

Data Impact Challenge Answer Submission

- Question: For what portion of patients with metastatic disease is cancer screening, or surveillance for a new primary cancer, conducted in a given year?
- Team and list of all team member names: Team Treat Cancer WISely
Team members: Hadas Fischer, Kinwah Fung, Simron Singh, Matt Cheung, Peter Austin, Jill Timmouth, Lorraine Lipscombe

Describing the Data and Analysis

- **Data Custodian Organization(s) and data sources:** We used population-based administrative health care databases from Ontario, Canada that are held at the Institute for Clinical Evaluative Sciences (ICES).
- **List of Datasets Used:** The following datasets were linked using unique encoded identifiers and analyzed at ICES: the Ontario Cancer Registry (OCR), the Registered Persons database, the Ontario Health Insurance Plan (OHIP), the Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD), the Ontario Breast Screening Program (OBSP), and the Ontario Crohn's and Colitis database.
- **Exclusions:** The cohort included all adult residents of Ontario of eligible screening age (age 50 or older), with valid demographic information who were diagnosed with incident colorectal (CRC), lung, breast, or prostate cancer between January 1, 2007 and December 31, 2012. Only individuals who had stage 4 (metastatic) cancer at diagnosis were included. We excluded individuals who had a prior history of any of the four cancers of interest (CRC, lung, breast, prostate) and those who were diagnosed with multiple cancers on the same date. The population did not include patients who progressed to metastatic cancer after being diagnosed with stage 1-3 cancer at diagnosis. The cohort also did not include individuals for whom stage information was not available at the time of diagnosis. Patients younger than the screen-eligible age (<50 years) were excluded.

We examined the cumulative incidence of cancer screening at 1 year and 3 years after diagnosis for the following two primary cancers separately:

1. For the CRC screening analysis, we also excluded:
 - Patients who had CRC as their incident cancer diagnosis.
 - Patients with a previous history of inflammatory bowel disease.
 2. For the Breast Cancer screening analysis, we excluded:
 - Women who had breast cancer as their incident cancer diagnosis
 - Male patients (male CRC and lung cancer patients and prostate cancer patients).
- **Nature and Size of Cohort** (e.g. geographic area covered, number of patients included):
We analysed two cohorts based on the type of cancer screening:
 1. CRC screening analysis: All adult Ontario residents age 50 – 105 years who were diagnosed with incident lung, breast, or prostate stage 4 cancer in the years 2007 – 2012. N = 20,992

2. Breast cancer screening analysis: All female Ontario residents age 50 – 105 years who were diagnosed with incident lung or colorectal stage 4 cancer in the years 2007 – 2012.

N = 10,034

- **Data timeframe**: Cohort of patients with stage 4 colorectal, lung, breast or prostate cancer in the years January 1, 2007 – Dec 31, 2012. Follow-up period was up to December 31, 2013.

Brief summary of the analysis methodology:

The following definitions were used to identify screening:

1. CRC screening: Individual had a fecal occult blood test (FOBT) OR underwent an outpatient colonoscopy.
2. Breast cancer screening: Women who had a mammogram through the Ontario Breast Screening Program or had a bilateral mammogram based on OHIP billing.

This is a retrospective cohort study. Since this study population has a high mortality rate, the incidence of screening was calculated using the cumulative incidence function which takes into account the competing risk of death or the occurrence of the cancer for which the patient was being screened (prior to being screened). For breast cancer, we identified the sub-group of patients who received breast cancer screening through a provincial screening program (OBSP) or via OHIP billings. In regards to CRC, FOBT is generally only done for screening purposes. Colonoscopy however may be done for either screening or for symptoms such as bleeding, therefore we identified these 2 tests separately and limited colonoscopies to outpatient procedures. We estimated screening rates stratified by the following age categories: 50 – 74 years, and ≥ 75 years. Screening rates were described for the period of 1 year and 3 years following incident cancer diagnosis. Only the first screening test (regardless of type) after cancer diagnosis was counted.

Findings

Numerator and denominator definitions were not applicable in these analyses because of the attrition of patients due to death and the occurrence of the cancer for which they were screened.

Colorectal Cancer Screening:

Among the 20,992 adult patients with metastatic lung, breast, and prostate cancer, CRC screening within 1 year of cancer diagnosis occurred in 2.8%, 6.1%, and 13.0%, respectively. Note: A proportion of the outpatient colonoscopies may have been performed for symptoms rather than screening.

