

## Characteristics of frequent emergency department users in British Columbia, Canada: a retrospective analysis

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### Abstract

**Background:** Frequent emergency department users disproportionately account for rising health care costs. We aimed to characterize frequent emergency department users in British Columbia, Canada.

**Methods:** We performed a retrospective analysis using health administrative databases. We included patients aged 18 years or more with at least 1 emergency department visit from 2012/13 to 2015/16, linked to hospital, physician billing, prescription and mortality data. We used annual emergency department visits made by the top 10% of patients to define frequent users ( $\geq 3$  visits/year).

**Results:** Over the study period, 13.8%–15.3% of patients seen in emergency departments were frequent users. We identified 205 136 frequent users among 1 196 353 emergency department visitors. Frequent users made 40.3% of total visits in 2015/16. From 2012/13 to 2015/16, their visit rates per 100 000 BC population showed a relative increase of 21.8%, versus 13.1% among all emergency department patients. Only 1.8% were frequent users in all study years. Mental illness accounted for 8.2% of visits among those less than 60 years of age, and circulatory or respiratory diagnoses for 13.3% of visits among those aged 60 or more. In 2015/16, frequent users were older and had lower household incomes than nonfrequent users; the sex distribution was similar. Frequent users had more prescriptions (median 9, interquartile range [IQR] 5–14 v. 1, IQR 1–3), primary care visits (median 15, IQR 9–27 v. 7, IQR 4–12) and hospital admissions (median 2, IQR 1–3 v. 1, IQR 1–1), and higher 1-year mortality (10.2% v. 3.5%) than nonfrequent users.

**Interpretation:** Emergency department use by frequent users increased in BC between 2012/13 and 2015/16; these patients were heterogenous, had high mortality and rarely remained frequent users over multiple years. Our results suggest that interventions must account for heterogeneity and address triggers of frequent use episodes.

Canadians spent \$7068 per capita on health care in 2019, with emergency department expenses accounting for a higher proportion of costs than in previous years.<sup>1,2</sup> High users of health care services are a national priority for cost containment.<sup>3,4</sup> Specifically, frequent users of emergency departments account for only 4.5%–8% of emergency department patients, yet make 21%–30% of visits.<sup>5,6</sup> They are high and costly users of other health care services.<sup>7–9</sup> In addition, they make higher-acuity visits, and are admitted and die more often than nonfrequent users.<sup>10–14</sup>

Effective solutions to improve patient care and decrease costly health care use require a detailed understanding of frequent emergency department users. Most characterizations have been conducted at the institutional level and in other countries,<sup>15–19</sup> and previous Canadian provincial analyses are cross-sectional rather than longitudinal.<sup>9,20,21</sup> Population-level trends and transitions into frequent use remain unexplored.

Interventions described to date (e.g., case management, care plans) may decrease emergency department visits by frequent users<sup>16,18,22</sup> but have not been studied rigorously in Canada. Sustainable solutions require a nuanced understanding of the nature (not just quantity) of frequent users’ interactions

with the health care system. For instance, more than 93% of frequent users are attached to primary care, although the continuity and appropriateness of these relationships have not been explored.<sup>9,23–27</sup> Liaising frequent users with primary care providers at discharge has mixed effects on emergency department use.<sup>28,29</sup> It is unknown whether improving the quality of primary care relationships can redirect frequent users toward nonacute care and improve outcomes. We hypothesized that frequent users might experience less primary care continuity.

Our objective was to characterize frequent emergency department users in British Columbia using a longitudinal, linked provincial database of demographic, clinical and health care use data.

**Competing interests:** Kathryn Dong reports personal fees from Alberta Health Services and the College of Physicians and Surgeons of Alberta, outside the submitted work. No other competing interests were declared.

