median of 3 times in the

Table 2. Characteristics of study subjects included in the diagnosis phase, by province

CHARACTERISTIC	BRITISH COLUMBIA, 2007 TO 2011, N (%)* (N = 14 198)	MANITOBA, 2007 TO 2012, N (%)* (N = 4216)	ONTARIO, 2007 TO 2012, N (%)* (N = 46 966)
Age group, y			
• < 40	577 (4.1)	190 (4.5)	2801 (6.0)
• 40-49	2355 (16.6)	636 (15.1)	7722 (16.4)
• 50-59	3407 (24.0)	1009 (23.9)	11 807 (25.1)
• 60-69	3641 (25.6)	1078 (25.6)	11 734 (25.0)
• 70-74	1369 (9.6)	388 (9.2)	4423 (9.4)
• >74	2849 (20.1)	915 (21.7)	8479 (18.1)
Comorbidity, ADGs			
• 0-3	4559 (32.1)	995 (23.6)	12 392 (26.4)
• 4-5	3449 (24.3)	948 (22.5)	10 698 (22.8)
• 6-7	2790 (19.7)	861 (20.4)	9916 (21.1)
• 8-9	1832 (12.9)	682 (16.2)	7023 (15.0)
• ≥ 10	1568 (11.0)	730 (17.3)	6937 (14.8)
Stage at diagnosis			
• I	5966 (42.0)	1706 (40.5)	17 475 (37.2)
• II	4550 (32.0)	1582 (37.5)	16 610 (35.4)
• III	1803 (12.7)	601 (14.3)	6110 (13.0)
• IV	597 (4.2)	259 (6.1)	2059 (4.4)
• Missing	1282 (9.0)	68 (1.6)	4712 (10.0)

ADG—Johns Hopkins Aggregated Diagnosis Group.
*Percentages might not add to 100 owing to rounding.

Table 3. Characteristics of study subjects who received adjuvant chemotherapy, by province

CHARACTERISTIC	BRITISH COLUMBIA, 2007 TO 2011, N (%)* (N = 4133)	MANITOBA, 2007 TO 2012, N (%)* (N = 1472)	ONTARIO, 2007 TO 2011, N (%)* (N = 12 851)
Age group, y			
• < 40	276 (6.7)	130 (8.8)	1299 (10.1)
• 40-49	1157 (28.0)	405 (27.5)	3302 (25.7)
• 50-59	1412 (34.2)	514 (34.9)	4252 (33.1)
• 60-69	1019 (24.7)	325 (22.1)	3059 (23.8)
• 70-74	189 (4.6)	68 (4.6)	610 (4.7)
• >74	80 (1.9)	30 (2.0)	329 (2.6)
Comorbidity, ADGs			
• 0-3	1534 (37.1)	406 (27.6)	3584 (27.9)
• 4-5	1092 (26.4)	346 (23.5)	3126 (24.3)
• 6-7	746 (18.0)	317 (21.5)	2832 (22.0)
• 8-9	472 (11.4)	204 (13.9)	1831 (14.2)
• ≥ 10	284 (6.9)	199 (13.5)	1478 (11.5)
• Unknown	5 (0.1)	0 (0.0)	0 (0.0)
Stage at diagnosis			
• I	1083 (26.2)	344 (23.4)	2881 (22.4)
• II	2182 (52.8)	775 (52.6)	7332 (57.1)
• III	868 (21.0)	353 (24.0)	2638 (20.5)

ADG—Johns Hopkins Aggregated Diagnosis Group.
*Percentages might not add to 100 owing to rounding.

Table 4. Characteristics of study populations included in the survivorship phase, by province

CHARACTERISTIC	BRITISH COLUMBIA, 2007 TO 2010, N (%)* (N = 9338)	MANITOBA, 2007 TO 2011, N (%)* (N = 2688)	ONTARIO, 2007 TO 2010, N (%)* (N = 23 700)
Follow-up time, y			
• 1	9338 (100.0)	2688 (100.0)	23 700 (100.0)
• 2	8862 (94.9)	2583 (96.1)	22 297 (94.1)
• 3	6213 (66.5)	2037 (75.8)	21 148 (89.2)
• 4	3865 (41.4)	1516 (56.4)	17 255 (72.8)
Age group, y			
• < 40	403 (4.3)	114 (4.2)	1353 (5.7)
• 40-49	1697 (18.2)	432 (16.1)	4074 (17.2)
• 50-59	2378 (25.5)	715 (26.6)	6322 (26.7)
• 60-69	2449 (26.2)	725 (27.0)	6156 (26.0)
• 70-74	860 (9.2)	255 (9.5)	2239 (9.4)
• > 74	1551 (16.6)	447 (16.6)	3556 (15.0)
Comorbidity, ADGs			
• 0-3	2913 (31.2)	598 (22.2)	5891 (24.9)
• 4-5	2292 (24.5)	655 (24.4)	5472 (23.1)
• 6-7	1886 (20.2)	559 (20.8)	5184 (21.9)
• 8-9	1232 (13.2)	434 (16.1)	3654 (15.4)
• ≥ 10	1015 (10.9)	442 (16.4)	3499 (14.8)
Stage at diagnosis			
• I	4178 (44.7)	1268 (47.2)	10 036 (42.3)
• II	3098 (33.2)	1086 (40.4)	8602 (36.3)
• III	1065 (11.4)	317 (11.8)	2660 (11.2)
• IV	179 (1.9)	7 (0.3)	88 (0.4)
• Unknown	818 (8.8)	10 (0.4)	2314 (9.8)

