2012 ARCC Conference
CONCURRENT SESSION C: Cancer Costing in Canada

First-year costs of Cancer Care in Ontario

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Background

- Cancer is a leading cause of death in Canada, with costly implications for patients and governments.

- Understanding how health care resources are spent on cancer treatment is important to policy makers and health researchers to make future decisions.
Overview of project

- **Objective**: estimate cancer costs for patients diagnosed with one of the 21 most common cancers in Ontario between 1997 and 2007

- Parallel analyses conducted in British Columbia, under the auspices of the Canadian Centre for Applied Research in Cancer Control (ARCC)
Overview of project

• Analyses/Products:
  • First Year Costs for Most Common Cancer Diagnoses
  • Evaluation of Trends in 1st Year Cancer Costs
  • 5-year Cancer Costs
  • Lifetime Cancer Costs
  • Cancer Costing Methods
  • Contribute to the improvement of costing methods in Ontario
Cohort Selection

• Included:
  • patients assigned a single, valid ICD-O code corresponding to primary cancer diagnosis
  • patients with no 2\textsuperscript{nd} cancer diagnosed within 90 days of initial cancer diagnosis
  • patients who survived \( \geq 30 \) days after initial diagnosis

• Excluded:
  • patients with missing, unusual or incorrect histology codes
Cohort Selection

Cancer sites examined:

<table>
<thead>
<tr>
<th>Brain</th>
<th>Head and neck</th>
<th>Ovary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female breast</td>
<td>Leukemia</td>
<td>Pancreas</td>
</tr>
<tr>
<td>Cervix</td>
<td>Liver</td>
<td>Prostate</td>
</tr>
<tr>
<td>Colorectal</td>
<td>Lung</td>
<td>Renal</td>
</tr>
<tr>
<td>Corpus uteri</td>
<td>Lymphoma</td>
<td>Testis</td>
</tr>
<tr>
<td>Esophagus</td>
<td>Melanoma</td>
<td>Thyroid</td>
</tr>
<tr>
<td>Gastric</td>
<td>Myeloma</td>
<td>Urinary bladder</td>
</tr>
</tbody>
</table>

22\textsuperscript{nd} category - all other tumour sites combined
Costing of Resources

- Activity Level Reporting System (ALR) (data from Cancer Care Ontario)
- New Drug Funding Program (NDFP) (data from Cancer Care Ontario)
- CIHI Discharge Abstract Database (DAD)
- National Ambulatory Care Reporting System (NACRS)
- Ontario Drug Benefit Plan (ODB)
- Ontario Home Care Administrative System (OHCAS)/Home Care Database (HCD)
- Continuing Care Reporting System (CCRS)
- Ontario Health Insurance Plan (OHIP)
## Costing of Resources

<table>
<thead>
<tr>
<th>Type of Service</th>
<th>Database</th>
<th>Unit</th>
<th>Weight</th>
<th>Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cancer-specific care</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>OHIP/NACRS</td>
<td>Visit/Weighted Case</td>
<td>RIW</td>
<td>Cost Per Weighted Case (CPWC)</td>
</tr>
<tr>
<td>NDFP (chemotherapy)</td>
<td>NDFP</td>
<td>Dose</td>
<td>N/A</td>
<td>Cost Per Dose</td>
</tr>
<tr>
<td>Radiation Therapy</td>
<td>ALR</td>
<td>Fraction (NHPIP codes)</td>
<td>N/A</td>
<td>Earle et al. cost estimate</td>
</tr>
<tr>
<td><strong>Hospital-based care</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inpatient Hospitalization</td>
<td>DAD</td>
<td>Weighted Case</td>
<td>RIW</td>
<td>Cost Per Weighted Case (CPWC)</td>
</tr>
<tr>
<td>Same Day Surgery</td>
<td>NACRS</td>
<td>Weighted Case</td>
<td>CACS RIW</td>
<td>Cost Per Weighted Case (CPWC)</td>
</tr>
<tr>
<td>Emergency Department</td>
<td>NACRS</td>
<td>Weighted Visit</td>
<td>CACS RIW</td>
<td>Cost Per Weighted Visit</td>
</tr>
<tr>
<td><strong>Tertiary Care</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complex Continuing Care Hospital</td>
<td>CCRS</td>
<td>Weighted Day</td>
<td>CMI</td>
<td>Cost Per Weighted Day</td>
</tr>
<tr>
<td>Long Term Care Facility</td>
<td>ODB/MOHL.TC</td>
<td>Day</td>
<td>N/A</td>
<td>Cost Per Diem</td>
</tr>
<tr>
<td>Home Care</td>
<td>OHCAS, HCD</td>
<td>Visit</td>
<td>N/A</td>
<td>Cost Per Visit</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary and Specialist Physician services</td>
<td>OHIP</td>
<td>Visit</td>
<td>N/A</td>
<td>OHIP Fee</td>
</tr>
<tr>
<td>Prescription Drugs (outpatient)</td>
<td>ODB</td>
<td>Visit</td>
<td>N/A</td>
<td>ODB Fee</td>
</tr>
<tr>
<td>Diagnostic Tests</td>
<td>OHIP</td>
<td>Visit</td>
<td>N/A</td>
<td>OHIP Fee</td>
</tr>
</tbody>
</table>
Results

