CanIMPACT Data Dictionary

Table 1. Patient socio-demographic, health status, disease status, and healthcare use variables

Category	Variable	Definition	Data Sources	Comments
Socio-demographic characteristics	Age Coding: continuous and <40, 40-49, 50-59, 60-69, 70-74, 75+	Patient's age at diagnosis, calculated as the time in years between individual's cancer diagnosis date and date of birth	Provincial Cancer Registry Health Insurance Plan Client Registry	Nova Scotia resolution is at month/year
Socio-demographic characteristics	Immigration Status Coding: Non-immigrant, <5 years, 5-10 years, >10 years	Immigration status at an individual level	Citizenship and Immigration Canada (CIC) Data	CIC data is only available in Ontario and British Columbia.
Socio-demographic characteristics	Immigration Tertile (area-level measure) Coding: 1=lowest, 3=highest tertile	Immigration Tertile is assigned based on Census summary data at a Dissemination Area (DA) level. Census Dissemination Areas are ranked Canada-wide according to the percentage of combined immigrants and non-permanent residents, and then divided into three approximately equal parts (tertiles). Measured for patients in urban areas only.	Health Insurance Plan Clients Registry Postal Code Conversion File Plus (PCCF+)	Postal Code Conversion File Plus (PCCF+) is an application developed and updated by Statistics Canada. Versions may differ in terms of variables and postal code reference file. At the time of this study, different versions of PCCF+ application were available in each province: PCCF+ 5E in Ontario; PCCF+ 5J in Manitoba; PCCF+ 5K in British Columbia, Alberta and Nova Scotia. Immigration Tertile is available in PCCF+ 5H and later versions, and thus this variable is not available in Ontario. Postal codes in rural areas serve wider geographic areas with probabilistically assigned DA and more heterogeneous resident population compared to those in
Socio-demographic characteristics	Neighborhood income quintile Coding: 1=lowest, 5= highest income quintile	Neighbourhood income per person equivalent (IPPE) is a household size-adjusted measure of household income, based on 2006 census summary data at the DA level, and using person-equivalents implied by the 2006 low income cut-offs (LICOs). Neighbourhood income quintile was derived by ranking DA average IPPE within each Census Metropolitan Area (CMA), Census Agglomeration (CA), or provincial residual area not in any CMA or CA, and then the population was divided into approximate fifths (quintiles), thus creating community-specific income quintiles based on IPPE.	Health Insurance Plan Clients Registry Postal Code Conversion File Plus (PCCF+)	

Socio-demographic characteristics	Material Deprivation Index Quintile Coding: 1=least deprived, 5=most deprived quintile	Material Deprivation Index is a dimension of Canadian Marginalization Index[1] based on Census and Geographic information. Deprivation factor score at DA level derived from a Principle Component Factor Analysis. Deprivation quintile was created Canada-wide by sorting and dividing DA-level factor scores into fifths.	Health Insurance Plan Clients Registry Postal Code Conversion File Plus (PCCF+)	urban areas. The lack of geographic precision leads to random misclassification of income quintile/immigration tertile in rural areas. Nova Scotia rural sub-categories using PCCF are not valid so Nova Scotia results restricted to urban-rural categorization only. Lacking the DA, BC was not able to produce the Material Deprivation Index Quintile.
Socio-demographic characteristics	Urban/rural residence Coding: Urban, Rural, Rural-remote, Rural very remote, Rural unknown	Urban/rural residence is defined based on Statistical Canada's Census Metropolitan Area (CMA) and Census Agglomeration (CA) Influenced Zones (MIZ), which takes into account population size, distance and commuting flow between rural and small towns and larger centres.	Health Insurance Plan Clients Registry Postal Code Conversion File	
Health status	Co-morbidity Coding: continuous and categorized: 0-3, 4-5, 6-7, 8-9, 10+	Measured using the Johns Hopkins Aggregated Diagnosis Groups (ADG). Calculated using healthcare data in 6-30 months prior to the cancer diagnosis Two measures were produced: 1) Total number of ADGs 2) The number of major ADGs	Physician Billing Claims Hospital Inpatient Data	This measure requires all diagnosis codes from all patient-physician encounters in specified data sources. Licensed ACG software is required to produce this measure. The ADG was not calculated for AB since they were not able to access the software.
Disease characteristics	Cancer Stage Coded as grouped stage: I, II, III, IV, unknown	Assigned based on tumour-node-metastasis (6th edition) Stage is based on the staging criteria of the American Joint Committee on Cancer or the Collaborative Stage initiative. For cases with more than one valid stage value, a resolved "best stage" is derived based on a pre-specified algorithm that uses pathologic stage when available and clinical stage otherwise.	Provincial cancer registry Collaborative Staging Data	Data completeness varies across provinces due to different implementation timelines of Collaborative Staging. Other stage data available in the provincial registries is from regional cancer center data.
Disease characteristics	Histological Grade Values: well differentiated, moderately differentiated, poorly differentiated.	Measures the aggressiveness of tumor.	Provincial cancer registry Collaborative Staging Data	Histologic grade used registry ICD-O coding and collaborative stage Nottingham BR score/grade when available.
Disease characteristics	Inflammatory Breast Cancer Status Coding: y/n	Indicates if the case is an Inflammatory Breast Cancer using collaborative stage T-category = T4d or cancer registry histology = 8530	Provincial cancer registry Collaborative Staging Data	These patients present with different symptoms than other breast cancer patients.

