



Estimating Costs of Hospital Stays

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On The State of The Art in Costing Methods

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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.

Stakeholders



Data Sources

Hospitals



Clinicians



Regulatory authorities and professional associations



Provinces and territories



Other organizations



Regional health authorities



Residential facilities



Analytical Products

Agenda

1. CIHI Data Sources and Methodologies

2. Hospital Patient Cost Estimates
 - a) Top-Down (Cost of a Standard Hospital Stay)

 - b) Bottom-Up (Patient Costing)

Clinical Data Sources

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

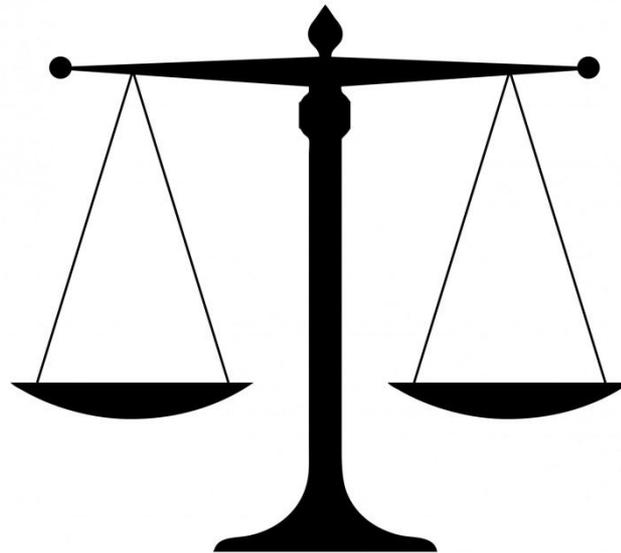
- **CIHI Case Mix Products:**
 - Grouping Methodologies: CMG+, CACS
 - Statistics: RIW, ELOS



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

Calibration data for CMG+

- **Clinical data (DAD abstracts)**
 - Full coverage of all inpatient episodes
 - ICD-10-CA diagnoses and CCI interventions

- **Patient cost data**
 - Historically, only available from a number of facilities within Ontario, Alberta and British Columbia
 - Fully-costed patient encounters

Case mix group variables (CMG+)

- Clinical data (diagnoses and interventions) from each episode is used to assign it to a **Case Mix Group (CMG)**
- Two key health resource indicators are calculated
 - Expected Length Of Stay (ELOS)
 - **Resource Intensity Weight (RIW)**

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 .

Resource Intensity Weights

- Variation in resource consumption and length of stay exist for cases within a CMG
- Five factors used to account for this variation
 1. Age group
 2. Comorbidity level
 3. Flagged interventions
 4. Intervention event
 5. Out-of-hospital interventions

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

Financial Data Sources

- Financial
 - **The Canadian MIS Database (CMDB)**
 - Financial and statistical data reported by health service organizations in Canada
 - No patient-level data
 - The MIS Standards
 - A set of national standards for the collection and reporting of financial and statistical data related to day-to-day operations of health service organizations across the continuum
 - **The Canadian Patient Cost Database (CPCD)**
 - Costed patient encounters collected by organizations in Ontario, Alberta and British Columbia



Examples of Data Reported to the CMDB



Type of Data	Data Element	Examples
Financial	Revenues	Global Funding, Donations, etc.
Financial	Expenses	Compensation, Supplies, Equipment-Related Expenses, etc.
Statistical	Volume of Hours Earned by Employees	# of Worked Hours, # of Benefit Hours, # of Purchased Hours
Statistical	Volume of Service Activity	# of Exams Performed, # of Procedures/ Interventions Performed, # of Inpatient Days, etc.

Functional Centre

- Data in the CMDB is reported by **functional centre**
- (Def'n) *A subdivision of an organization used to record the budget and actual expenses, statistics, and revenues which pertain to the function or activity being carried out.*
- Examples of functional centres:
 - Intensive Care Unit
 - Operating Room
 - Pharmacy
 - Information Systems

Canadian Patient Cost Database (CPCD)

- Contains patient records with *associated costs*
- Care Types: *DAD, NACRS, NRS, OMHRS, CCRS*
- Patient costs are calculated through patient-specific reported costs and resource-intensive algorithms that distribute MIS costs to patients

In summary...