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## Methods

### Design, setting and participants

This was a retrospective analysis of administrative databases capturing patients who visited an emergency department in BC between fiscal years 2012/13 and 2015/16. The study cohort comprised patients aged 18 years or more who made at least 1 emergency department visit, identified based on classification within the National Ambulatory Care Reporting System (NACRS) (Appendix 1, Supplemental Figure S1, available at [www.cmajopen.ca/content/9/1/E134/suppl/DC1](http://www.cmajopen.ca/content/9/1/E134/suppl/DC1)).<sup>30</sup> Twenty emergency departments contributed to NACRS in 2012/13, and 29 from 2013/14 to 2015/16. These institutions accounted for an estimated 74% of total emergency department visits in BC in 2015/16.<sup>31</sup>

### Data sources

Our study cohort (from NACRS) was linked to data on hospital admissions (Canadian Institute for Health Information Discharge Abstract Database),<sup>32</sup> physician billing (Medical Services Plan),<sup>33</sup> prescription medications (PharmaNet)<sup>34</sup> and mortality (BC Vital Statistics Agency).<sup>35</sup> Population Data BC (PopData) houses and links databases using patient health number, age, sex and postal code. PopData is a multiuniversity resource supporting linkage and access to individual-level, deidentified data for research. It was established in 2009 but originated in the 1980s as the BC Linked Health Data Set, funded by the provincial Ministry of Health. PopData performs validation and employs rigorous, standardized linkage procedures, using a combination of deterministic and probabilistic approaches.<sup>36,37</sup>

### Variables and definitions

#### Frequent and nonfrequent users

We defined frequent users as patients within our cohort in the top 10% of emergency department users in each fiscal year and nonfrequent users as patients in the bottom 90% of emergency department users, consistent with the Canadian Institute for Health Information definition.<sup>38</sup> We chose the institute's definition to facilitate future comparisons with a top 10% cohort of emergency department users in other Canadian provinces. In our data set, the top 10% of emergency department users corresponded to 3 or more visits annually.

To determine visit counts, we first attempted to identify and remove scheduled revisits. Clinicians on our team determined that most scheduled revisits in BC are for intravenous antibiotic treatment for cellulitis. We therefore developed an algorithm to identify emergency department visit strings occurring within 48 hours of one another with an initial diagnosis of cellulitis. To verify the accuracy of our approach, we examined diagnoses associated with 48-hour repeat emergency department visits in 2012/13. Cellulitis was the most common specified diagnosis (12.1%), followed by abdominal pain (4.0%), follow-up examination (3.0%) and other medical care (2.3%).

#### Demographic characteristics

Sex, age, rural/urban residence and average neighbourhood income adjusted for household size<sup>39</sup> were available for frequent and nonfrequent users in our database. We obtained population estimates from the Government of BC.<sup>40</sup>

#### Acute care

We obtained characteristics of emergency department visits (ambulance arrival, triage level, diagnoses, disposition) from NACRS.

We defined visit acuity using the Canadian Triage and Acuity Scale, a national tool that allows emergency departments to prioritize care.<sup>41</sup> Its 5 acuity levels range from life- or limb-threatening presentations requiring immediate care (level 1) to patients whose condition is stable in whom delayed assessment is not expected to cause deterioration (level 5).<sup>42</sup> The scale has high interrelater reliability and excellent predictive validity for resource use, costs and admission.<sup>43-45</sup>

We obtained hospital admission dates and diagnoses from the Discharge Abstract Database.

#### Physician visits and majority source of care

We used the general practitioner specialty code to identify primary care providers and visits from the Medical Services Plan.

We counted number of visits to primary care physicians and number of unique primary care physicians seen. To describe primary care continuity, we calculated a "majority source of care" variable indicating whether the patient received 3 or more services in 1 year, and 50% or more of services from 1 primary care physician.<sup>46,47</sup>

#### Mortality

We obtained death dates and causes from the BC Vital Statistics Agency, and examined mortality by sex, age and age group.