Disease Characteristics	Receptor Status (ER/PR/HER2) Coding: 1) ER status positive/negative 2) ER+orPR+&HER2-, ER+orPR+&HER2+, ER-&PR-&HER2+, ER-&PR-&HER2-	Measures the ER, PR, HER2 receptor status	Provincial Cancer Registry Collaborative Staging Provincial drug prescription database	Data completeness varies across provinces due to different implementation timelines of Collaborative Staging. In BC, Breast Cancer Outcomes Unit dataset (extracted from charts of all referred patients) was used to collect these values. MB used the cancer registry. Drug prescription database for senior patients aged 65 and above was used to reduce the number of missing values in Ontario based on the assumption that only ER/PR positive patients would be prescribed hormonal therapy.
Healthcare use	Continuity of Care Coding: 0 visits, 1-2 visits, low continuity (<0.75), high continuity (0.76-1)	Measured using the Usual Provider of Care Index[2] for visits to primary care physicians (PCP) in 6 to 30 months prior to the cancer diagnosis date. 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.	Physician billing claims Provincial physician databases	
Healthcare use	Resource Utilization Band (RUBs) Coding: 0=no use or invalid diagnosis, 1=healthy user, 2=low, 3=moderate, 4=high, 5=very high user	Measures use of the healthcare system. Measured using the Johns Hopkins Aggregated Diagnosis Groups (ADG). Calculated using healthcare data in 6-30 months prior to the cancer diagnosis.	Physician billing claims Hospital inpatient data	This measure requires all diagnosis codes from all patient-physician encounters in specified data sources. Licensed ACG software is required to produce this measure.
Healthcare System	Regional Health Authority	Indicates the health authority responsible for regional administration of public healthcare services in each province.	Health Insurance Plan Clients Registry	Regional Health Authority is province-specific

[1] Matheson FI, Dunn JR, Smith KLQ, et al. Development of the Canadian Marginalization Index: a new tool for the study of inequality. Canadian Journal of Public Health, 2012;103(Suppl. 2):S12-S16

[2] Breslau N, Reeb KG. Continuity of care in a university-based practice. J Med Educ 1975;50:965-9.

Table 2. Diagnostic service variables

Category	Variable	Definition and coding	Data Sources	Comments
Diagnostic method	Cancer Detection Method Values: screened/non-screened	Describes whether the breast cancer was detected through screening	Provincial Breast Screening Program database Physician billing claims Hospital Inpatient Data;	Cancer detection method is determined within each participating province based on the local context. In MB, BC and NS, only radiologists who are part of the screening program can bill for screening mammograms So all the screening mammogram records will come from the organized screening databases. In MB, about 11% of women have a non-screening bilateral mammogram every 2 years that are supposed to be for non-screening purposes These were not included as screen-detected cases. In Ontario and Alberta, physicians outside the organized breast screening programs can order and bill for screening mammograms (opportunistic screening). Therefore, algorithms were developed empirically in those two provinces to capture both organized screening and opportunistic screening. *Note: the screening age-eligibility varies across provinces.* *Limitation: Administrative data did not have test results; therefore we do not know if a screening mammogram had abnormal findings.*
Diagnostic Timeliness	Diagnostic Interval Coding: in days	Defined as the time interval between the **index contact date** and the diagnosis date. The **index contact date** was determined using algorithms specific to the detection method. For screen-detected patients, the index contact date is the date of initial screening. For non-screened patients, the	Provincial Breast Screening Program database Physician billing claims Hospital Inpatient Data	For non-screened breast cancer patients, the *most recent encounter prior to the first diagnosis test* was determined in each province based on data availability in a hierarchical order: a) The order date of the first diagnostic test b) The last visit (up to 6 months prior to the first diagnostic test) to the referring doctor who ordered the first diagnostic test. If the

