Estimating Costs of Hospital Stays

Anyk Glussich
Program Lead, Financial Standards and Information (FSI)
Canadian Institute for Health Information (CIHI)
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CIHI Mandate

To lead the development and maintenance of comprehensive and integrated health information that:

- Enables sound policy; and

- Provides effective health system management to improve health and health care.
Data Sources

- Hospitals
- Clinicians
- Regulatory authorities and professional associations
- Provinces and territories
- Other organizations
- Regional health authorities
- Residential facilities

Analytical Products
Agenda

1. Requirements for Costing Hospital Stays

2. Hospital Patient Cost Estimates
   a) Bottom-Up (Patient Costing)
   b) Top-Down (Cost of a Standard Hospital Stay)
   c) Per Diems

3. Caveats

4. Resources
Data Requirements for Costing Hospital Stays

• Information about utilization
  – Patient-specific information about diagnoses, interventions implemented, length-of-stay, etc.

• Information about costs
  – Comprehensive costs that accurately estimate the patient’s utilization of services
Hospital Utilization Data Sources at CIHI

- **Discharge Abstract Database (DAD)**
  - Captures administrative, clinical and demographic information on hospital discharges and some day surgeries.

- **National Ambulatory Care Reporting System (NACRS)**
  - Contains data for hospital-based and community-based ambulatory care.

- **International Statistical Classification of Diseases, 10th Revision, Canadian Version (ICD-10 CA) & Canadian Classification of Health Interventions (CCI)**

- **CIHI Case Mix Products:**
  - Grouping Methodologies: CMG+, CACS
  - Statistics: RIW, ELOS
Hospital Financial Data Sources at CIHI

• Financial
  – The MIS Standards
    • A set of national standards for the collection & reporting of financial and statistical data related to day-to-day operations of health service organizations across the continuum
    • Typically reported by functional centre (“business unit”)
  – The Canadian Patient Cost Database (CPCD)
    • Costed patient encounters collected by organizations in Ontario, Alberta and Nova Scotia
  – The Canadian MIS Database (CMDB)
    • Financial and statistical data reported by health service organizations in Canada
    • No patient-level data
“Bottom-Up” Cost Estimates

- The collection of detailed data on resources utilized and the value of those resources at the patient level

- Also known as:
  - Patient Costing
  - Case Costing
  - Service Recipient Costing
  - Unit Costing
  - Micro Costing
  - Etc.
Canadian Hospital

**Unique Identifier**: 1234
**Encounter**: 22
**MCC**: 08
**CMG**: 321

**Date of Admission**: YYYY/MM/DD
**Date of Discharge**: YYYY/MM/DD
**Date of Birth**: YYYY/MM/DD
**Postal Code**: ANA NAN
**Physician**: Dr Bob

## Nursing Inpatient Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Direct Cost</th>
<th>Indirect Cost</th>
<th>Full Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Surgical Nursing Unit</td>
<td>$1,086</td>
<td>$268</td>
<td>$1,354</td>
</tr>
<tr>
<td>Operating Room</td>
<td>$950</td>
<td>$235</td>
<td>$1,185</td>
</tr>
<tr>
<td>Recovery Room</td>
<td>$320</td>
<td>$165</td>
<td>$485</td>
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</tbody>
</table>

## Diagnostic and Therapeutic Services

<table>
<thead>
<tr>
<th>Service</th>
<th>Direct Cost</th>
<th>Indirect Cost</th>
<th>Full Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen, Procurement and Dispatch</td>
<td>38</td>
<td>6</td>
<td>44</td>
</tr>
<tr>
<td>Clinical Chemistry</td>
<td>128</td>
<td>25</td>
<td>153</td>
</tr>
<tr>
<td>Hematology</td>
<td>80</td>
<td>29</td>
<td>109</td>
</tr>
<tr>
<td>X-Ray</td>
<td>180</td>
<td>41</td>
<td>221</td>
</tr>
<tr>
<td>Pulmonary Function</td>
<td>293</td>
<td>51</td>
<td>344</td>
</tr>
<tr>
<td>Physiotherapy</td>
<td>305</td>
<td>82</td>
<td>387</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>120</td>
<td>48</td>
<td>168</td>
</tr>
</tbody>
</table>

## Traceable Supplies and Other Expenses

<table>
<thead>
<tr>
<th>Item</th>
<th>Direct Cost</th>
<th>Indirect Cost</th>
<th>Full Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplies - Knee Prosthetic</td>
<td>4,500</td>
<td>4,500</td>
<td>9,000</td>
</tr>
<tr>
<td>Drugs - General Surgical Nursing</td>
<td>357</td>
<td>357</td>
<td>714</td>
</tr>
<tr>
<td>Drugs - Operating Room</td>
<td>150</td>
<td>150</td>
<td>300</td>
</tr>
</tbody>
</table>

**Total Cost - Unique Identifier 1234 - Encounter 22**

<table>
<thead>
<tr>
<th>Direct Cost</th>
<th>Indirect Cost</th>
<th>Full Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>$8,507</td>
<td>$950</td>
<td>$9,457</td>
</tr>
</tbody>
</table>