#### Diagnostic categories

Emergency department, hospital and mortality diagnoses were recorded within NACRS, the Discharge Abstract Database and the BC Vital Statistics Agency database using the *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* (ICD-10). We summarized diagnoses by the 22 ICD-10 chapters.<sup>48</sup>

#### Prescription medications

Using the provincial PharmaNet database, we defined unique medications as those with distinct generic drug names, consistent with previous literature.<sup>49</sup> We summarized unique medication counts by age group and American Hospital Formulary Service first-tier categories. The American Hospital Formulary Service is a widely used classification system that groups drugs with similar pharmacologic, therapeutic or chemical characteristics in a tiered hierarchy.<sup>50</sup>

#### Statistical analysis

We characterized frequent and nonfrequent user groups for each fiscal year, using all data sources available, and reported descriptive statistics. We analyzed data from all available

emergency department visits from all institutions reporting to NACRS to characterize our cohort. With the exception of 1 component of our analysis in which we calculated the relative percent change in emergency department visits overall and for frequent users' visits over the study period (expressed as a rate per annual BC population), we limited our analysis to a selection of 20 emergency departments that consistently reported to NACRS in all years to account for changes in reporting. We performed analyses using R (R Foundation for Statistical Computing).

### Ethics approval

The University of British Columbia Clinical Research Ethics Board approved this study (H18-00287).

### Results

Over the study period, 13.8%–15.3% of emergency department patients were frequent users (Table 1). We identified 205 136 frequent users among 1 196 353 emergency department patients. At the 20 institutions that consistently reported to NACRS over the study period, the visit rate per 100 000 of the BC population among frequent users increased from 6066 in 2012/13 to 7387 in 2015/16, a relative increase of 21.8%. In comparison, the rate of visits per 100 000 population made by all patients at these institutions increased from 16 051 to 18 146 over the study period, a relative increase of 13.0%.

Frequent users made a median of 4 (interquartile range [IQR] 3–5) emergency department visits in each study year. The proportion of visits attributable to mental illness increased from 4.7% (13 344/284 016) in 2012/13 to 6.0% (28 391/472 603) in 2015/16. In 2015/16, 23 153/283 403 visits (8.2%) among frequent users aged 18–59 years were related to mental illness; of these, 9431 (40.7%) were related to psychoactive substance use, 4046 (17.5%) to psychosis, 4042 (17.5%) to anxiety, and 2877 (12.4%) to mood disorders. Of all prescriptions provided to frequent users within this age group, 1 238 082 (17.3%) were for an opioid medication (Appendix 1, Supplemental Table S1). Circulatory and respiratory diagnoses accounted for 25 207/189 200 visits (13.3%) among frequent users aged 60 or more (Appendix 1, Supplemental Table S2).

A minority of frequent users were frequent users in the subsequent year (20.2%, 21.4% and 24.7% in 2012/13, 2013/14 and 2014/15, respectively), 21.9% of patients were frequent users in multiple consecutive or nonconsecutive years, and 1.8% of patients were frequent users in all study years in which they were alive (1.9% when examining only those alive during the entire study period). Almost one-third (30.8%) of nonfrequent users were nonfrequent users in multiple years.

### Comparison of frequent users and nonfrequent users

We report frequent and nonfrequent users' characteristics in 2015/16, our most recent year of data (Table 2). Frequent users ( $n = 102\ 811$ ) were older than nonfrequent users ( $n = 569\ 740$ ) (median age 54, IQR 35–73 yr v. 50, IQR 33–66 yr)

and disproportionately represented the 2 lowest neighbourhood income quintiles (48.3% v. 42.0%). The sex distribution was similar (53.1% and 51.8% female, respectively).