		index contact date is the earliest date of the following: 1) Most recent healthcare encounter with referring physician prior to the first diagnostic test. 2) The earliest date of breast-related encounters captured in physician billing claims and the CIHI-DAD database in 6 months before (including) the date of diagnosis	Provincial cancer registry	referring physician is missing, the test date was used. c) The last visit (up to 6 months prior to the first diagnostic test) to a primary care physician before the first test. If the primary care visit is missing, the test date was used. *Note: a) was used in NS,* *b) was used in BC and ON,* *c) was used in AB;* *a)b)and c) were considered in MB looking for the earliest date among all encounters collected* *Note: breast related encounters[1] determined in previous Ontario research. Slightly different diagnosis codes were used in Nova Scotia.*
Diagnostic Timeliness	First assessment Interval Coding: in days	Measured for non-screen detected patients only. Defined as the interval from the index contact date to the date of first diagnostic test/consult	Physician billing claims Hospital Inpatient Data Provincial cancer registry	
Diagnostic Timeliness	Time interval from first assessment to diagnosis Coding: in days	Measured for non-screen detected patients only. Defined as the interval from the first diagnostic test/consult to the date of diagnosis	Physician billing claims Hospital Inpatient Data Provincial cancer registry	
Utilization of Physician Services	Number of visits to any physician during the diagnostic interval Coding: counts	Defined as the number of encounters to any physicians for a breast-related diagnosis or procedure during the diagnostic interval	Physician billing claims Hospital Inpatient Data Provincial cancer registry	
Utilization of Physician Services	Number of PCP encounters during the diagnostic interval Coding: counts	Defined as the number of encounters to a primary care physician for a breast-related diagnosis during the diagnostic interval	Physician billing claims Hospital Inpatient Data Provincial physician databases Provincial cancer registry	

Utilization of Physician Services	Number of visits to a breast-cancer related specialists Coding: counts	Defined as the number of visits to a diagnostic radiologist, or a general surgeon who performed at least one breast surgery during the diagnostic interval	Physician billing claims Hospital Inpatient Data Provincial physician databases Provincial cancer registry	
Utilization of Physician Services	Number of different PCPs Coding: counts	Defined as the number of different primary care physicians (family physician, general practitioner) that a patient visited during the diagnostic interval for breast-related problems.	Physician billing claims Hospital Inpatient Data Provincial physician databases Provincial cancer registry	
Utilization of Physician Services	Number of PCP visits within 6 months prior to the date of diagnosis Coding: counts	Defined as the number of visits to primary care physicians for any reason in the 6 months prior to the cancer diagnosis date	Physician billing claims Provincial cancer registry	

[1] Breast cancer-related encounters included: breast cancer, other related cancer, benign breast neoplasm/CIS, infectious/inflammatory conditions of the breast as the diagnosis on the encounter or screening, diagnostic or non-specific mammograms, breast ultrasounds, breast MRI, breast biopsy, surgical consult with a breast cancer related diagnosis (breast cancer, benign breast neoplasm/CIS, infectious/inflammatory conditions of the breast). Anxiety-related encounters were added for counts during the diagnostic interval but not used for determination of the index contact date.

Table 3. Initial treatment and toxicity outcomes

Category	Variable	Definition and coding	Data Sources	Comments
Treatment	Lumpectomy Coding: Binary variable with [Y/N] values	Indicates whether a patient had a lumpectomy in -2 weeks to 9 months from the date of diagnosis.	Hospital Inpatient Data Same Day Surgery Data (in provinces where it is split out from the Hospital Inpatient Data)	Surgeries are not mutually exclusive. For instance, women who had two types of surgery in the 9 months post diagnosis are counted twice. Mastectomy type was not available in BC. Axillary lymph node dissection was not available in BC and this variable was not captured in NS because we deleted is from the analysis plans.
Treatment	Mastectomy Coding: Binary variable with [Y/N] values	Indicates whether a patient had a mastectomy in -2 weeks to 9 months from the date of diagnosis.	Hospital Inpatient Data Same Day Surgery Data (in provinces where it is split out from the Hospital Inpatient Data)	
Treatment	Type of Mastectomy Values: "bilateral" "unilateral"	Measured for patients who underwent a mastectomy.	Hospital Inpatient Data Same Day Surgery Data (in provinces where it is split out from the Hospital Inpatient Data)	
Treatment	Axillary lymph node dissection Coding: Binary variable with [Y/N] values	Indicates whether a patient had an axillary lymph node dissection in -2 weeks to 9 months from the date of diagnosis.	Hospital Inpatient Data Same Day Surgery Data (in provinces where it is split out from the Hospital Inpatient Data)	
Treatment	Radiotherapy status Coding: Binary variable with [Y/N] values	Indicates if a patient received non-palliative radiotherapy in 9 months of the cancer diagnosis	Radiotherapy data	
Treatment	Chemotherapy status Values: neoadjuvant, Adjuvant, both, NOS, none	Indicates whether a patient received chemotherapy in 9 months after the date of diagnosis and the type of chemotherapy received	Physician Billing Claims Hospital Inpatient Data Same Day Surgery Data (in provinces where it is split out from the Hospital Inpatient Data)	In Nova Scotia, only patients who had intravenous chemotherapy in the two provincial cancer centres and some satellite clinics are captured in the clinical data. In Nova Scotia, IV chemo administration is associated with a feecode in the physician billing data, but this chemo data is not complete. In order to conduct a study at a provincial level, NS developed an algorithm that allows the assignment of chemo receipt and associated dates.