- **Canadian MIS Database (CMDB)**
 - Aggregate financial and statistical data for individual health service organizations from all jurisdictions except Nunavut
- **Canadian Patient Cost Database (CPCD)**
 - Patient-record costing data from select organizations in Ontario, Alberta and British Columbia

How can we assess **Value for Money**?



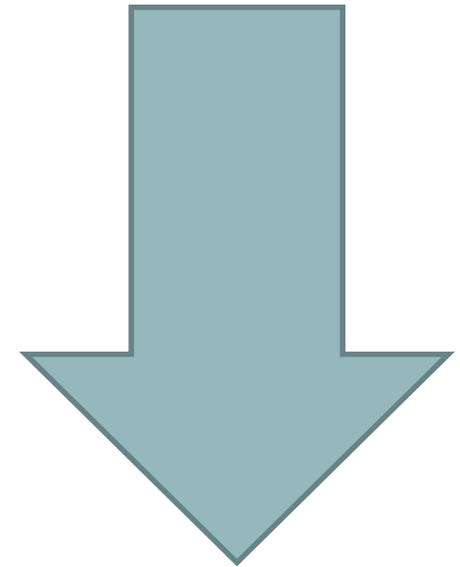
Which resources are being used to provide which services?

Are resources being used well?

Are services being used to foster a healthy population?

“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*



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

Sources of the CSHS

- **CMDB (Numerator)**
 - Full acute inpatient cost is calculated for each hospital
 - Includes acute inpatient costs regardless of which functional centre they are reported in
 - Is a full cost (direct cost + indirect cost)
- **DAD (denominator)**
 - Each patient in the DAD is ‘grouped’ and assigned an RIW
 - The RIWs are aggregated by hospital (“weighted cases”)

From CSHS to a Cost Estimate

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

i = national, provincial, regional or hospital level

j = 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

Limits of CSHS

- Only includes costs incurred by the hospital
- Does not include any physician costs
- Not available for Nunavut or Northwest Territories
- CSHS cost estimates cover all significant conditions treated during the inpatient stay, not just the most responsible diagnosis.

Patient Cost Estimator

- Available on CIHI website: www.cihi.ca/pce
- Allows a user to calculate cost estimates by Case Mix Group based on the $CSHS * RIW$ formula

Inpatient Per Diem Rates

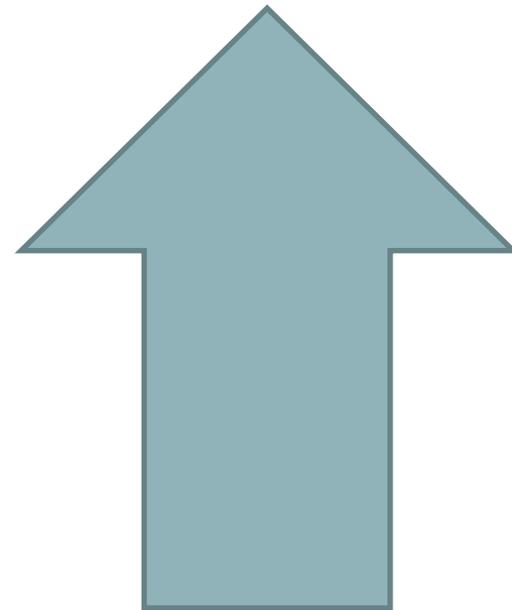
- Numerator: Total inpatient expenses in hosp.
- Denominator: Total inpatient days in hosp.
- Cost estimate = **Per Diem * LOS**
- Some limitations...consider:

CMG #	CMG Name	Base RIW	ELOS
315	Hip Replacement	2.23	5.3
136	Bacterial Pneumonia	0.90	5.4

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

“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.



Roll the Clip!