Frequent users arrived more commonly by ambulance (26.1% v. 18.8%), made higher acuity visits and were admitted to hospital more often (18.8% v. 14.0%) than nonfrequent users. Their most common discharge diagnoses related to a broad category of symptoms, including abdominal pain, chest pain, headache and fever. Mental disorders accounted for 6.0% of frequent users' visits. Frequent users had a greater median number of admissions than nonfrequent users (2, IQR 1–3 v. 1, IQR 1–1). The most common admission diagnoses were mental disorders for frequent users (15.2%) and circulatory diseases for nonfrequent users (17.3%).

Frequent users made a median of 15 (IQR 9–27) primary care visits to a median of 6 (IQR 4–9) primary care physicians. In contrast, nonfrequent users made a median of 7 (IQR 4–12) primary care visits to a median of 3 (IQR 2–5) primary care physicians. The proportions of frequent users and nonfrequent users who had a physician who provided the majority of their care were similar (43.9% v. 45.5%). A total of 777 frequent users (0.8%) made no primary care visits, and 2610 (2.5%) made 1–2 visits. The corresponding values for the nonfrequent users were 19 839 (3.5%) and 82 269 (14.4%). Frequent users had more prescription medications than nonfrequent users (median 9, IQR 5–14 v. 1, IQR 1–3).

Frequent users had a higher mortality rate within 1 year of their last emergency department visit than nonfrequent users (10.2% v. 3.5%).

### Interpretation

Our analyses indicate that emergency department visits increased each year in BC from 2012/13 to 2015/16 and that visits by frequent users of the emergency department rose disproportionately: we found a relative increase of 21.8% in frequent users' visits over the study period, compared to 13.0% for all patients. Frequent use tended to be transient; only 1.8% of patients were frequent users in all study years in which they were alive (1.9% for those who were alive during all study years). Frequent users were heterogenous, with differing diagnoses among age subgroups (e.g., mental health among younger patients, and circulatory and respiratory among older patients).

Frequent users were high users of other health care services. They were admitted to hospital more often, visited more primary care physicians and made more primary care visits than nonfrequent users. We hypothesized that frequent users might experience less primary care continuity, consistent with prior research;<sup>51,52</sup> however, our results were not able to confirm this hypothesis. Finally, frequent users experienced poor health outcomes. We observed high relative numbers of prescription medications (which could indicate inappropriate prescribing or many comorbidities, or both),<sup>49</sup> high comparative admissions and a 1-year mortality rate nearly 3 times greater than that for nonfrequent users (10.2% v. 3.5%).

**Table 1: Characteristics of emergency department visits and of the top 10% ( $\geq 3$  visits/year) of emergency department users in British Columbia, 2012/13 to 2015/16**