Treatment	Initial treatment course Categories: Mast alone; mast + adj chemo; mast + adj chemo + RT; Mast + neoadj chemo + RT; BCS alone; BCS + adj chemo; BCS + RT; BCS + adj chemo + RT; Surg + other tx combos; No surg; No tx; Unknown tx.	Combined initial treatment course using mastectomy, lumpectomy (BCS), chemotherapy and radiotherapy variables described above	Hospital Inpatient Data Same Day Surgery Data (in provinces where it is split out from the Hospital Inpatient Data) Radiotherapy data Physician Billing Claims	These categories were derived by examining combined treatment frequencies from ON and were refined using the clinical expertise on the team.
Treatment Time Intervals	Time from surgery to adjuvant chemotherapy initiation	Time interval between the date of last surgical procedure within 6 months of breast cancer and the start date of adjuvant chemotherapy. Measure restricted to patients treated with adjuvant chemotherapy. Patients treated with radiotherapy prior to adjuvant chemotherapy were excluded.	Hospital Inpatient Data Same Day Surgery Data (in provinces where it is split out from the Hospital Inpatient Data) Physician Billing Claims Data Radiotherapy data in each province	In Nova Scotia, only patients who had intravenous chemotherapy in the two provincial cancer centres and some satellite clinics are captured in the NSCR/OPIS. In Nova Scotia, Intravenous chemo administration is associated with a feecode in the physician billing data, but this chemo data is not complete. In order to conduct a study at a provincial level, NS developed an algorithm that allows the assignment of chemo receipt and associated dates.
Treatment Time Intervals	Time from first presentation to adjuvant chemotherapy initiation	Time interval between the index contact date (start of the diagnostic interval) to the adjuvant chemotherapy initiation date. Measure restricted to patients treated with adjuvant chemotherapy. Patients treated with radiotherapy prior to adjuvant chemotherapy were excluded.	Hospital Inpatient Data Same Day Surgery Data (in provinces where it is split out from the Hospital Inpatient Data) Physician Billing Claims Data Radiotherapy data in each province	
Time windows used for treatment	a) Neoadjuvant chemotherapy study time frame	Interval from the start of neoadjuvant chemotherapy to the date of surgery	Hospital Inpatient Data	

toxicity outcomes (a to c)			Same Day Surgery Data (in provinces where it is split out from the Hospital Inpatient Data) Physician Billing Claims Data	
	b) Adjuvant chemotherapy study time frame	Interval from the start of adjuvant chemotherapy to 6 months after.	Physician Billing Claims Data	Chemotherapy end date data is not available in NS and Manitoba. The 6-month interval was used to approximate the average duration of chemotherapy.
	c) Pre-chemotherapy study time frame	Between the first post-surgery medical oncologist visit date and the start date of adjuvant chemotherapy treatment	Physician Billing Claims Data	
Treatment toxicity outcomes	Hospitalizations that resulted from an ED visit (EDH) in specified time frame a)-b) above Coding: count data	EDHs are defined as hospitalizations where patients were admitted directly from the emergency department for any reason. Subset count variables: 1) Cancer or Toxicity-related visits 2) Visits at non-regular office days 3) Visits related to Febrile Neutropenia 4) Visits related to other systemic treatment related toxicity	Hospital Inpatient Data	Cancer-related and toxicity-related codes determined from previous ON studies[1,2] In Nova Scotia, ED visits are identified from the physician billing Claims data via a data field for provider type (i.e., will contain 'ER Physician') not location. In Ontario, ED visits are identified from the Physician Billing Claims data where location of service ="ED" In British Columbia, ED visits are identified from the Physician Billing Claims where location of service = "E". In Manitoba, ED visits are identified from the Physician Billing Claims data via billing codes specific to emergency-room based services in conjunction with facility code.
Treatment toxicity outcomes	Direct Hospitalizations (H) in specified time frame a)-b) above Coding: count data	Direct Hospitalizations are defined as hospitalizations where patients were admitted directly without a prior ED visit. Subset count variables: 1) Cancer or Toxicity-related visits 2) Visits at non-regular office days 3) Visits related to Febrile Neutropenia 4) Visits related to other systemic treatment related toxicity	Hospital Inpatient Data	
Treatment toxicity outcomes	ED visits only (E) in specified time frame a)-b) above Coding: count data	ED visits only are defined as visits to an Emergency Department without subsequent hospital admissions. ED visits only are identified from the Physician Billing Claims with a service	Hospital Inpatient Data Physician Billing Claims	

