



Decrease in emergency medical services utilization during early stages of the COVID-19 pandemic in British Columbia

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Abstract

Objective To date in the COVID-19 pandemic, there has been a decrease in patients accessing emergency health services, (EHS) but research has been conducted in areas with a very high incidence of COVID-19. In an area with a low COVID-19 incidence, we estimate changes in EHS use.

Methods We compared EHS encounters in British Columbia from March 15 (the date of school and business closures) to May 15, 2020, when compared to the same period in 2019. We categorized EHS encounters into 18 presenting complaints and prespecified critical care complaints including major trauma, cardiac arrest, stroke, and ST-elevation myocardial infarction. We analyzed by descriptive methods.

Results Comparing 2019 to 2020, total EHS encounters decreased from 83,925 (incidence rate 834 per 100,000 person-months) to 71,611 (incidence rate 701 per 100,000 person-months) for a decrease of 133 per 100,000 person-months (95% CI 126–141). The top 18 codes had a significant decrease in every category except respiratory and anxiety. Encounters for critically ill patients decreased significantly overall from 3019 to 2753 (incidence rate difference 3.1 per 100,000 person-months, 95% CI 1.6–4.5), including stroke, trauma, and STEMI, but the incidence of OHCA appeared stable.

Conclusion In a single province with a low incidence of COVID-19, there was a 15% reduction in overall EHS use and a 9% reduction in critical illness. EHS planners will need to match patient need with available resources.

Keywords Emergency medical services · COVID 19 · Critical care

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Résumé

Objectifs Jusqu'à présent dans la pandémie de Covid-19, il y a eu une diminution du nombre de patients ayant accès aux services de santé d'urgence, mais des recherches ont été menées dans des zones à très forte incidence de Covid-19. Dans une zone à faible incidence de Covid-19, nous estimons les changements dans l'utilisation des services de santé d'urgence.

Méthodes Nous avons comparé les cas des services de santé d'urgence en Colombie-Britannique du 15 mars (date de fermeture des écoles et des entreprises) au 15 mai 2020, par rapport à la même période en 2019. Nous avons classé les cas des services de santé d'urgence en 18 plaintes de présentation et des plaintes de soins intensifs pré-spécifiées, y compris un traumatisme majeur, un arrêt cardiaque, un accident vasculaire cérébral et un infarctus du myocarde avec élévation du segment ST. Nous avons analysé par des méthodes descriptives.

Résultats En comparant 2019 à 2020, le nombre total des cas des services de santé d'urgence est passé de 83 925 (taux d'incidence de 834 pour 100 000 personnes-mois) à 71 611 (taux d'incidence de 701 pour 100 000 personnes-mois) pour une diminution de 133 pour 100 000 personnes-mois (IC à 95 % 126 à 141). Les 18 codes principaux ont connu une diminution significative dans toutes les catégories, sauf respiratoire et anxiété. Les cas chez les patients gravement malades ont globalement diminué de manière significative de 3 019 à 2 753 (différence de taux d'incidence de 3,1 pour 100 000 personnes-mois, IC à 95 % de 1,6 à 4,5), y compris les accidents vasculaires cérébraux, les traumatismes et les STEMI, mais l'incidence des arrêts cardiaque hors hôpital semble stable.

Conclusions Dans une seule province avec une faible incidence de Covid-19, il y a eu une réduction de 15 % de l'utilisation globale des services de santé d'urgence et une réduction de 9 % des maladies graves. Les organisateurs des services de santé d'urgence devront faire correspondre les besoins des patients avec les ressources disponibles.

Clinician's capsule

What is known about the topic?

During the Covid-19 pandemic, ambulance calls have decreased in many jurisdictions.

What did this study ask?

In British Columbia, what are the yearly changes in ambulance calls from spring 2020 compared with spring 2019?

What did this study find?

We found a 15% overall reduction in calls extending to every health region. All chief complaints were decreased except dyspnea and anxiety. Critical illness calls decreased 9%.

Why does this study matter to clinicians?

There should be planning for fewer overall ambulance transports and ED visits. Delayed presentations of critical illness could result in atypical presentations.

is optimized if the response matches patient need, EHS and emergency department (ED) planners can plan such responses around changing encounter patterns. We examined all-cause EHS utilization in British Columbia (BC), Canada, a jurisdiction with a low COVID-19 incidence [6], to see if encounter patterns also decreased.

