

Explaining Variability in the Cost of a Standard Hospital Stay

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Background

- **In Canada, about 10-15% of hospitals have patient costing programs in place**
 - Mostly larger hospitals, about 1/3 of all inpatient volume
- **For the majority of facilities that can't currently cost out patient-specific care, CIHI makes available the indicator, *Cost of a Standard Hospital Stay (CSHS)***
- **The CSHS is a hospital-specific measure of the average cost per weighted case**

Cost of Standard Hospital Stay

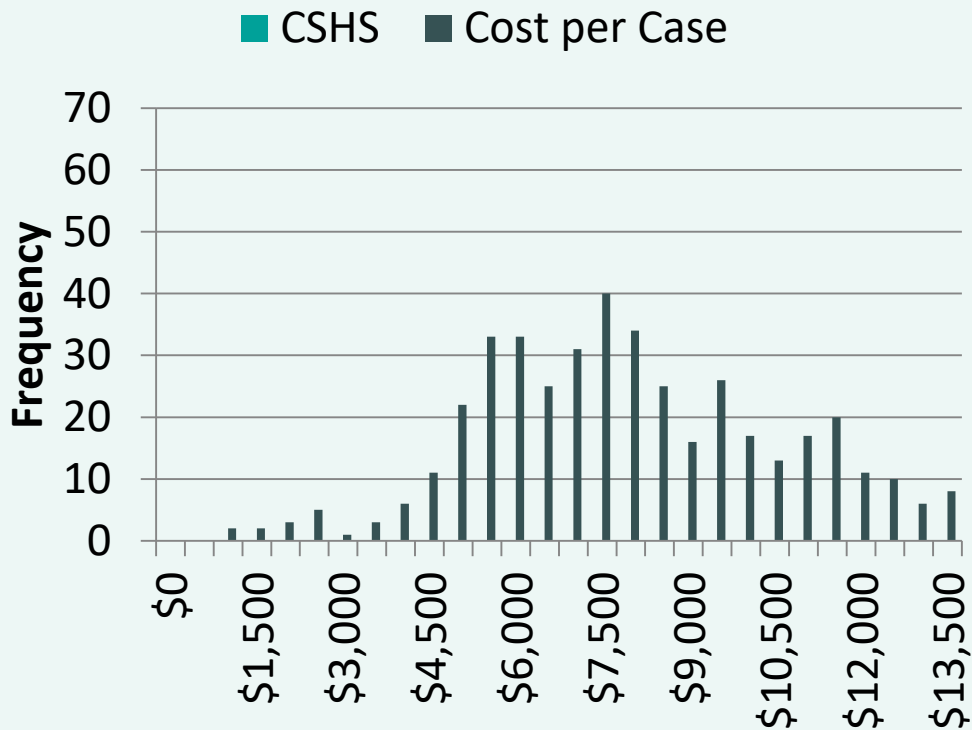
$$\frac{\text{Total Inpatient \$}}{\text{Total Weighed Cases}}$$