		date more than one day prior or any time after a hospitalization stay. Subset count variables: 1) Cancer or Toxicity-related visits 2) Visits at non-regular office days 3) Visits related to Febrile Neutropenia 4) Visits related to other systemic treatment related toxicity		
Utilization of Physician Services	Number of primary care physician visits in specified time frame a)-c) above Coding: count data	A primary care physician 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. Subset count variables: 1) Cancer-related primary care physician visits	Physician Billing Claims Data Provincial physician databases	Cancer-related visits were any with diagnosis codes equal to: breast cancer, other malignant neoplasms, CIS, anxiety.
Health outcome	Overall Survival	Defined as the number of days between the date of adjuvant chemotherapy initiation and the date of death	Physician Billing Claims Data Health Insurance Plan Clients Registry	In British Columbia, death date information is specified to the month (not day)

[1] Bastedo SJ, Krzyzanowska M, Moineddin R, Yun L, Enright KA, Grunfeld G. A population-based assessment of primary care visits during adjuvant chemotherapy for breast cancer. Curr Oncol. 2017;24(2):90-94. doi:1-.3747/co.24.3431

[2] Krzyzanowska MK, Enright K, Moineddin R, Yun L, Powis M, Ghannam M, Grunfeld E. Can chemotherapy-related acute care visits be accurately identified in administrative data? J Oncol Pract 2017;Nov 20: JOP2017023697. doi: 10.1200/JOP.2017.023697. [Epub ahead of print].

Table 4. Survivorship services indicators

Category	Variable	Definition and coding	Data Sources	Comments
Time frame used in survivorship phase	Survivorship Follow-up time	Defined for each individual as: from 1 to a maximum of 5 years after the cancer diagnosis date depending on the censor date.	Physician Billing Claims Health Insurance Plan Clients Registry Provincial Cancer Registry	Restricted to those alive at 30 months post-diagnosis with no evidence of metastases, recurrence or a second primary cancer. Study patients were then censored 6 months before death or 90 days before a recurrence or new primary cancer.
Healthcare use	Survivorship Continuity of Care with Primary Care Physicians Coding: 0 visits, 1-2 visits, low continuity (<0.75), high continuity (0.76-1)	Measured using Usual Provider Continuity Index for visits to primary care physicians at office, home or long-term care facility in 12 to 36 months after the cancer diagnosis date. 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. High continuity was defined as a score of greater than 0.75, and a score of 1 indicates perfect continuity of care.	Provincial Cancer Registry Physician Billing Claims Provincial physician databases	
Healthcare use	Continuity of Care with Oncologists Coding: 0 visits, 1-2 visits, low continuity (<0.75), high continuity (0.76-1)	Measured using Usual Provider Continuity (UPC) Index for visits to each type of Oncologists in 12 to 36 months after the cancer diagnosis date, including: 1) UPC Index for visits to Medical Oncologists 2) UPC Index for visits to Surgical Oncologists 3) UPC Index for visits to Radiation Oncologists	Physician Billing Claims Provincial physician databases	Surgical oncologists were identified from physicians who performed breast surgery on this cohort of breast cancer patients during the survivorship follow-up period (12 to a maximum of 60 months post cancer diagnosis)
Utilization of Physician Services	Follow-up Physician Type Categories: None; Other specialist only; Primary care physicians; Oncologists; Both	Indicates the type of physicians (PCP vs. Oncologists vs. Other specialist) that interacted with patients during the survivorship follow-up, categorized as: Category “Both primary care and oncologists” further broken down into:	Physician Billing Claims Provincial physician databases	

