Identifying factors associated with high use of acute care in Canada: a population-based retrospective study

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RDC Showcase 2022

Agenda

- **Background**
- **Methods**
- **Results**
- **Discussion and conclusion**

Background – Disproportionate use of health care services and resources

- Over 50% of healthcare expenditures were consumed by 5% of patients in developed countries or regions

- In Canada, 5% of patients accounted for

  61% of hospital and community care expenditures in Ontario

  30% of physician services in British Columbia

High system users (HSUs)

BMJ Open. 2018;8(9):e023113.
Heal Policy. 2013;9(1):44-51.
J Health Serv Res Policy. 2003;8(4):215-224

Background – Metrics defining HSUs

- Cumulative costs --- **HCUs**
- Length of hospital stay
- Frequency of hospitalizations
- Frequency of emergency department (ED) visits.

- Usually defined as patients in the top-1%, top-5%, top-10% or top-20%

BMJ Open. 2018;8(9):e023113.
Heal Policy. 2013;9(1):44-51.
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Background – Poor health gains despite high healthcare resource use

Table 3 Comparison of hospitalization and mortality for high users, other users and all users by number of major comorbidity types

Major comorbidity	High users (HU)			Other users (OU)			All users			Ratio HU/OU	
	n	Hospital-ization	Death	*n*	Hospital-ization	Death	*n*	Hospital-ization	Death	Hospital-ization	Death
Low	41,491	47.8%	3.7%	2,163,337	3.4%	1.0%	2,204,828	4.3%	1.1%	13.9	3.63
Medium	54,043	77.8%	14.2%	150,232	30.3%	9.8%	204,275	42.8%	10.9%	2.6	1.46
High	16,202	95.2%	32.6%	6,372	72.8%	40.2%	22,574	88.9%	34.7%	1.31	0.81
Total	111,736	69.2%	13.0%	2,319,941	5.4%	1.7%	2,431,677	8.3%	2.2%	12.9	7.64

J Health Serv Res Policy. 2003;8(4):215-224.

Background – Poor health gains despite high healthcare resource use

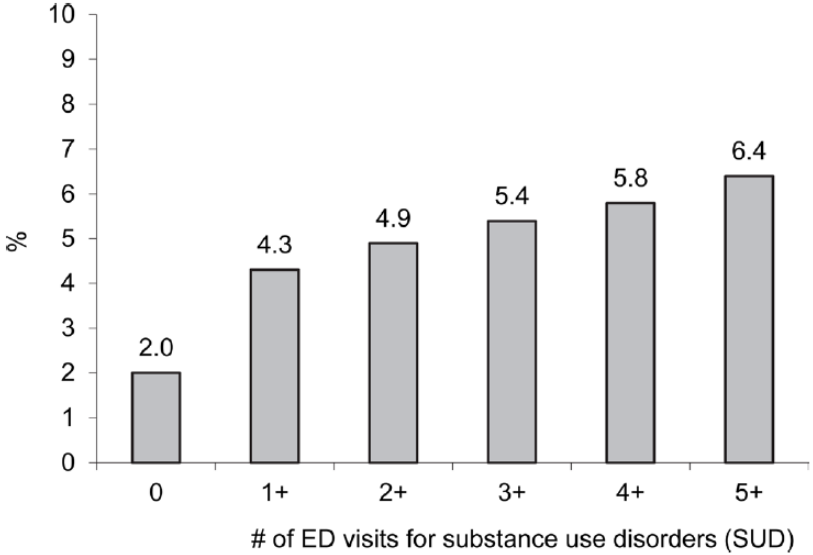
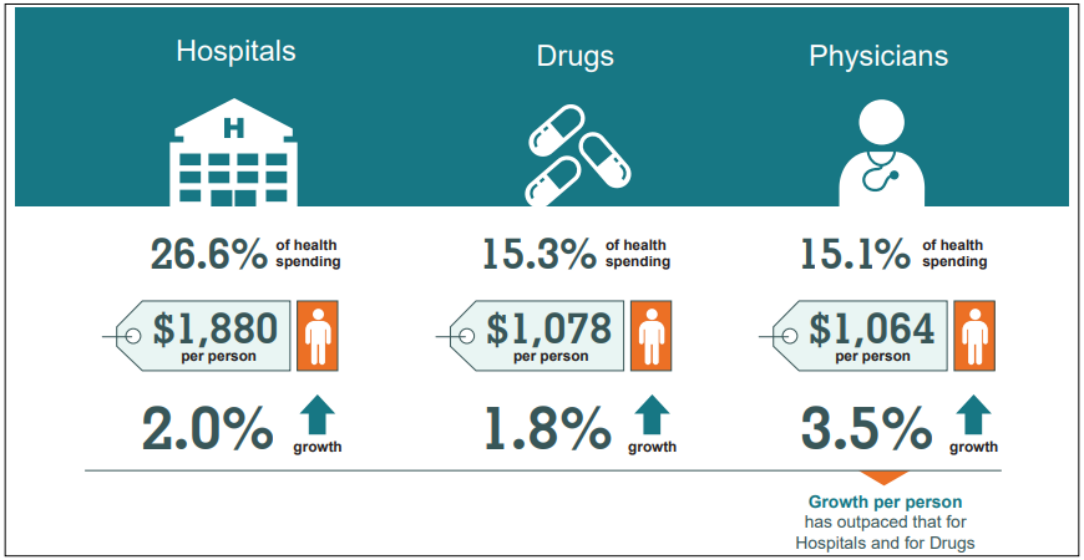