Characteristic	2012/13	2013/14	2014/15	2015/16
Total no. of patients	452 427	559 902	643 000	672 551
Total no. of visits	757 562	942 298	1 112 400	1 171 839
No. of frequent users (% of all patients)	62 552 (13.8)	78 984 (14.1)	97 120 (15.1)	102 811 (15.3)
No. of visits by frequent users	284 016	355 742	442 854	472 603
Total no. of visits/100 000 population	16 362	20 019	23 290	24 116
No. of visits by frequent users/100 000 population	6134	7558	9272	9726
% of total visits attributable to frequent visits				
Top 10% users	37.5	37.7	39.8	40.3
Top 5% users	25.5	25.4	27.2	27.7
Top 1% users	8.6	8.2	8.9	9.5
No. of visits, median (IQR)	4 (3–5)	4 (3–5)	4 (3–5)	4 (3–5)
<b>Frequent emergency department users</b>				
<b>Patient characteristics</b>				
Sex, no. (%) of patients				
Female	32 881 (52.6)	41 551 (52.6)	51 639 (53.2)	54 585 (53.1)
Male	29 655 (47.4)	37 420 (47.4)	45 461 (46.8)	48 210 (46.9)
Unknown	16 (0.02)	13 (0.02)	20 (0.02)	16 (0.02)
Age category, yr, no. (%) of patients				
18–29	11 252 (18.0)	13 928 (17.6)	17 140 (17.6)	17 962 (17.5)
30–39	8766 (14.0)	11 192 (14.2)	13 468 (13.9)	14 320 (13.9)
40–49	8651 (13.8)	10 640 (13.5)	12 583 (13.0)	13 088 (12.7)
50–59	9130 (14.6)	11 571 (14.6)	13 853 (14.3)	14 899 (14.5)
60–69	7879 (12.6)	10 026 (12.7)	12 581 (13.0)	13 447 (13.1)
$\geq 70$	16 874 (27.0)	21 627 (27.4)	27 495 (28.3)	29 095 (28.3)
Age at year end, median (IQR), yr	53 (35–72)	53 (34–72)	54 (35–73)	54 (35–73)
<b>Visit characteristics</b>				
Top 5 diagnostic categories (ICD-10 chapter)				
Symptoms, signs, and abnormal clinical and laboratory findings (XVIII)	45 000 (15.8)	63 544 (17.9)	82 383 (18.6)	87 247 (18.5)
Injury, poisoning and certain other consequences of external causes (XIX)	28 709 (10.1)	38 390 (10.8)	49 566 (11.2)	53 119 (11.2)
Mental and behavioural disorders (V)	13 344 (4.7)	19 103 (5.4)	24 023 (5.4)	28 391 (6.0)
Disease of genitourinary system (XIV)	12 402 (4.4)	16 595 (4.7)	22 199 (5.0)	23 235 (4.9)
Diseases of musculoskeletal system and connective tissue (XIII)	11 376 (4.0)	15 753 (4.4)	20 283 (4.6)	22 025 (4.7)
Missing	105 512 (37.2)	105 922 (29.8)	116 761 (26.4)	122 105 (25.8)

Note: ICD-10 = *International Statistical Classification of Diseases and Related Health Problems, 10th Revision*, IQR = interquartile range.

There is a potential for improved efficiency from interventions addressing the extensive use of health care services by frequent users. We observed income disparity between frequent and nonfrequent users, which policy interventions could target.

Our findings corroborate those of previous studies showing that frequent users are heterogenous, high users of primary

care and other services, and have prevalent mental health and chronic illness, and increased mortality.<sup>7,12,13,14,16,19,53,54</sup> The evanescent nature of frequent emergency department use may indicate a naturally self-limiting state triggered by acute crisis. We suspect that many patients move into and out of the frequent user state as acute crises resolve. For clinicians who

**Table 2 (part 1 of 2): Characteristics of emergency department visits and of frequent (top 10%) and nonfrequent (bottom 90%) emergency department users, 2015/16**

Characteristic	No. (%) of patients or visits*	
	Nonfrequent users <i>n</i> = 569 740	Frequent users <i>n</i> = 102 811
<b>Patients</b>		
Sex		
Female	295 385 (51.8)	54 585 (53.1)
Male	274 283 (48.1)	48 210 (46.9)
Unknown	72 (0.01)	16 (0.02)
Age, median (IQR), yr	50 (33–66)	54 (35–73)
Neighbourhood income quintile		
Q1 (lowest)	122 615 (21.5)	28 100 (27.3)
Q2	116 585 (20.5)	21 598 (21.0)
Q3	111 426 (19.6)	19 294 (18.8)
Q4	110 531 (19.4)	17 199 (16.7)
Q5 (highest)	98 238 (17.2)	14 699 (14.3)
Unknown	5901 (1.0)	1329 (1.3)
Missing	4444 (0.8)	592 (0.6)
Residence		
Rural	31 623 (5.6)	4642 (4.6)
Urban	533 673 (93.7)	97 577 (94.9)
Missing	4444 (0.8)	592 (0.6)
No. of visits, median (IQR)	1 (1–1)	4 (3–5)
Mortality		
No. of deaths within 1 yr of last emergency department visit	19 836 (3.5)	10 475 (10.2)
Sex		
Male	10 380 (52.3)	4822 (46.0)
Female	9441 (47.6)	5650 (53.9)
Unknown	15 (< 0.00)	3 (< 0.00)
Age at death, median (IQR), yr	81 (69–89)	78 (66–87)
<b>Visits</b>		
Total no. of visits	699 236	472 603
Transportation method		
Air ambulance	356 (0.1)	86 (0.02)
Combination of air and ground ambulance	226 (0.05)	79 (0.02)
Ground ambulance	131 335 (18.8)	123 419 (26.1)
No ambulance	567 319 (81.1)	349 019 (73.9)
Triage level (Canadian Triage and Acuity Scale)		
1 (Resuscitation)	5014 (0.7)	3357 (0.7)
2 (Emergent)	114 723 (16.4)	83 750 (17.7)
3 (Urgent)	337 639 (48.3)	239 910 (50.8)
4 (Less urgent)	220 680 (31.6)	121 871 (25.8)
5 (Nonurgent)	19 113 (2.7)	22 326 (4.7)
Unknown	2067 (0.3)	1389 (0.3)