	primary care physician and oncologists.	PCP+Med onc; PCP+Rad onc; PCP+Surg onc; PCP+Multiple oncologists		
Adherence to guideline	Follow-up visit guideline adherence Categorized as: Less than recommended; Consistent with recommended; Greater than recommended	Two visits measures were considered: a) Oncologist visits + all Primary care physician visits b) Oncologist visits + breast cancer-related Primary Care physician visits Adherence was defined as 3 or 4 visits per year in the first two follow-up years and 2 visits per year afterwards. Follow-up visit guideline adherence was assessed separately for two visits measures (a-b) yearly, and combined over all four years of survivorship follow-up time.	Physician Billing Claims Provincial physician databases	Accords with ASCO 2006 and Canadian guidelines for oncology visits, surveillance mammograms and surveillance imaging [1,2]
Adherence to guideline	Surveillance breast imaging guideline adherence Categorized as: Less than recommended; Consistent with recommended; Greater than recommended	Breast imaging is defined as mammogram, breast ultrasound, breast MRI. Adherence was defined as one surveillance breast imaging per year. Adherence was assessed for patients without bilateral mastectomies yearly and over four years during the survivorship follow-up time.	Physician Billing Claims	
Adherence to guideline	Other surveillance imaging guideline adherence Categorized as: adherent y/n or missing	Other surveillance imaging is defined as investigation traditionally used for surveillance for metastatic breast cancer: bone scans; chest imaging with chest x-rays or chest computerized tomographic scans (CT); abdomen/pelvic imaging with ultrasounds, CT scan, or magnetic resonance imaging (MRI). Adherence is defined as no surveillance imaging for metastatic diseases per year. Adherence was assessed yearly and over four years during the survivorship follow-up time.	Physician Billing Claims	Nova Scotia imaging data were restricted to the Capital Health District due to the complexity in accessing other imaging data from multiple sources. BC excluded: magnetic resonance imaging (MRI). Inter-provincial comparison of "imaging for metastatic disease compliance" will be restricted to urban areas only.

Utilization of Physician Services	Total number of visits to any physician Coding: count data	Defined as a visit to any physician specialty at an office, home, or long-term facility. Measured yearly in the survivorship follow-up period and the following and over all 4 follow-up years combined. Restricted to patients with complete follow-up in the specified time period.	Physician Billing Claims Provincial physician databases	
Utilization of Physician Services	Visits to all primary care physicians Coding: count data	Defined as the number of visits to a family physician or a general practitioner at an office, home, or long-term care facility. Measured yearly in the survivorship follow-up period and the following and over all 4 follow-up years combined. Restricted to patients with complete follow-up in the specified time period.	Physician Billing Claims Provincial physician databases	
Utilization of Physician Services	Breast-cancer related visits to primary care physicians Coding: count data	Defined as visits to a family physician or a general practitioner at an office, home, or long-term care facility for breast-related reasons determined by specified diagnosis code. Measured yearly in the survivorship follow-up period and the following and over all 4 follow-up years combined. Restricted to patients with complete follow-up in the specified time period.	Physician Billing Claims Provincial physician databases	Breast-related encounters were those with a diagnosis of breast cancer, other related cancer, benign breast neoplasm/CIS, infectious/inflammatory conditions of the breast
Utilization of Physician Services	Oncologist visits Coding: count data	Defined as visits to a medical oncologist, radiation oncologist or surgical oncologist at an office, home, or long-term care facility. Measured yearly in the survivorship follow-up period and the following and over all 4 follow-up years combined. Restricted to patients with complete follow-up in the specified time period.	Physician Billing Claims Provincial physician databases	
Utilization of Physician Services	Non-Oncology specialist visits Coding: count data	Defined as visits to specialists other than medical oncologist, radiation oncologist, or surgical oncologist at an office, home, or long-term care facility Measured yearly in the survivorship follow-up period and the following and over all 4 follow-up years combined.	Physician Billing Claims Provincial physician databases	

		Restricted to patients with complete follow-up in the specified time period.		

[1] Khatcheressian JL, Wolff AC, Smith TJ, et al: American Society of Clinical Oncology 2006 update of the breast cancer follow-up and management guidelines in the adjuvant setting. J Clin Oncol 24:5091-5097, 2006.

[2]Grunfeld E, Dhesy-Thind S, Levine M, et al: Clinical practice guidelines for the care and treatment of breast cancer: Follow-up after treatment for breast cancer (summary of the 2005 update). CMAJ 172:1319-1320, 2005

Table 5. Chronic illness and preventive care service indicators

These indicators were assessed for the same chronic disease cohorts at two different 2-year time periods:

1) Baseline: 6-30 months prior to the cancer diagnosis date
2) Survivorship: 12-36 months post the cancer diagnosis date

We adapted previously published cohort definitions and quality indicators for this work from: *Asch SM, Sloss EM, Hogan C, et al: Measuring underuse of necessary care among elderly Medicare beneficiaries using inpatient and outpatient claims. JAMA 284:2325-2333, 2000* and *Earle CC, Neville BA: Under use of necessary care among cancer survivors. Cancer 101:1712- 1719, 2004*.