Methods

Study setting and design

This observational study used aggregate provincial data collected and maintained by BC Emergency Health Services, (BCEHS) the sole prehospital provider covering nearly one million square kilometers. We examined all out-of-hospital EHS encounters within BC (population 5,031,893 and 5,110,971 in the first quarters of 2019 and 2020, respectively). The province is divided into five health authorities: Fraser Health Authority (FHA; approximate population 1.9 million persons), Interior Health Authority (IHA; 745 000), Northern Health Authority (NHA; 300 000), Vancouver Coastal Health Authority (VCH; 1.25 million), and Vancouver Island Health Authority (VIHA; 870 000).

The first BC case of COVID-19 was identified on January 26, 2020, and 100th on March 14, 2020 [6]. On March 15, the provincial government closed schools and non-essential businesses and encouraged people to remain at home. On June 4, the provincial social contact rate was estimated at 40% of normal [7]. The institutional ethical review boards of Providence Health Care and the University of British

Introduction

Recent reports have described significant changes in patients accessing emergency health services (EHS) during the COVID-19 pandemic, [1–5] although results range from stable volume for ST-elevation myocardial infarction and stroke [2,3], to an increase in out-of-hospital cardiac arrest [4,5]. These observations have been generally recorded in areas with a high incidence of COVID-19. Since EHS service

Columbia approved this study. We adhered to STROBE criteria [8].

Data collection

BCEHS uses Siren (Medusa Medical Technologies, Halifax, Nova Scotia) to create electronic records for all encounters. These include transfers from home to hospital (99.8% of total) and hospital to non-hospital location (0.2% of total) but not-interhospital transfers. (Sung Lee, personal communication September 29, 2020) Paramedics select a mandatory diagnostic code from a standardized list of complaints, such as chest pain or dyspnea. We report the 18 most common codes. We also pre-specified critically ill subgroups: OHCA, stroke, STEMI, and major trauma. (Appendix 1).

Outcomes

We compared EHS encounter incidence rates per 100,000 person-months overall and for each of the most common 18 diagnostic codes between March 15 and May 15, 2020 to the same period in 2019, and calculated incidence rate differences with 95% confidence intervals. To ascertain whether patient decisions to call BCEHS were associated with local incidence of COVID-19, we analyzed the incidence rate difference in each of BC’s five health regions and compared this to the COVID-19 incidence in each of the health regions.

Analysis

Data were directly imported into an Excel spreadsheet and analyzed with R version 3.6.3. (Foundation for Statistical Computing, Vienna) We used descriptive methods for assessment.

Results

By May 15, 2020, the province had a cumulative total of 2425 laboratory-confirmed COVID-19-positive cases from 116,802 tests, for a 2.1% positive rate [7]. Comparing 2019 to 2020, total EMS encounters between March 15 and May 15 decreased from 83,925 (incidence rate 834 per 100,000 person-months) to 71,611 (incidence rate 701 per 100,000 person-months) for a decrease of 133 per 100,000 person-months (95% CI 126–141). Of the 18 prespecified codes, sixteen had a decrease in calls, most notably chest pain, abdominal pain, and syncope/collapse (Fig. 1). Two codes increased significantly: respiratory distress/symptoms from 31 to 35 per 100,000 (incidence rate difference 3.8 per 100,000 person-months, 95% CI 1.2–4.3) and anxiety from 17 to 21 per 100,000 (difference 3.4 per 100,000 person-months, 95% CI 2.2–4.6). Encounters for critically ill patients decreased significantly overall from 3019 to 2753 (incidence rate difference 3.1 per 100,000 person-months, 95% CI 1.6–4.5), including stroke, trauma,