**Table 2 (part 2 of 2): Characteristics of emergency department visits and of frequent (top 10%) and nonfrequent (bottom 90%) emergency department users, 2015/16**

Characteristic	No. (%) of patients or visits*	
	Nonfrequent users n = 569 740	Frequent users n = 102 811
Top 5 diagnostic categories (ICD-10 chapter)	129 292 (18.5) Injury, poisoning and certain other consequences of external causes (XIX)	87 247 (18.5) Symptoms, signs, and abnormal clinical and laboratory findings (XVIII)
	122 264 (17.5) Symptoms, signs, and abnormal clinical and laboratory findings (XVIII)	122 264 (17.5) Injury, poisoning and certain other consequences of external causes (XIX)
	29 882 (4.3) Diseases of digestive system (XI)	28 391 (6.0) Mental and behavioural disorders (V)
	29 804 (4.3) Diseases of respiratory system (X)	22 548 (4.8) Diseases of respiratory system (X)
	24 808 (3.5) Diseases of circulatory system (IX)	21 803 (4.6) Diseases of digestive system (XI)
Missing	185 520 (26.5)	122 105 (25.8)
<b>Discharge disposition</b>		
Discharged to place of residence (home or institution)	598 572 (85.6)	380 633 (80.5)
Admitted or transferred	98 039 (14.0)	89 107 (18.8)
Left before completion of treatment	2024 (0.3)	2684 (0.6)
Died	601 (0.09)	179 (0.04)
No. of drug prescriptions, median (IQR)	1 (1–3)	9 (5–14)
<b>Hospital admission</b>		
No. of admissions per person, median (IQR)	1 (1–1)	2 (1–3)
Top 5 discharge diagnostic categories (ICD-10 chapter)	19 953 (17.3) Diseases of circulatory system (IX)	14 661 (15.2) Mental and behavioural disorders (V)
	17 255 (14.9) Injury, poisoning (XIX)	13 221 (13.7) Diseases of circulatory system (IX)
	15 527 (13.4) Diseases of digestive system (XI)	11 273 (11.7) Diseases of digestive system (XI)
	10 774 (9.3) Mental and behavioural disorders (V)	10 074 (10.5) Diseases of respiratory system (X)
	10 110 (8.7) Diseases of respiratory system (X)	9656 (10.0) Symptoms and abnormal clinical and laboratory findings (XVIII)
<b>Physician billing</b>		
No. of primary care physicians visits, median (IQR)	7 (4–12)	15 (9–27)
No. of individual primary care physicians visited, median (IQR)	3 (2–5)	6 (4–9)
Majority source of care	259 203 (45.5)	45 169 (43.9)
Note: ICD-10 = <i>International Statistical Classification of Diseases and Related Health Problems, 10th Revision</i> , IQR = interquartile range. *Except where noted otherwise.		

identify patterns of frequent emergency department use, understanding contributing comorbidities and triggers, and providing early interventions may shorten the duration and morbidity of these episodes.