Category	Variable	Definition and coding	Data Sources	Comments
Cohorts of breast cancer patients with chronic diseases at baseline (6-30 months prior to diagnosis)	Patients with Chronic Stable Angina	Number of patients with a) One or more hospitalizations with diagnosis of chronic stable angina ***or*** b) Two or more physician visits with diagnosis of chronic stable angina	Physician billing claims Hospital Inpatient Data	Across provinces, 1-3% had this chronic disease at baseline, so the numbers were too small in two provinces (MB and NS) to analyse
	Patients with Congestive Heart Failure	Number of patients with a) One or more hospitalizations with diagnosis of Congestive Heart Failure ***or*** b) Two or more physician visits with diagnosis of Congestive Heart Failure	Physician billing claims Hospital Inpatient Data	Across provinces, 2% had this chronic disease at baseline, so the numbers were too small in two provinces (MB and NS) to analyse
	Patients with COPD	Number of patients with a) One or more hospitalizations with diagnosis of COPD ***or*** b) Two or more physician visits with diagnosis of COPD	Physician billing claims Hospital Inpatient Data	Across provinces, 3% had this chronic disease at baseline, so it was **large enough to analyse**
	Patients with Transient Ischemic Attack	Number of patients with a) One or more hospitalizations with diagnosis of Transient Ischemic Attack ***or*** b) Two or more physician visits with diagnosis of Transient Ischemic Attack	Physician billing claims Hospital Inpatient Data	Across provinces, <1% had this chronic disease at baseline, so the numbers were too small in two provinces (MB and NS) to analyse
	Patients with Angina (including unstable angina or chronic stable angina)	Number of patients with a) One or more hospitalizations with diagnosis of Angina ***or*** b) Two or more physician visits with diagnosis of Angina	Physician billing claims Hospital Inpatient Data	Across provinces, 1-3% had this chronic disease at baseline, so the numbers were too small in two provinces (MB and NS) to analyse
	Patients with Diabetes	Number of patients with a) One or more hospitalizations with diagnosis of Diabetes ***or***	Physician billing claims Hospital Inpatient Data	Across provinces, 11-13% had this chronic disease at baseline so it was **large enough to analyse**

		b) Two or more physician visits with diagnosis of Diabetes		
	Patients with known cholelithiasis	Number of patients with a) One or more hospitalizations with diagnosis of cholelithiasis ***or*** b) Two or more physician visits with diagnosis of cholelithiasis	Physician billing claims Hospital Inpatient Data	Across provinces, 1% had this chronic disease at baseline, so the numbers were too small in two provinces (MB and NS) to analyse
	Patients with emphysema	Number of patients with a) One or more hospitalizations with diagnosis of emphysema ***or*** b) Two or more physician visits with diagnosis of emphysema	Physician billing claims Hospital Inpatient Data	Across provinces, <1% had this chronic disease at baseline, so the numbers were too small in two provinces (MB and NS) to analyse
Chronic illness quality measures The indicators were calculated for those members of the baseline chronic disease cohort who were eligible for provincial health insurance plan during all of baseline and years 1 through 3 post-diagnosis.	C1. One visit every 6 mos for patients with **Chronic Stable Angina** Coding: binary y/n	Indicates if a patient with chronic stable angina had one or more visits to any physician every 6 months	Physician billing claims	The indicator was calculated only if the sample size is equal to or greater than 90 as small sample size yields unstable estimates. **Only COPD and diabetes met this criterion for all provinces.** Information for Indicator C8 was unreliable in ON as eye exam coverage is not consistently accessed by ON diabetics because it is not covered for the general population[1]. Information for Indicator C9 was not available in BC and MN. **So the reportable indicators were: C3 and C7**
	C2. Visit every 6 mos for patients with **Congestive Heart Failure** Coding: binary y/n	Indicates if a patient with congestive heart failure had one or more visits to any physician every 6 months	Physician billing claims	
	C3. Visit every 6 mos for patients with **COPD** Coding: binary y/n	Indicates if a patient with COPD had one or more visits to any physician every 6 months	Physician billing claims	
	C4. Visit every yr for patients with diagnosis of **Transient Ischemic Attack** Coding: binary y/n	Indicates if a patient with transient ischemic attack had one or more visits to any physician every year.	Physician billing claims	
	C7. Visit every 6 mos for patients with **Diabetes** Coding: binary y/n	Indicates if a patient with diabetes had one or more visits to any physician every 6 months.	Physician billing claims	
	C8. Eye examination every yr for patients with **Diabetes** Coding: binary y/n	Indicates if a patient with diabetes had one or more eye examinations every year.	Physician billing claims	
	C9. Glycosylated hemoglobin for fructosamine every 6 mos for patients with **Diabetes**	Indicates if a patient with diabetes had one or more test for glycosylated hemoglobin for fructosamine every 6 months.	Physician billing claims Hospital Inpatient Data	