- http://www.youtube.com/watch?v=bMtZRGPXx_o

Hospital Patient Cost Record



Canadian Hospital

Unique Identifier	1234	Encounter	22	
Date of Admission	YYYY/MM/DD	MCC 08		Diseases and Disorders of the Musculoskeletal System and Connective Tissue
Date of Discharge	YYYY/MM/DD			Unilateral Knee Replacement
Date of Birth	YYYY/MM/DD	CMG 321		
Postal Code	ANA NAN			
Physician	Dr Bob			

Nursing Inpatient Services

	Direct Cost	Indirect Cost	Full Cost
General Surgical Nursing Unit	\$ 1,086	\$ 268	\$ 1,354
Operating Room	950	235	1,185
Recovery Room	320	165	485

Diagnostic and Therapeutic Services

Specimen, Procurement and Dispatch	38	6	44
Clinical Chemistry	128	25	153
Hematology	80	29	109
X-Ray	180	41	221
Pulmonary Function	293	51	344
Physiotherapy	305	82	387
Pharmacy	120	48	168

Traceable Supplies and Other Expenses

Supplies - Knee Prosthetic	4,500		4,500
Drugs - General Surgical Nursing	357		357
Drugs - Operating Room	150		150

Total Cost - Unique Identifier 1234 - Encounter 22

\$	<u>8,507</u>	\$	<u>950</u>	\$	<u>9,457</u>
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Dimensions of CPCD Data

**Functional
Centre**

**Which business areas
of the hospital
contributed the most
to the patient cost?**

**Cost
Group**

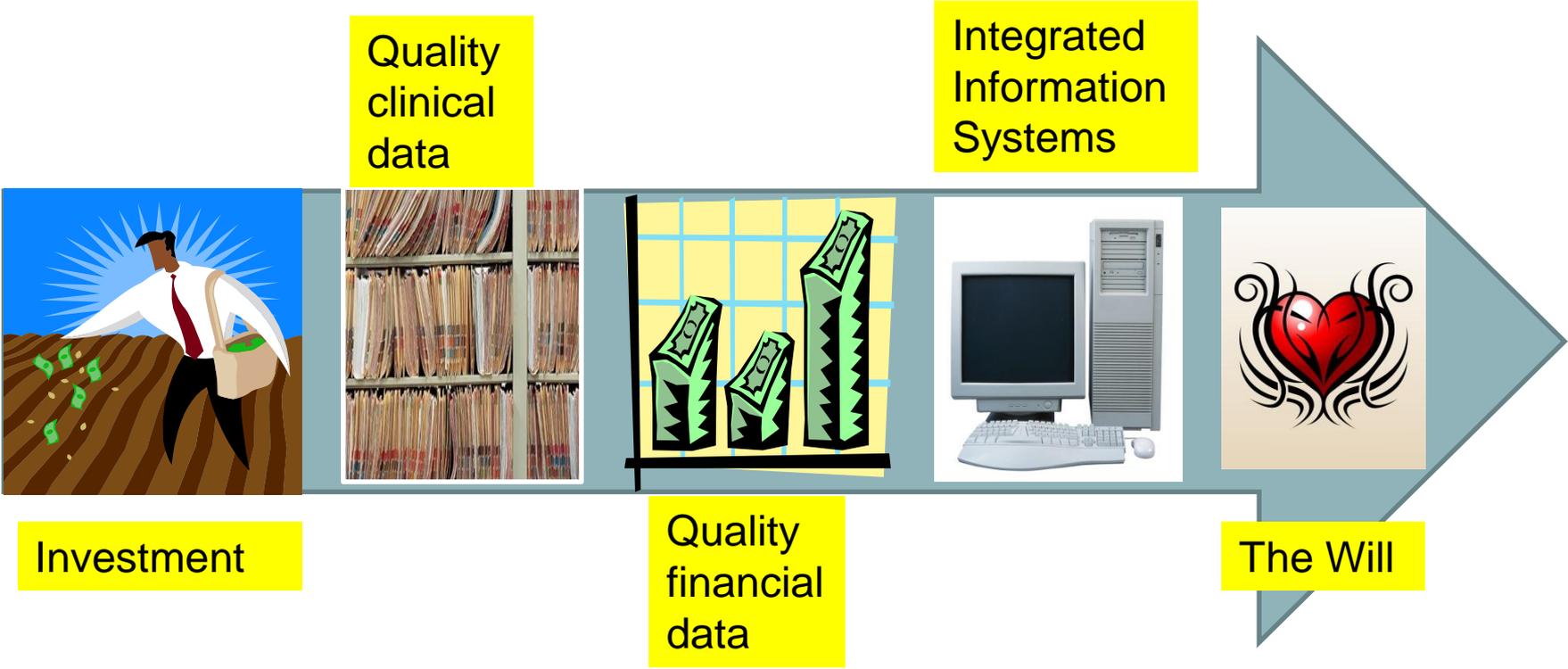
**What types of costs
contribute the most to
the patient cost?**