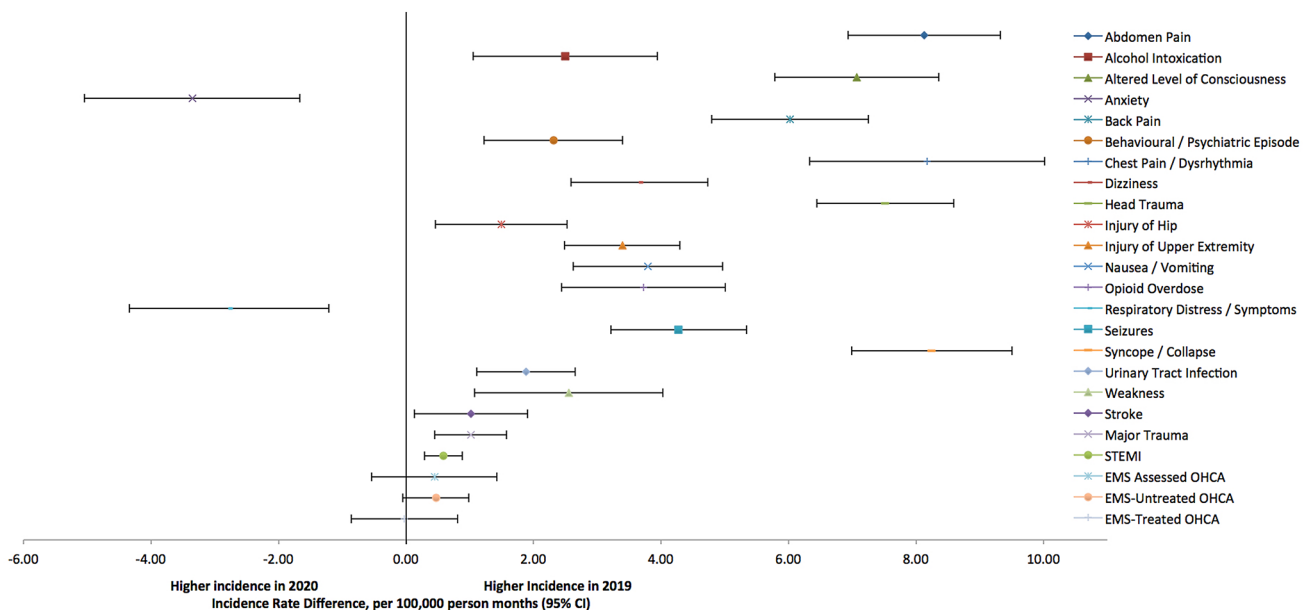


Fig. 1 March–May 2020 versus March–May 2019 change in British Columbia ambulance attendance per chief complaints

and STEMI. The incidence of OHCA was not statistically different.

While EMS encounters declined in all regions, the absolute reduction in incidence rate ranged from 70 per 100 000 person-months (95% CI 39–101) in the NHA to 179 per 100 000 person-months (95% CI 160–199) in VIHA. Dividing absolute regional reduction (in 100000 person-months) by the number of regional COVID-19 cases, results ranged from 81/1154 cases [0.070 per case] in FHA to (179/121 cases [1.5 per case]) in VIHA. (Appendix Fig. 1).

Discussion

In a province with a relatively low incidence of COVID-19, we demonstrate that all-cause EMS utilization decreased by 15% when compared with a historical control; while trauma, stroke, and STEMI decreased by 9%, and cardiac arrests did not decrease. Importantly, EMS calls for respiratory complaints and anxiety increased significantly during this time, similar to Israeli data [9]. Our findings extend to all health regions, and patient decisions to contact the ambulance were not associated with local COVID-19 incidence.

Studies have shown an apparent short-term decrease in EHS encounters [1,9], or hospital visits for chest pain or myocardial infarction [2], stroke, [4] but a potential increase in OHCA [3]. These data have arisen from regions with higher incidences of COVID-19. Despite BC's low incidence, our results indicate significantly decreased EHS encounters across a broad spectrum of complaints, including critical illness. Patients might be reluctant to seek help due to concerns about contacting COVID-19, or a desire to not “burden” the health care system, perhaps bolstered by reports from regions that have been dramatically affected.

The reasons for decreased EHS encounters is unclear, illustrated by the disconnect between regional COVID-19 incidence and changes in encounters. Different health regions may have a different population age and comorbidity profile, and older, sicker patients may contact EHS at different rates. Furthermore, patients may have contacted EHS due to lack of primary care, and this may have been different between regions.