	Coding: binary y/n			
Preventive Care Quality Indicators The indicators were calculated for those members of the baseline chronic disease cohort who were eligible for provincial health insurance plan during all of baseline and years 1 through 3 post-diagnosis.	P1. Influenza vaccination Coding: binary y/n	Indicates if a patient received one or more flu shots.	Physician billing claims	Across provinces, the information was unreliable information or not available
	P2. Cholesterol screening Coding: binary y/n	Indicates if a patient had one or more cholesterol screenings.	Physician billing claims	Information was not available in any province
	P3. Assessment of visual impairment every 2 yrs Coding: binary y/n	Indicates if a patient was assessed for visual impairment.	Physician billing claims	Information was not available in MB and ON
	P5. Cervical cancer screening in age-eligible females Coding: binary y/n	Indicates if an eligible patient received cervical cancer screening.	Physician billing claims Hospital Inpatient Data	Patients had to be age-eligible during the entire baseline and survivorship periods. Information was not available in MB and NS
	P6. Bone densitometry in female patients age>=65 yrs Coding: binary y/n	Indicates if an eligible patient received a test for bone densitometry.	Physician billing claims	Patients had to be age-eligible during the entire baseline period. Information was not available in MB and NS
	P7. Colorectal cancer screening in age-eligible individuals Coding: binary y/n	Indicates if an eligible patient received colorectal cancer screening.	Physician billing claims Hospital Inpatient Data	Patients had to be age-eligible during the entire baseline and survivorship periods. Information was not available in MB and NS
Avoidable Outcomes	A1. Among patients with known **angina**, >=3 emergency department visits for cardiovascular related diagnosis in 1 yr Coding: binary y/n	Measures if a patient with angina had three or more emergency department visits with cardiovascular related diagnosis after the first diagnosis date of angina in the baseline period.	Physician billing claims Hospital Inpatient Data	The indicator was calculated only if the sample size is equal to or greater than 90 as small sample size yields unstable estimates. **Only COPD and diabetes met this criterion for all provinces. So only indicators A4 and A6 were analysed and indicator A6 occurred in 0 to <1% across provinces.** For indicator A1, emergency room visits are usually captured in the National Ambulatory Care Reporting System (NACRS). Since NACRS data is unavailable or incomplete in most of the provinces (NS, MB, BC), ED visits are identified from physician billing claims data in conjunction with Hospital Inpatient data.
	A2. Among patients with known **cholelithiasis**, diagnosis of subsequent perforated gallbladder Coding: binary y/n	Measures if a patient had one or more visits with perforated gallbladder diagnosis after the first diagnosis date of cholelithiasis in the baseline.	Physician billing claims Hospital Inpatient Data	
	A3. Among patients with known **emphysema**, subsequent admission for a respiratory diagnosis Coding: binary y/n	Measures if a patient had one or more admissions with a respiratory diagnosis after the first diagnosis of emphysema in the baseline period.	Hospital Inpatient Data	
	A4. Among patients with known **COPD**, subsequent	Measures if a patient had one or more admissions with a respiratory diagnosis	Hospital Inpatient Data	

	admission for a respiratory diagnosis Coding: binary y/n	after the first diagnosis of COPD in the baseline period.		
	A5. Nonelective admission for **congestive heart failure** Coding: binary y/n	Measures if a patient had one or more hospital admissions with the most responsible diagnosis of congestive heart failure after the first diagnosis in the baseline period.	Hospital Inpatient Data	
	A6. Among patients with known **diabetes**, admission for hyperosmolar or ketotic coma Coding: binary y/n	Measures if a diabetic patient had one or more hospital admissions with a hyperosmolar or ketotic coma diagnosis.	Hospital Inpatient Data	

[1] Kiran "T, Kopp A, Moineddin R, et al. Unintended consequences of delisting routine eye exams on retinopathy screening for people with diabetes in Ontario, Canada. CMAJ 2013. DOI:10.1503/cmaj.120862