**Diseases and Disorders of the**

**Musculoskeletal System and Connective Tissue**

**Unilateral Knee Replacement**
Canadian Patient Cost Database (CPCD)

- Contains patient records with associated costs

- Patient costs are calculated by aggregating:
  - patient-specific reported costs
  - non-patient specific reported costs that are distributed to patients via an allocation basis
Dimensions of CPCD Data

- Functional Centre: Which business areas of the hospital contributed the most to the patient cost?
- Cost Group: What types of costs contribute the most to the patient cost?
- Day: Which days of the patient’s stay were the most expensive? The least expensive?
Number of CPCD Sites for Year of Most Recent Data Submission (Jan 2016)

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>FY</th>
<th>Inpatient (DAD)</th>
<th>Ambulatory (NACRS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario</td>
<td>2013</td>
<td>49</td>
<td>51</td>
</tr>
<tr>
<td>Alberta</td>
<td>2013</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>62</td>
<td>68</td>
</tr>
</tbody>
</table>
“Top-Down” Cost Estimates

• Estimating the cost of a hospital stay via aggregate financial and clinical information

• Also known as:
  – Case-Mix Costing
  – Cost of a Standard Hospital Stay
  – Cost Per Weighted Case*
CIHI’s case mix system for grouping acute inpatient data (CMG+)

Astronomical # of combinations of diagnoses and interventions

> 3,000,000 discharges in DAD

529 Case Mix Groups

Reasonable number of groups with which to make comparisons between patient types

Goal: Groupings with similar clinical and resource utilization characteristics
Resource Intensity Weights

- Resource – reflect total $$

- Intensity – amount of the service utilized

- Weight – relative value

  – compared to an “average case” of 1.0000

  – Cases more resource intensive than the average are >1, those less intensive than the average are <1.
Examples of RIWs in CMG+ †

• Example 1
  – A case in CMG 221 (Colostomy) in Age Group 18 to 59 years, and no comorbidities, flagged interventions or intervention event.
  – Base RIW for CMG 221, Age Group 18-59 = 1.84054

• Example 2
  – Same case as in Example 1, with Comorbidity Level 4
  – Base RIW * Factor Effect = 1.84054 * 2.52952 = 4.65568

† RIW & CMG Methodology Year 2014
Cost Of A Standard Hospital Stay (CSHS)

Total Acute Inpatient Cost**

Number of Acute Inpatient Weighted Cases***

** Includes actual inpatient costs from Canadian hospitals that report to the Canadian MIS Database.

*** Relates to RIWs assigned to acute inpatients in the Discharge Abstract Database
From CSHS to a Cost Estimate

$\text{CSHS}_i \times \text{RIW}_j = \text{Hospital cost estimate of treating a specific patient}$

$i = \text{national, provincial, regional or hospital level}$

$j = \text{patient in DAD}$
Example: Cost Estimate for CMG 136 (Bacterial Pneumonia)

Hospital A’s 2012-2013 CSHS = $5,567

CMG 136, Age 18-59 typical cases with no factors

Base RIW = 0.90127

Expected Cost of Bacterial Pneumonia patient at Hospital A = 0.90127 x $5,567

= $5,017.37
Patient Cost Estimates

Cost of a specific patient
(Patient Cost Data)

Average cost of a specific patient
($\text{CSHS}_{\text{fac}} \times \text{RIW}_{\text{pt}}$)

Average cost of an average patient in a jurisdiction
($\text{CSHS}_{\text{prov}} \times \text{RIW}_{\text{pt}}$)
(Patient Cost Cost Estimator)
Inpatient Per Diem Rates

- Numerator: Total inpatient expenses in hosp.
- Denominator: Total inpatient days in hosp.
- Cost estimate = Per Diem * LOS

Some limitations…consider:

<table>
<thead>
<tr>
<th>CMG #</th>
<th>CMG Name</th>
<th>Base RIW</th>
<th>ELOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>315</td>
<td>Hip Replacement</td>
<td>2.23</td>
<td>5.3</td>
</tr>
<tr>
<td>136</td>
<td>Bacterial Pneumonia</td>
<td>0.90</td>
<td>5.4</td>
</tr>
</tbody>
</table>

* for age group 18-59, DAD RIW & ELOS, for CMG+ 2014
Cost Estimate Myths

• “Thanks for this! Now I have estimates for health system costs for <insert illness here>”.
  – These estimates reflect hospital costs only.

• “I want to use patient costing data because it’s the real cost; CSHS figures are just an estimate.”
  – Patient costing figures are estimates too, albeit more precise than CSHS

• “All I am interested in is the cost of the intervention/procedure. Don’t give me all of that other stuff.”
  – These cost estimates reflect the patient stay, not the intervention per se.
Resources

• Patient Cost Estimator: www.cihi.ca/pce

• Health System Performance (CSHS): http://yourhealthsystem.cihi.ca/

• CSHS Methodology Notes: http://indicatorlibrary.cihi.ca/pages/viewpage.action?pageId=1114237
Thank You!

Grouping Methodologies and RIWs: casemix@cihi.ca

Financial Standards and Information: fsi@cihi.ca