ADG—Johns Hopkins Aggregated Diagnosis Group
*Percentages might not add to 100 owing to rounding.

Table 5. Number of visits with PCPs during the diagnosis phase, by province

PCP VISITS	BRITISH COLUMBIA, 2007 TO 2011 (N = 13 505)	MANITOBA, 2007 TO 2012 (N = 4216)	ONTARIO, 2007 TO 2012 (N = 44 437)
Mean (SD) no. of visits	3.6 (2.8)	3.7 (3.1)	3.8 (3.3)
Median (IQR) no. of visits	3 (2-5)	3 (2-5)	3 (2-5)
No. of visits, n (%)			
• 0	919 (6.8)	343 (8.1)	3708 (8.3)
• 1	2497 (18.5)	602 (14.3)	7259 (16.3)
• 2-4	6879 (50.9)	2004 (47.5)	21 819 (49.1)
• 5-6	1852 (13.7)	677 (16.1)	6207 (14.0)
• ≥ 7	1358 (10.1)	590 (14.0)	5444 (12.3)

IQR—interquartile range, PCP—primary care physician.

Table 6. Number of visits with PCPs during adjuvant chemotherapy treatment, by province

PCP VISITS	BRITISH COLUMBIA, 2007 TO 2011 (N = 4133)	MANITOBA, 2007 TO 2012 (N = 1472)	ONTARIO, 2007 TO 2011 (N = 12 851)
Mean (SD) no. of visits	3.3 (3.0)	4.7 (4.7)	4.8 (5.3)
Median (IQR) no. of visits	2 (1-4)	3 (1-7)	4 (2-6)
No. of visits, n (%)*			
• 0	771 (18.7)	212 (14.4)	1369 (10.7)
• 1-3	2309 (55.9)	562 (38.2)	5031 (39.1)
• 4-6	727 (17.6)	289 (19.6)	3273 (25.5)
• ≥ 7	326 (7.9)	409 (27.8)	3178 (24.7)

IQR—interquartile range, PCP—primary care physician.
*Percentages might not add to 100 owing to rounding.

6 months before their cancer diagnoses. Approximately 12% visited a PCP 1 or more times per month (ie, ≥7 times) in the diagnosis phase, with higher proportions observed in Manitoba (14.0%) and Ontario (12.3%) compared with British Columbia (10.1%). British Columbia also had the lowest proportion of women with no PCP visits during the diagnosis phase (6.8% in British Columbia, 8.1% in Manitoba, and 8.3% in Ontario).
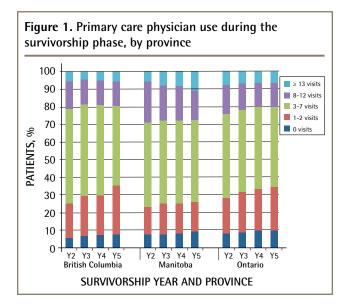
Use of PCPs during breast cancer adjuvant chemotherapy by province is presented in **Table 6**. During chemotherapy, 87.3% of women visited PCPs at least once,

while 10.7% (Ontario) to 18.7% (British Columbia) of women had no PCP contact during this phase. Women in British Columbia had a median of 2 PCP visits, compared with 3 visits in Manitoba and 4 visits in Ontario. Similarly, in Manitoba and Ontario, a quarter of breast cancer patients visited PCPs at least once per month, in contrast to 7.9% in British Columbia.

