

First Nations status and emergency department triage scores in Alberta: a retrospective cohort study

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Abstract

Background: Previous studies have found that race is associated with emergency department triage scores, raising concerns about potential health care inequity. As part of a project on quality of care for First Nations people in Alberta, we sought to understand the relation between First Nations status and triage scores.

Methods: We conducted a population-based retrospective cohort study of health administrative data from April 2012 to March 2017 to evaluate acuity of triage scores, categorized as a binary outcome of higher or lower acuity score.

We developed multivariable multilevel logistic mixed-effects regression models using the levels of emergency department visit, patient (for patients with multiple visits) and facility. We further evaluated the triage of visits related to 5 disease categories and 5 specific diagnoses to better compare triage outcomes of First Nations and non-First Nations patients.

Results: First Nations status was associated with lower odds of receiving higher acuity triage scores (odds ratio [OR] 0.93, 95% confidence interval [CI] 0.92–0.94) compared with non-First Nations

patients in adjusted models. First Nations patients had lower odds of acute triage for all 5 disease categories and for 3 of 5 diagnoses, including long bone fractures (OR 0.82, 95% CI 0.76–0.88), acute upper respiratory infection (OR 0.90, 95% CI 0.84–0.98) and anxiety disorder (OR 0.67, 95% CI 0.60–0.74).

Interpretation: First Nations status was associated with lower odds of higher acuity triage scores across a number of conditions and diagnoses. This may reflect systemic racism, stereotyping and potentially other factors that affected triage assessments.

Health outcomes are markedly worse for First Nations than non-First Nations people. Although this is largely because of inequities in the social determinants of health,^{1–4} inequities in the provision of health care also exist.^{5,6} Emergency departments serve as a point of accessible health care. Status First Nations patients make up 4.8% of unique patients and 9.4% of emergency visits in Alberta,⁷ and Canadian studies describe First Nations patients' experiences with racism when seeking emergency care.^{8,9}

Evaluating triage contributes empirically to understanding the health care of First Nations patients insofar as triage is a quantifiable, intermediate process by which systemic racism¹⁰ may influence patient outcomes. The Canadian Triage Acuity Scale¹¹ is a 5-level scale used to classify the severity of patient symptoms. Triage nurses use a brief assessment, medical history, and presenting signs and symptoms to assign each patient a triage score that determines the priority in which the patient should be seen by a provider. Therefore, accurate triage is important for patient health outcomes.¹² In practice, triage is a social

interaction where local practice, biases, stereotypes and communication barriers come into play. Studies have found that women receive less acute triage scores than men,^{13,14} and that racial minority^{13,15–17} and Indigenous^{18–20} patients receive less acute triage scores than white or non-Indigenous patients. Indeed, Indigenous patients in Canada have described a perception “of social triaging in the [emergency department], whereby decisions about who is seen first seemed to them [to be] based less on triaged clinical priorities but on the social positioning of the patient.”²¹ Differential triage scores for minority populations raise health equity concerns.

As part of a larger mixed-methods project evaluating the quality of emergency care for First Nations people in Alberta, we sought to evaluate quantitative differences in emergency visit characteristics and outcomes of First Nations and non-First Nations people in Alberta. Specifically, we aimed to estimate the relation between First Nations status and acuity of triage, and to evaluate whether predictors of acuity differ by First Nations status.

Methods

Design

We conducted a population-based retrospective cohort study by linking Alberta administrative health data from Apr. 1, 2012, to Mar. 31, 2017. We included all emergency department visits during the study period.

Setting

Forty-five First Nations exist in Alberta.²² The province administers health services through a single health authority,^{23,24} and this authority divides the province into 5 geographic “zones.” Two of these zones are based on metropolitan cities (Edmonton and Calgary) and their surrounding communities.^{25,26} These zones contain the province’s 3 tertiary mixed hospitals and 2 pediatric tertiary hospitals. Both the Edmonton and Calgary zones rely on electronic triage in their metropolitan emergency facilities, albeit using different electronic health record systems. Rural hospitals in the Calgary zone generally rely on paper-based triage. During our study period, the Emergency Department Information System was used in the Edmonton zone, and metropolitan Calgary relied on Sunrise Clinical Manager. These systems include some prompts of triage scores (e.g., a presentation of “cardiac feature chest pain” results in a Canadian Triage Acuity Scale score of 2), but for many presentations, a trained triage nurse must enter a triage score (personal communications, nurse executive and nurse educator, Alberta Health Services, Oct. 20–21, 2021). The 3 remaining zones cover large geographic areas that contain both smaller urban centres (e.g., Red Deer) and many rural communities.^{27–29} Few facilities within these 3 zones have electronic triage systems.