Importantly, our results indicate a growing prevalence of mental health issues and substance use among younger frequent users. For these subgroups, clinicians should consider initiating emergency department treatments when appropriate

(e.g., in patients with opioid use disorder), and ensuring that timely access to community-based treatment and supports tailored to specific clinical and psychosocial needs are available from the emergency department.

Future studies should focus on further characterizing frequent users' heterogeneity and distinct subgroups. Differential mortality among subgroups has not been adequately explored. This is a required next step in identifying modifiable risk factors that could be mitigated to improve outcomes. In addition, studies should assess predictors of episodic and persistent frequent use of the emergency department over multiple years, to target these populations separately for interventions. Future qualitative work should engage health care providers and patients within specific subgroups to understand these frequent users' unmet needs and drivers of use, and to develop collaborative solutions. Studies should seek to understand increasing trends in mental health issues and substance use.

Finally, clinicians, hospitals and regions should pilot targeted approaches to address frequent users' heterogeneous needs, using settings other than the emergency department when possible. These directed interventions could include specific case management based on clinical and social needs, follow-up of mental health issues and substance use, medication reviews for those with polypharmacy (especially if there are multiple prescribers) and chronic disease management for older patients coordinated with a most responsible primary care provider.

### Limitations

Our study has limitations inherent in analyses of data from large administrative databases. We relied on NACRS emergency department records to create our study cohort. The observed increase in emergency department visits partially reflects an increase in NACRS reporting institutions.<sup>30</sup> We mitigated this by examining visit increase in a subset of consistently reporting institutions. The National Ambulatory Care Reporting System disproportionately includes emergency departments in larger urban and suburban centres. Nonetheless, it is the most comprehensive provincial database of emergency department visits. By 2015/16, 29 BC emergency departments had contributed 1.57 million records, for a provincial coverage rate of 74%.<sup>55</sup> Although NACRS has a flag for scheduled emergency department revisits, flagging is not mandatory and is therefore coded unreliably. We therefore developed a clinically driven algorithm to identify presumed revisits for cellulitis treatment. Our algorithm is unvalidated; however, we explored all 48-hour repeat visits, and cellulitis was the only commonly appearing diagnosis.

We could not explore important variables (e.g., homelessness, employment, ethnicity, individual and family income) not captured in included databases. Although a graded analysis of frequent use would have strengthened our analysis, we chose to examine the top 10% of users to remain consistent with Canadian Institute for Health Information standards.<sup>38</sup>

Missing data were nominal for most variables; however, the NACRS discharge diagnosis was missing for 25.8% of

frequent users and 26.5% of nonfrequent users. Although these proportions are high, we do not suspect a systematic difference between groups, as there is no clinical reason why data abstractors would be more or less likely to code an emergency department diagnosis for frequent users. Canadian Institute for Health Information quality assurance indicates that missing emergency department diagnoses is due to incomplete reporting.<sup>56</sup> Discharge diagnosis was a conditional mandatory field for level 2 reporting facilities in BC during the study period (i.e., completion of either presenting problem or discharge diagnosis was required).<sup>57,58</sup> To mitigate coding inconsistencies, we collapsed diagnosis information into ICD-10 chapters, as previously described.<sup>59,60</sup> Finally, the 4-year study time frame precluded us from assessing whether the observed trends have been consistent in the longer term or have persisted since 2015/16.

### Conclusion

Emergency department use by frequent users increased in BC between 2012/13 and 2015/16. These patients were heterogeneous, were high users of other health care services, had higher mortality than nonfrequent users and rarely remained frequent users over multiple years. Our results suggest a need for interventions that account for this heterogeneity and that address factors that may trigger frequent use episodes.

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