The use of PCPs during breast cancer survivorship is displayed in **Table 7** and **Figure 1**. Breast cancer patients in Manitoba had the most PCP encounters during survivorship, with 9.4% visiting their PCP at least

Table 7. Number of visits with PCPs during the survivorship phase, by province			
PCP VISITS	**BRITISH COLUMBIA, 2007 TO 2010**	**MANITOBA, 2007 TO 2011**	**ONTARIO, 2007 TO 2010**
Year 2 after diagnosis			
No. of patients	9338	2688	23 700
Mean (SD) no. of visits	5.6 (3.7)	6.0 (5.0)	5.6 (5.6)
Median (IQR) no. of visits	5 (3–7)	5 (3–8)	4 (2–7)
No. of visits, n (%)*			
• 0	516 (5.5)	196 (7.3)	1880 (7.9)
• 1–2	1861 (19.9)	428 (15.9)	4857 (20.5)
• 3–7	4966 (53.2)	1287 (47.9)	11 171 (47.1)
• 8–12	1441 (15.4)	525 (19.5)	3915 (16.5)
• ≥13	554 (5.9)	252 (9.4)	1877 (7.9)
Year 3 after diagnosis			
No. of patients	8862	2583	22 297
Mean (SD) no. of visits	5.3 (4.2)	5.8 (4.9)	5.3 (5.4)
Median (IQR) no. of visits	4 (3–7)	5 (2–8)	4 (2–7)
No. of visits, n (%)*			
• 0	584 (6.6)	190 (7.4)	1938 (8.7)
• 1–2	2014 (22.7)	457 (17.7)	5059 (22.7)
• 3–7	4603 (51.9)	1219 (47.2)	10 337 (46.4)
• 8–12	1233 (13.9)	512 (19.8)	3371 (15.1)
• ≥13	428 (4.8)	205 (7.9)	1592 (7.1)
Year 4 after diagnosis			
No. of patients	6213	2037	21 148
Mean (SD) no. of visits	5.3 (4.3)	5.8 (4.9)	5.1 (5.2)
Median (IQR) no. of visits	4 (3–7)	5 (2–8)	4 (2–7)
No. of visits, n (%)*			
• 0	426 (6.9)	160 (7.9)	2024 (9.6)
• 1–2	1417 (22.8)	353 (17.3)	5005 (23.7)
• 3–7	3193 (51.4)	953 (46.8)	9726 (46.0)
• 8–12	839 (13.5)	399 (19.6)	2991 (14.1)
• ≥13	338 (5.4)	172 (8.4)	1402 (6.6)
Year 5 after diagnosis			
No. of patients	3865	1516	17 255
Mean (SD) no. of visits	4.9 (3.8)	5.7 (4.8)	5.0 (5.2)
Median (IQR) no. of visits	4 (2–6)	5 (2–8)	4 (2–7)
No. of visits, n (%)*			
• 0	308 (8.0)	139 (9.2)	1729 (10.0)
• 1–2	849 (22.0)	249 (16.4)	4212 (24.4)
• 3–7	1887 (48.8)	709 (46.8)	7819 (45.3)
• 8–12	577 (14.9)	298 (19.7)	2400 (13.9)
• ≥13	244 (6.3)	121 (8.0)	1095 (6.3)

IQR—interquartile range, PCP—primary care physician.
*Percentages might not add to 100 owing to rounding.

Figure 1. Primary care physician use during the survivorship phase, by province

once per month in the second year after a cancer diagnosis and 8.0% visiting their PCP at least once per month in the fifth year after a cancer diagnosis. The proportion of women having no visits during the survivorship phase was highest in Ontario and lowest in British Columbia. Overall, there was a decreasing trend of PCP use over time across provinces.

With respect to continuity of care with PCPs, Ontario had the highest proportion of women (55.1%) with high continuity of care at baseline compared with British Columbia (41.5%) and Manitoba (47.2%) (**Table 8**). During survivorship, the proportion of women who had high continuity of care with PCPs increased in all provinces (by 9.0% in British Columbia, 9.7% in Manitoba, and 1.8% in Ontario) compared with baseline.

DISCUSSION

In this multiprovince, retrospective cohort study using population-level administrative data, we have shown that in British Columbia, Manitoba, and Ontario PCPs are involved in the care of women with breast cancer across the diagnostic, treatment, and survivorship phases. Of the 3 phases, PCPs were the least involved during adjuvant chemotherapy treatment and this is consistent with the finding from a previous study that surveyed cancer patients about the perceived role of their PCPs in cancer care: 57% of patients thought their PCPs were involved in the diagnosis of cancer compared with 27% during cancer treatment and 43% during survivorship.[23] However, in Manitoba and Ontario, a quarter of women on average saw a PCP at least monthly during the treatment phase. In the survivorship phase there was a decreasing trend in PCP visits over time but an increase in continuity of care compared with baseline. We also observed differences between provinces. Ontario showed the highest continuity of care before diagnosis and maintained this level in survivorship. Women in British Columbia were the least likely to have visits at least monthly in all 3 phases. Women in Manitoba had the most PCP encounters during survivorship.