Most common cancer diagnoses within age groups
Results

Mean Costs of Care Before & After Dx for Long-term Survivors
Results

Mean Costs of Care Before & After Dx for Short-term Survivors
Results

Overall Breakdown of Resources (for all cancers):

*Long-term survivors*

Pre-diagnosis phase
- diagnostic tests (33%), LTC (17%), inpatient hospitalization (16%)
- physician services low

Post-diagnosis phase
- inpatient hospitalization (35%), chemotherapy (12%), SDS (9%)
- ER low
Results

Overall Breakdown of Resources (for all cancers):

*Short-term survivors*

Pre-diagnosis phase
- diagnostic tests (30%), inpatient hospitalization (25%)
- physician services low

Post-diagnosis phase
- inpatient hospitalization (62%)
- LTC low
## Results

**First-year cost estimates for Ontario:**

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td>7,235</td>
<td>$15,646</td>
<td>$113,198,810</td>
</tr>
<tr>
<td>Breast</td>
<td>5,217</td>
<td>$23,274</td>
<td>$121,420,458</td>
</tr>
<tr>
<td>Colorectal</td>
<td>5,010</td>
<td>$37,601</td>
<td>$188,381,010</td>
</tr>
<tr>
<td>Lung</td>
<td>4,867</td>
<td>$32,250</td>
<td>$156,960,750</td>
</tr>
<tr>
<td>Non-Hodgkin Lymphoma</td>
<td>1,838</td>
<td>$31,092*</td>
<td>$57,147,096</td>
</tr>
<tr>
<td>Melanoma</td>
<td>1,490</td>
<td>$15,065</td>
<td>$22,446,850</td>
</tr>
<tr>
<td>Pancreas</td>
<td>746</td>
<td>$43,518</td>
<td>$32,464,428</td>
</tr>
<tr>
<td>Brain</td>
<td>695</td>
<td>$46,428</td>
<td>$32,267,460</td>
</tr>
</tbody>
</table>

* Mean cost estimate is for lymphoma (Hodgkin and non-Hodgkin)
Results

Trends in first-year cost estimates for Ontario (<45)
Results

Trends in first-year cost estimates for Ontario (45+)

![Graph showing trends in first-year cost estimates for different cancers in Ontario. The graph displays the mean cost (in 2009 dollars) over the years from 1997 to 2007 for Breast, Lung, Colorectal, and Prostate cancers.]
Results

Trends in first-year cost estimates for Ontario (65+)

![Graph showing trends in first-year cost estimates for Ontario (65+)]
Conclusions

• 1st year pre- and post-diagnosis mean costs of cancer care in Ontario are substantial and vary by tumour site

• Esophageal cancer most expensive cancer in first year post-diagnosis for medium- and long-term survivors

• Cancers with high 5-year relative survival ratio (thyroid, testicular and melanoma) lowest mean cost for medium- and long-term survivors

• Testicular cancer most expensive cancer in first year post-diagnosis for short-term survivors

• Liver cancer least expensive for short-term survivors
Conclusions

• Diagnostic tests and inpatient hospitalization - 50% of total costs in pre-diagnosis phase

• Inpatient hospitalization - largest portion of total costs in post-diagnosis phase (35% and 61% for long-term and short-term survivors, respectively)

• Results largely in agreement with previous studies for patients aged 65+ in US

• Within cancer sites: northern and larger LHINs presented highest costs; smaller LHINs presented lowest costs
Policy implications

- useful in planning for future health care budgets and setting priorities for allocating resources
  - cancers with largest financial burden during 1st year post-diagnosis: colorectal, lung, breast, prostate cancer

- improve quality of future cancer-related economic evaluations by providing accurate estimates of 1st year cancer costs
Next steps in our analysis

- phase-specific and lifetime costs of cancer care in Ontario
  - determine length of phases of care (initial care, continuing care and terminal care phases)
  - estimate net cancer-related costs for each phase through matching

- use of statistical methods to estimate costs
  - comparison of estimates from both methods
Summary/Concluding Remarks

Future analyses/extensions:

• extend analyses to other populations (example: children)
  • CIHR grant funded
• data linkage between healthcare and workplace administrative datasets to estimate indirect morbidity costs (disability days lost to cancer care, absenteeism)
  • obtain more global picture of burden of cancer care to society
• additional Canada-US comparisons
  • end of life care and costs study
Thank you.

Acknowledgments:
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