These findings are important to EHS and ED planners and clinicians. While some might defer calling EHS or attending an ED without consequence, critical illness cannot be deferred, and such patients will need to eventually attend an ED. For example, delayed STEMI could lead to severe complications such as heart failure, arrhythmia, or valve dysfunction, as observed in Italy [10]. Furthermore, with the corresponding increase in anxiety-related complaints, EHS and ED planners should ensure that mental health capacity is increased.

This analysis has limitations common to similar recent studies [1–5,9,10] including a short time frame at the start of the pandemic and unclear future directions. Inclusion of years prior to 2019 may have provided a different baseline. Paramedics classified all codes and interobserver reliability is unknown, but there is no evidence to suspect systematically different coding during the pandemic. Data are aggregated and results, therefore, unadjusted for age, comorbidity, illness severity, availability of primary care, or repeat visits; it is possible certain groups of patients are over- or under-represented in our population.

Conclusion

In a single province with a low incidence of COVID-19, there was a 15% reduction in overall EHS use and a 9% reduction in critical illness. EHS planners will need to match patient need with available resources. Furthermore, there may be increased complications from delayed presentations of critically ill patients.

Author contributions BG, JH, and FXS conceived the study. BG submitted the ethics application, co-drafted the article, co-performed statistical analyses, and created the figures and tables. FXS co-drafted the article and co-performed statistical analysis. SL created the study dataset and contributed to study design. JH, JA, JD, RA, JT, SJ, and JC provided input on study design, interpretation of findings, and manuscript revision. JH, JA, and JD contributed to data acquisition. All authors approved the manuscript.

Compliance with ethical standards

Conflict of interest The authors declare no conflict of interest.

References

1. Valent F, Licata S. Emergency medical system calls during Italy's Covid-19 lockdown. *Ann Emerg Med.* 2020;1:3 (**In press**).
2. De Filippo O, D'Ascenzo F, Angelini F, et al. Reduced rate of hospital admissions for ACS during Covid-19 outbreak in Northern Italy. *N Engl J Med.* 2020;2:NEJMc2009166. <https://doi.org/10.1056/NEJMc2009166>.
3. Baldi E, Sechi GM, Mare C, et al. Out-of-hospital cardiac arrest during the Covid-19 outbreak in Italy. *N Engl J Med.* 2020;3:NEJMc2010418. <https://doi.org/10.1056/NEJMc2010418>.
4. Marijon E, Karam N, Jost D, et al. Out-of-hospital cardiac arrest during the COVID-19 pandemic in Paris, France: a population-based, observational study. *Lancet Public Heal.* 2020. [https://doi.org/10.1016/S2468-2667\(20\)30117-1](https://doi.org/10.1016/S2468-2667(20)30117-1).
5. Holmes JL, Brake S, Docherty M, Lilford R, Watson S. Emergency ambulance services for heart attack and stroke during UK's COVID-19 lockdown. *Lancet.* 2020;395(10237):e93–4. [https://doi.org/10.1016/S0140-6736\(20\)31031-X](https://doi.org/10.1016/S0140-6736(20)31031-X).
6. British Columbia Center for Disease Control. British Columbia Covid-19 dashboard. Available at <https://experience.arcgis.com/experience/a6f23959a8b14bfa989e3cda29297ded>. (Accessed July 27 2020).

7. British Columbia Center for Disease Control. Covid-19: Going Forward. June 4, 2020. Available at https://news.gov.bc.ca/files/June4_Covid19_PPP_VI.pdf. (Accessed 26 Sept 2020)
8. STROBE criteria. Available online at www.equator-network.org/reporting-guidelines/strobe. (Accessed 29 Sept 2020)
9. Jaffe E, Sonkin R, Strugo R, Zerath Z. Evolution of emergency medical calls during a pandemic—an emergency medical services during the Covid-19 outbreak. *Am J Emerg Med*. 2020. <https://doi.org/10.1016/j.ajem.2020.06.039>.
10. De Rosa S, Spaccarotella C, Basso C, Calabro MP, Curcio A, Filardi PP, et al. Reduction of hospitalizations for myocardial infarction in Italy in the Covid-19 era. *Eur Heart J*. 2020. <https://doi.org/10.1093/eurheartj/ehaa409>.