Breast Cancer Screening:

Among the 10,034 women with metastatic CRC and lung cancer, breast cancer screening within 1 year following cancer diagnosis occurred in 8.0% and 8.7% of women, respectively.

Table 1 presents the rate (%) of colorectal and breast cancer screening within 1 and 3 years following diagnosis, and stratified by cancer site and age.

Table 1: Screening rates in patients with stage 4 colorectal, lung, breast or prostate cancer

Table 1a: Colorectal Screening (%)			
	Lung Cancer N= 15,948	Breast Cancer N = 1,678	Prostate Cancer N = 3,366
CRC screening rate (%) within 1 year after diagnosis			
Overall	2.8	6.1	13.0
By age			
Age 50 – 74 years ^u	3.2	7.7	15.6
Age ≥ 75 years	2.0	2.9	9.5
By screening modality			
FOBT	1.5	3.2	7.4
Outpatient colonoscopy	1.3	2.9	5.6
CRC screening rate (%) within 3 years after diagnosis			
Overall	3.9	11.9	26.9
Table 1b: Breast Cancer Screening (%)			
	Lung Cancer N= 7,323	Colorectal N = 2,711	
Breast cancer screening rate (%) within 1 year after diagnosis			
Overall	8.7	8.0	
By age			
Age 50 – 74 years ^u	10.9	12.4	
Age ≥ 75 years	4.4	3.0	
Screening through OBSP			
OBSP	2.0	3.3	
Non-OBSP mammogram	6.7	4.6	
Breast cancer screening rate (%) within 3 years after diagnosis			
Overall	10.2	13.1	

^u Recommended average risk screening age

FOBT - Fecal Occult Blood Test; OBSP - Ontario Breast Screening Program

Interpretation & limitations:

Our findings demonstrate that a significant proportion of patients with metastatic cancer with a known poor prognosis received screening for new primary cancers. Screening in this population is not only an inappropriate use of scarce health care resources, but also potentially affects quality patient care. From a patient perspective, such screening exposes them to potential harms as well as involves extra testing, time, stress and financial burden in a population very unlikely to benefit. Patients with stage 4 disease already have a difficult journey and this excess testing only adds to the patients' difficulties during this time.

Screening rates for both CRC and breast cancer were higher in individuals age 50 – 74, which is the recommended age in Ontario for CRC and breast cancer screening in an average risk population.

CRC screening was higher in men with prostate cancer compared to patients with lung or breast cancer, which may be due the fact that stage 4 prostate cancer is not as imminently fatal. It may also be attributed to colonoscopies done for rectal bleeding post radiation treatment.

Limitations: Using the OHIP fee codes throughout the study period, we cannot rule out that a proportion of the colonoscopies may have been done to investigate symptoms such as bleeding and were not for screening purposes. A sub-analysis using data from 2012-2013, when an OHIP code for colonoscopy for symptoms was introduced, showed that up to 61% of colonoscopies in this population were coded as “colonoscopy in the presence of signs and symptoms” and therefore our results may overestimate CRC screening colonoscopies. However, the rate of FOBT remained high in all groups, indicating with this modality alone that CRC screening was excessive. Our data also does not allow us to determine the reason for bilateral mammograms identified by OHIP (for example, some may have been performed for symptoms such as a lump on physical examination), however similar OHIP codes have been verified and are used routinely for other provincial quality indicators like the Cancer System Quality Index measured annually in Ontario.

Conclusion: Our findings indicate inappropriate screening and investigation in metastatic stage 4 patients. Further investigation should be targeted to causes for this, as well as costs to the health system (resource utilization), financial costs borne by patients (lost productivity and additional indirect costs), and non-financial implications to patients and caregivers (including harms resulting from screening and impact on quality of life).

Acknowledgement: This study was supported by the Institute for Clinical Evaluative Sciences (ICES), which is funded by an annual grant from the Ontario Ministry of Health and Long-Term Care (MOHLTC). The opinions, results and conclusions reported in this paper are those of the authors and are independent from the funding sources. No endorsement by ICES or the Ontario MOHLTC is intended or should be inferred. Parts of this material are based on data and information compiled and provided by CIHI. However, the analyses, conclusions, opinions and statements expressed herein are those of the authors, and not necessarily those of the CIHI.