Our findings suggest that PCPs play a key role in the breast cancer diagnosis phase and the survivorship phase, particularly early on. During the treatment phase, the

Table 8. Continuity of care with PCPs before and after breast cancer diagnosis, by province

CONTINUITY MEASURE	BRITISH COLUMBIA	MANITOBA	ONTARIO
Baseline continuity of care			
No. of patients	14 198	4216	46 966
Study period	2007 to 2011	2007 to 2012	2007 to 2012
No. of visits, n (%)			
• 0	931 (6.6)	273 (6.5)	3592 (7.6)
• 1–2	1445 (10.2)	368 (8.7)	5006 (10.7)
UPC index score,* n (%)			
• Low (≤ 0.75)	5931 (41.8)	1585 (37.6)	12 501 (26.6)
• High (> 0.75)	5891 (41.5)	1990 (47.2)	25 867 (55.1)
Survivorship phase continuity of care			
No. of patients	8862	2583	22 297
Study period	2007 to 2010	2007 to 2011	2007 to 2010
No. of visits, n (%)			
• 0	229 (2.6)	84 (3.3)	624 (2.8)
• 1–2	511 (5.8)	145 (5.6)	1470 (6.6)
UPC index score,* n (%)			
• Low (≤ 0.75)	3650 (41.2)	883 (34.2)	7513 (33.7)
• High (> 0.75)	4472 (50.5)	1471 (56.9)	12 690 (56.9)

*Women with fewer than 3 visits during the study period were not included in the UPC index calculation.
PCP—primary care physician, UPC—Usual Provider of Care.

care of many patients with breast cancer might indeed be turned over completely to oncologists, but in line with other literature our results suggest that PCPs still help some patients deal with treatment side effects and provide psychosocial supports as well as other elements of primary care.[8] Interestingly, in all phases there were some patients who had no primary care contact, and some patients who were being seen monthly or more frequently. Both of these extremes suggest opportunities for improvement in the quality of care that patients receive along the cancer care continuum and in the level of integration between oncology and primary care. We also observed a general improvement in the UPC index from before diagnosis to the survivorship phase, which might reflect an appreciation of the importance of continuity of care (a core component of primary care) for patients with a serious medical history.[24]

Limitations

This is the first study to our knowledge that has examined interprovincial data to describe PCP use at the population level for women with breast cancer during diagnosis, treatment, and survivorship. We were able to make use of similarly structured databases across provinces, such as provincial cancer registries and physician billing claims, to ensure rigorous comparability of data. However, this study has several limitations. As administrative data were used for the analysis, additional data not routinely collected could not be used. For example, visits to physicians or advanced practice nurses not reimbursed under fee-for-service models that did not shadow bill are not captured in medical claims databases. Advanced practice nurses play a variety of roles including as cancer specialists, patient navigators, educators, consultants, and care coordinators.[25] We were unable to measure encounters with advanced practice nurses and thus might have underestimated overall primary health care use throughout the breast cancer care continuum. We were also unable to describe longitudinal PCP patterns of use at an individual level. Previous research shows that most cancer patients maintain their level of resource use, with only 20% switching from low to high use or vice versa.[26] We were also unable to determine the reasons for interprovincial differences in PCP use or the appropriateness of PCP encounters. Despite the adoption of a common research and analytic plan, variation in variable definition and billing practices across provinces could not be eliminated. For example, regional variation in the presence and billing practices of general practitioners in oncology[27] might have contributed to the observed difference in PCP use across provinces. Women in British Columbia were the least likely to have visits on at least a monthly basis, but current data do not allow us to determine if this reflects a strength of the primary care system or other

variables such as sociodemographic, clinical, or health system factors. The contribution of these variables to PCP use for women diagnosed with breast cancer needs to be further examined. We did not separate screening-detected breast cancer patients from symptom-detected breast cancer patients. These 2 types of patients might have differed in PCP contact.

Conclusion

Because the core elements of high-quality primary care include comprehensiveness, coordination, and continuity, better overall quality of care for patients with cancer will be achieved if primary care and oncology become more integrated and if PCPs are able to play a central role in cancer care.[28] Canadian research involving PCPs has demonstrated that they are willing to assume responsibility for survivorship care with appropriate supports in place,[29,30] and can also play key roles in the treatment phase with appropriate supports. Future research by the CanIMPACT team will focus on the development of sustainable and scalable Canadian interventions to increase integration of primary care and oncology care during all phases of the cancer care continuum. Pan-Canadian research, including qualitative studies,[31] might also help to better understand interprovincial differences.

This multiprovince study shows that there is variation in PCP use for patients with breast cancer, both across the phases of care and across provinces. However, PCPs play a key role in all stages of care for women diagnosed with breast cancer. By fostering and further developing this role, we can improve the quality of care women receive during this complex journey.

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Contributors

Ms Jiang was responsible for the study design and had a main role in writing the manuscript. **Dr Lofters** contributed a great deal to the study design and interpretation and to writing the manuscript. The rest of the authors participated in the study design and results interpretation and contributed to manuscript revision.

Competing interests

None declared

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