Day

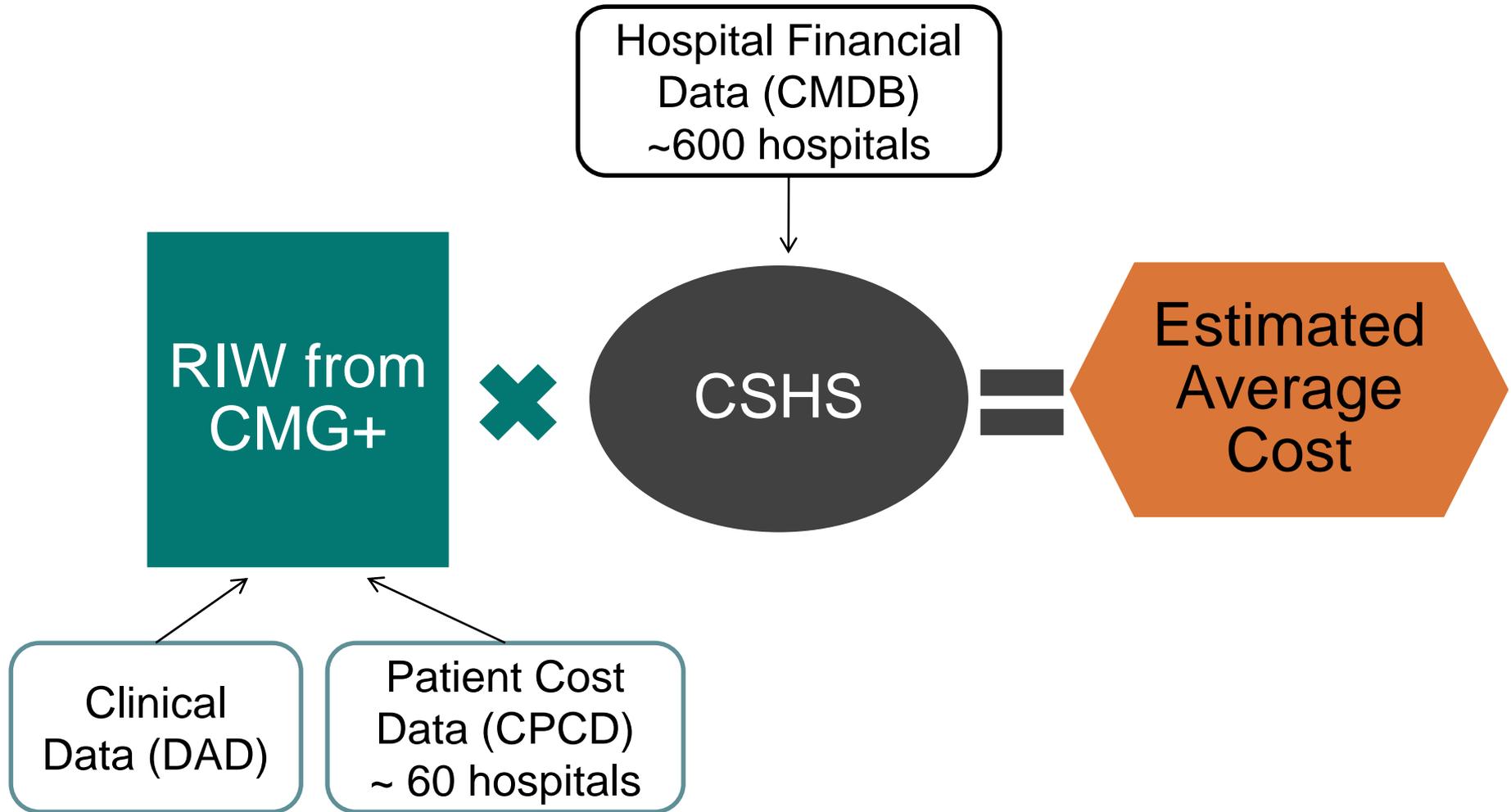
**Which days of the
patient's stay were
the most expensive?
The least expensive?**



What's required for patient costing?