Cost of Standard Hospital Stay

Avg Cost per Case

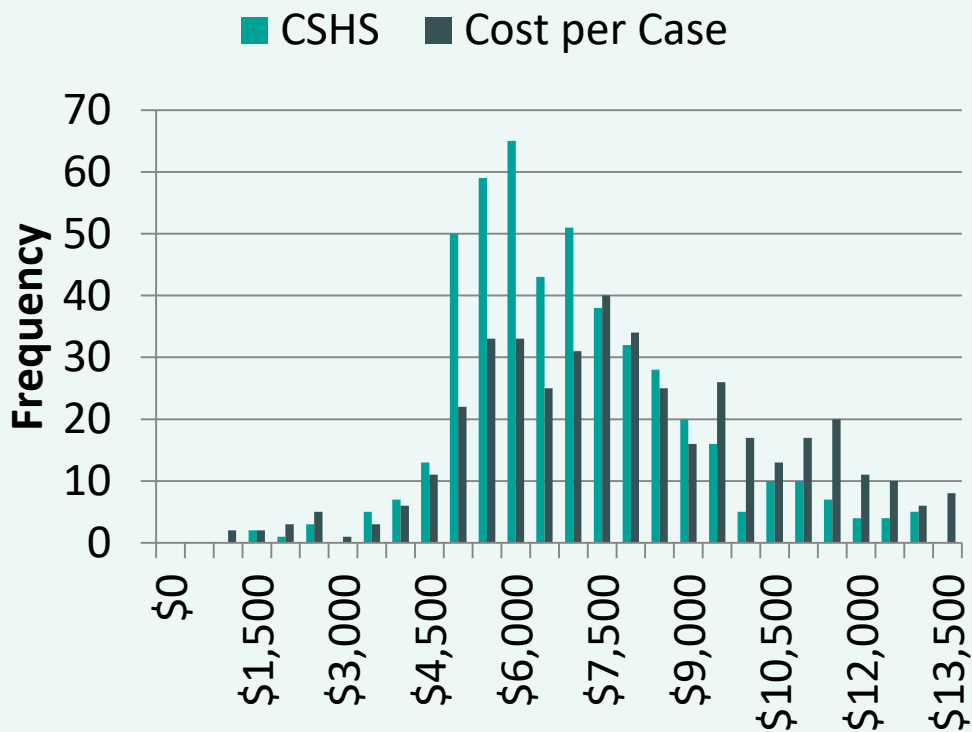
Case Mix Index

Case Mix Adjusted Estimate



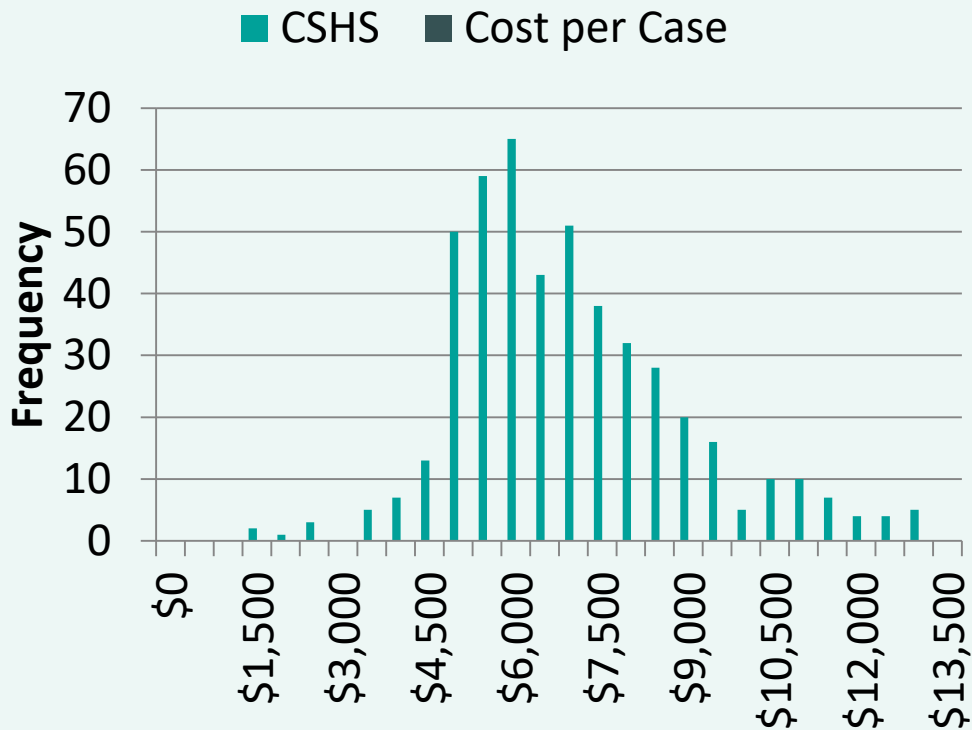
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Nevertheless, quite a bit of variability remains unexplained by case mix.

Common Uses

- **Commonly used in conjunction with case mix tools (DRGs) to provide patient-level cost estimates**
- **Budgeting, forecasting**
- **Can be used directly as a comparative efficiency indicator**
 - *Ceteris paribus*

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- Can be used directly as a comparative efficiency indicator
 - *Ceteris paribus*
- But *Ceteris* are rarely *paribus*...

What Do Users Need to Consider?

For many years, CIHI cautioned users that many factors affect CSHS

- Staff mix, size, specialty, etc.