Figure 1 Mortality among frequent ED users for mental disorders in the 2 years following the index ED visit.

Emerg Med J EMJ. 2018;35(4):220-225.

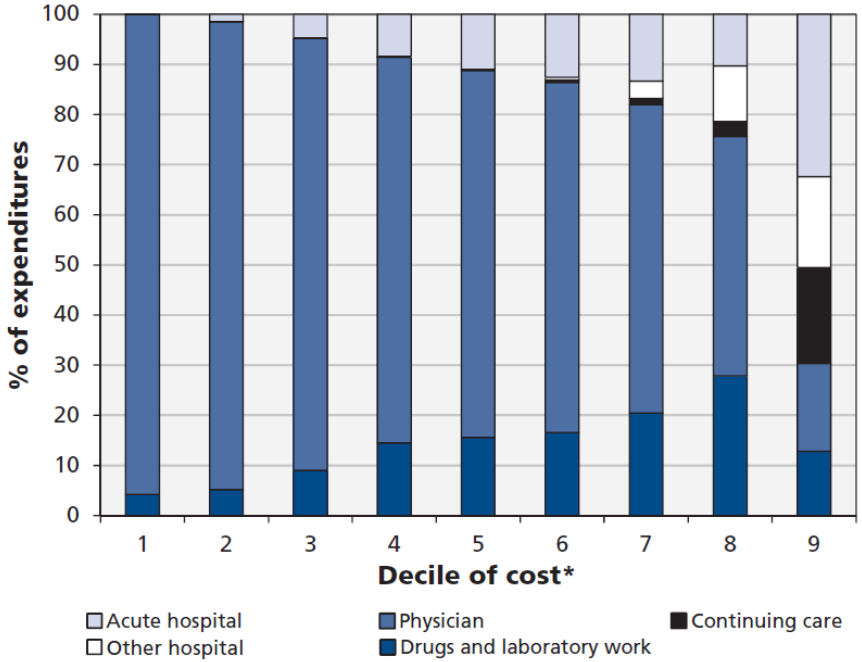
Background – Acute care is the largest source and driver of healthcare expenditures

- Distribution of Healthcare expenditures in Canada 2019 (before the pandemic)



Canadian Institute for Health Information. National Health Expenditure Trends, 1975 to 2019

Background – Acute care is the largest source and driver of spending among HCUs



CMAJ, 2016, 188(3)

Background – HCUs in acute care consume more resources than HCUs in other care types

TABLE 2. Distribution of patients and costs across care types, 2009/10

	High-Cost Users			All Users		
Care Type	# of Patients	Total Cost ($M)	Average Cost per Patient ($K)	# of Patients	Total Cost ($M)	Average Cost per Patient ($K)
IP	170,035	5,365	31.55	819,971	8,096	9.87
DS	54,775	129	2.35	968,344	1,158	1.20
ER	158,667	233	1.47	2,926,568	1,319	0.45
MH	14,868	805	54.14	35,517	904	25.45
Rehab	23,239	465	20.01	25,536	477	18.68
CCC	16,852	824	48.92	18,265	833	45.61
HC	114,270	819	7.17	430,465	1,427	3.32

IP=In-Patient; DS=Day Surgery; ER=Emergency; MH=Mental Health; Rehab=Rehabilitation; CCC=Chronic Continuing Care; HC=Home Care

Heal Policy. 2013;9(1):44-51.

Objectives

- This study aimed to identify socioeconomic, demographic, and clinical factors associated with being HCUs of acute care in adult patients (≥ 18 years) in Canada and to examine how they vary across provinces.