CSHS and Patient Costing



Patient Cost Estimates

Cost of a specific patient
(Patient Cost Data)

Average cost of a specific patient
($CSHS_{fac} \times RIW_{pt}$)

Average cost of an average patient
in a jurisdiction
($CSHS_{prov} \times RIW_{pt}$)
Patient Cost Estimator

Number of CPCD Sites for Year of Most Recent Data Submission (Jan 2015)



Jurisdiction	FY	Inpatient (DAD)	Ambulatory (NACRS)	Continuing Care (CCRS)	Mental Health (OMHRS)	Rehab (NRS)
Ontario	2012	42	48	22	27	26
Alberta	2012	13	16	NR	NR	NR
British Columbia	2012	7	N/A	NR	NR	NR
Total		62	64	22	27	26

Cost Estimate Myths

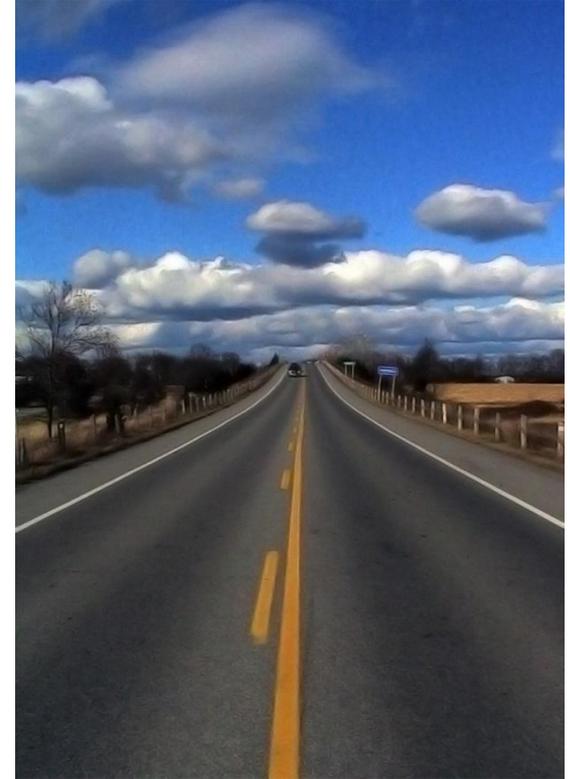
- “ Thanks for this! Now I have estimates for health system costs for <insert illness here>”.
 - These estimates reflect hospital costs only.
- “I want to use patient costing data because it’s the real cost; CSHS figures are just an estimate.”
 - Patient costing figures are estimates too, albeit more 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.

Our Products

- Patient Cost Estimator: www.cihi.ca/pce
- Health System Performance: <http://yourhealthsystem.cihi.ca/>
- CSHS Values: http://www.cihi.ca/web/resource/en/hfp_datatables_2014_en.xlsx
- CSHS Methodology Notes:
https://secure.cihi.ca/free_products/HFP_Indicators_Methodological_Notes2014_EN.pdf
- Functional Area RIWs (CMG+):
https://secure.cihi.ca/free_products/CMG_2014_Table_v1.0_EN.zip
- Functional Area RIWs (CACS):
https://secure.cihi.ca/free_products/CACS_2014_Tables_v1.0_EN.zip
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Coming Up

- FY 2012 PCE Estimates: February 2015
- Updated FAR Estimates: March 2015
- 2013-2014 CSHS Values: June 2015
- CSHS Variability Study: June 2015



Questions?

- Grouping Methodologies and RIWs : casemix@cihi.ca
- MIS Standards: mis@cihi.ca
- Patient Cost Estimates: cpcd@cihi.ca

Thank You!



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Better data.
Better decisions.
Healthier Canadians