Based on

1. Common sense

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Never tested empirically

Approach

- **Modelling exercise to validate and quantify factors that drive differences in cost**
- **Similar exercise to that used when designing an ABF system**
- **Developed a conceptual hospital cost function, modelled as a log-linear relationship**

Conceptual Hospital Cost Function

Concept	Measure
Size (economies of scale)	Acute care beds
Geography/Remoteness	Urban/rural
Teaching status	Yes/no
Price of labour	Provincial average wage relative to national
	Hospital average wage relative to provincial (staff mix, overtime, etc.)
Intensity of labour / productivity	Relative labour use per weighted case
Contracting External Labour	% Purchased hours (3 rd party agencies)
Co-located post-acute services	Presence of dedicated inpatient rehab beds (yes/no)
Clinical efficiency	Length of Stay to Expected Length of Stay (LoS/eLoS)
Degree of specialization / Scope of services provided	Herfindahl-Hirschmann index based on case mix

Initial Results

Preliminary results of model were promising

High explained variance

Most variables significant, coefficients reasonable

One exception:

Ratio of LoS/eLoS consistently negative and significant across models



Suggests that the longer a patient stays, the cheaper it becomes

- Even though CSHS adjusts for case mix



Hospitals offsetting costs by putting patients to work?

Underlying Issue

- **Wrong weights being used in some facilities**
- **In the data used, large number of long-term care facilities self-identify as acute inpatient hospital**
 - These facilities get access to tools that aren't available in their sector
 - **BUT** CMG+ is designed for use in acute inpatient setting
- **Tends to inflate weighted cases relative to actual expenses incurred**
 - Additionally, many hospitals do not discharge and readmit for post-acute portion of stay
- **Difficult to identify precisely in data**

Mitigation

- **Problem driven by post-acute and non-acute patients**
 - Generally long-stay atypical cases
- **By adjusting for % atypical long-stay patients, effect disappears**
- **Also changed coefficient on LoS/eLoS from negative to positive**

Final Model

R-square	Coefficient of Variation		Root MSE	Log(CSHS) Mean	
0.756	1.580		0.137	8.721	
Parameter	Estimate	Standard Error	t-Value	Pr > t	
Intercept	8.406	0.028	297.04	<.0001	
Size >50 beds*	0.098	0.015	6.35	<.0001	
Size 50 – 99 beds*	0.068	0.015	4.44	<.0001	
Size 100 – 299 beds*	0.057	0.013	4.22	<.0001	
Teaching (yes/no)	0.162	0.013	12.28	<.0001	
Onsite rehab (yes/no)	-0.028	0.009	-3.09	0.0021	
Rural (yes/no)	0.025	0.007	3.25	0.0012	
Scope of services provided	0.002	0.000	7.29	<.0001	
Wage index – hosp to prov	0.010	0.000	31.45	<.0001	
Wage index – prov to CAN	0.006	0.000	19.93	<.0001	
% purchased hours	0.007	0.001	4.15	<.0001	
Relative hours per weighted case	0.007	0.000	108.12	<.0001	
% of long-stay atypical RIW	-0.001	0.000	-4.23	<.0001	
Fiscal Year 2013	0.136	0.008	15.4	<.0001	
Fiscal Year 2012	0.104	0.008	11.79	<.0001	
Fiscal Year 2011	0.060	0.008	6.83	<.0001	
Fiscal Year 2010	0.015	0.009	1.75	0.0798	

*relative to hospitals > 300 beds

Final Results

Final model validates caveats; users should consider:

- **Factors outside of hospital's control**
 - Geography, teaching, jurisdictional wage differences, scope of services provided, onsite post-acute services
- **Factors in hospital's control**
 - Wage-related decisions: overtime, staff mix, etc.
 - 3rd party (agency) staff
 - Relative amount of labour used
- **Reporting practices can affect CSHS**
 - Non-acute and post-acute patients reported as acute tend to inflate denominator

Our Takeaways

- **Need to review carefully the criteria for inclusion in our tools, analyses**
- **Smaller facilities are looking for help with analysis, decision support**
- **If we don't provide them with the appropriate tools, decisions will be made using the wrong ones**





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