Methods – Data sources and population

- The HSUs linked to T1 Family File - Census of the Population Long-Form - National Household Survey (HSUS-T1FF-CENSUS-NHS, from now on referred to as "the linked dataset")

- Our focus:

  The adult (>=18 years old) acute care cost cohort

  HCUs: top 10% of highest cumulative costs users each year

  non-HCUs: randomly selected from the remaining 90% (ratio 1:4)

  Fiscal year 2011/2012 to 2014/2015

https://crdcn.org/taxonomy/term/4530

Methods – Selected variables

- **Clinical factors:** Admission category, discharge disposition, and Elixhauser comorbidity score
- **Demographic factors:** age, sex, rurality, marital status, immigrant status, visible minority
- **Socioeconomic factors:** work activity, occupation category, income status (after tax), and education
- **Interactions** between comorbidity score and age, sex and income status were also explored

https://crdcn.org/taxonomy/term/4530

Methods – Data analysis

- Data at patients' first admissions were used
- Descriptive statistics
- Multilevel logistic regression with the province as a random effect for primary analysis and sensitivity analysis
- Logistic regression models for the examination of provincial variations of risk factors

https://crdcn.org/taxonomy/term/4530

Methods – Data analysis

Sensitivity analyses were performed to:

- Compare different ways of handling missing data: complete case analysis vs multiple imputations

- Examine variations of risk factors across alternative HSU definitions (length of stay, frequency of hospitalizations, and frequency of ED visits)

- Explore impact of the inclusion of the interaction terms, admission category and discharge disposition

https://crdcn.org/taxonomy/term/4530

Methods – Data analysis

Protection of the confidentiality of respondents' personal information:

- The individual-level census weights
- Rounding on the base of five

The unadjusted odds ratio (OR) and 95% confidence interval were estimated. The significance level of 0.05 was used for all statistical tests. All the data analyses were performed using R statistical software, version 4.0.1

https://crdcn.org/taxonomy/term/4530

Results – Characteristics of included patients

- Between April 1, 2011, and March 31, 2014, a total of 3,890,315 patients with 6,015,200 hospitalizations were included.

- 2.16% with missing values

Results – Characteristics of included patients

- The HCUs and non-HCUs were similar with respect to their residential areas.

- However, the HCUs tended to be male, older, had lower work activity in the previous year, less educated, involved more urgent admissions and had a higher number of discharge dispositions other than home.

- The HCUs tended to have multiple admissions within a year

Results – Primary analysis

- Compared to patients discharged home with no support required, those transferred to health care facilities had higher odds of being acute care HCUs.
- Compared to patients with elective admissions, those with urgent admissions to the hospital (OR, 1.94; 95% CI, 1.93 - 1.95) were more likely to be HCUs.
- Compared to patients who did not work in the previous year, patients who worked had lower odds of being HCUs, especially for those with health occupations (OR, 0.69; 95% CI, 0.66 – 0.71).
- There were significant interactions between the Elixhauser comorbidity score and age/sex/income status.

Results – Provincial variations

- The association between the underlying risk factors and the outcome varied substantially between provinces.

- Among all the included factors, the association between socioeconomic factors and being HCUs has the largest variation across provinces, especially factors such as immigrant status, visible minority, and some types of occupations.

Results – sensitivity analysis

- Similar results for different methods of handling missing data while different results for different definitions of HSUs. There is substantial variation in the impacts of different discharge dispositions on the odds of being HSUs across different HSU definitions.

- Minimal impact of the inclusion of interaction terms, discharge disposition or admission category on coefficients of other variables

Discussion – Major findings and implications

- Socioeconomic predictors such as work activity and occupation category added to the analysis
- Modifiable factors: higher work activity is associated with lower odds of being HCUs
- The impact of patients' comorbidities could be modified by their age, sex, and income status.

For more accurate prediction and identification of HCUs

Discussion – Major findings and implications

- Provincial variations in socioeconomic factors – inform the design of interventions in different provinces

- Different HSU definitions capture different populations – selection of definition depends on the goal of intervention

  E.g., transitional care as a focus to reduce frequency of hospitalizations

Discussion - Strength and limitations

- A broad range of demographic, socioeconomic, and clinical factors;
- National perspective with provincial variations explored
- Variations across different definitions of HSUs investigated

- Multiple databases – time lag
- Under-representation of populations who did not participate in the surveys (eg, people living in institutions or other collective residences)

Thank you!

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