First Nations people rely on emergency care and smaller hospitals more than non-First Nations people in Alberta, especially in rural and remote areas.⁷ Forty-six percent of First Nations emergency department visits are by patients residing in the North zone of Alberta, compared with 21.7% of non-First Nations visits.⁷ Over a 5-year period, individual First Nations patients visited emergency care settings a median of 4 times (interquartile range 2–9), and non-First Nations patients visited a median of 2 times (interquartile range 1–4).⁷

Data sources

Alberta Health Services and the Ministry of Health completed the data linkage before providing deidentified data to the research team. First Nations population identifiers were from the Alberta Health Care Insurance Plan Population Registry.³⁰ This registry records First Nations status based on health care premiums paid by the federal government until the province ceased charging these premiums in 2009. Children or other dependents who are associated with the account of a registrant identified in the insurance plan as First Nations at any time since 1983 are also identified as First Nations. This method is used by Alberta Health Services to produce statistics on First Nations health and health services;³¹ by First Nations organizations, such as the Alberta First Nations Information Governance Centre (AFNIGC); and by other health services researchers.^{32,33}

The National Ambulatory Care Reporting System records data on emergency department visits, including facility type.³⁴ Facility

type categories are defined by Alberta Health Services.^{35,36} Driving distance from each patient’s postal code to the nearest emergency department is recorded in the Alberta Health Services Distance Tables.³⁷ Although patients may not always travel from their homes to the emergency department, or visit the emergency department closest to their home, this variable serves as a geographic measure of patient access to emergency care. Average income for each patient’s area of residence is derived from 2016 Canadian Census data.³⁸ Finally, Alberta Health Services analysts provided comorbidity information on each patient using the Charlson Comorbidity Index; they also indicated whether the patient had hypertension.^{39,40}

Outcomes

Our primary outcome was the acuity of triage scores for First Nations and non-First Nations patients. For analysis, we dichotomized triage scores between higher acuity (level 1 “resuscitation” or 2 “emergent”) and other triage scores, including missing scores.⁴¹ In dichotomizing triage scores for analysis, we follow the example of previous studies of Indigenous patients’ triage scores^{18,19} with a goal of producing interpretable results. Our secondary outcome was the interaction between First Nations status and other variables (e.g., between First Nations status and sex) in relation to triage scores. Dichotomizing scores facilitated analysis of this outcome, as it would have been very difficult to interpret interactions of 6 categories of triage scores with all other variables. We treated missing triage scores as less acute on the rationale that visits viewed by staff as lower acuity were most likely not to have a triage score assigned.

To evaluate whether differences between First Nations and non-First Nations patients’ triage scores were driven by differences in reasons for emergency department use, we evaluated models for patients presenting to the emergency department with diagnoses in 5 disease categories and for 5 specific diagnoses. We relied on 3M’s classifications of clinical risk groups⁴² for our broad categories, with further grouping and validating of disease categories by 2 authors (C.B. and B.R.H.) (see Appendix 1A for disease categories and Appendix 2 for a list of all diagnosis codes included in analyses of specific diagnoses, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.210779/tab-related-content).

First Nations partners, including our Elder advisory group, selected the 5 disease categories (Appendix 1A). Inviting the Elder advisory group to select conditions for analysis supported partner First Nations organizations to learn more about outcomes for conditions of interest to them. Considerations in the selection of conditions included relative prevalence of conditions among First Nations emergency care visits, differences in proportions of First Nations visits for specific conditions compared with non-First Nations visits, and the judgment of clinician research team members regarding the degree to which particular conditions constituted medical emergencies. We aimed to include a mix of objective and obvious diagnoses (e.g., trauma and injury), and more subjective diagnoses (e.g., mental health). Some previous studies have suggested greater treatment disparities for conditions where provider judgment plays a greater role, compared with those with more objective signs.^{43,44} Within those

parameters, partners and Elders selected conditions that were important for their communities. These were infection and trauma, given that they account for a high proportion of emergency department visits by First Nations patients; obstetrics and gynecological visits, given an expressed interest in maternal health; and mental health and substance use, given the serious impacts of these conditions.^{31,45} Specific diagnoses within each condition were chosen by P.M. and L.B. with the advice of the project quantitative working group (Appendix 1A).

All models included the same variables, except we excluded patient sex from models related to obstetric and gynecological visits.

Partnered research

This project was collaborative and participatory, and was conducted as a full partnership between the University of Alberta, AFNIGC and other partners. Principal Investigator P.M. (University of Alberta) and L.B. (AFNIGC) co-lead the project. Grant funds supported AFNIGC's participation. The partner organizations co-developed project objectives and methods. Our steering committee discussed project decisions and generally met monthly. Coauthors L.B. and K.J. are members of the quantitative working group that initially developed this manuscript, and all listed partner authors participated in interpretation of results. The principal investigator and either L.B. or B.H. jointly conduct all knowledge translation presentations for the project. An Elder advisory group was formed for the project, and project plans and results were discussed with the Elders at prespecified points in the project protocol. This ensured that the First Nations' perspectives are reflected in the work and that information gathered in the project is used appropriately.

Statistical analysis

We developed multivariable, multilevel logistic mixed-effects regression models to evaluate the relation between First Nations status and triage scores. The levels of the models were emergency department visit, patient (for patients who had more than 1 visit) and facility. Variables included First Nations status, patient sex, patient age, presence of comorbidities, travel distance, arrival by ambulance (or not), patient area income, time of arrival, zone of patient residence and facility type. We used listwise deletion for handling missing data in input variables, as we could not rule out the possibility that data were systematically missing for different reasons for First Nations and non-First Nations patients. Four percent of cases in our data set had missing data. This level of missing data is within accepted thresholds.

We dichotomized our continuous covariates to produce a more readily interpretable model. We divided income between the lowest quintile (areas with < \$42 000 average individual income) and any higher income quintile. We believe that lowest income quintile is a reasonable threshold for evaluating a relation between this socioeconomic factor and triage scores, and were motivated to include area income given the reported stigmatization of poverty in emergency departments.²¹ Patients were categorized as having 1 or more comorbidities, or having none. In our overall data set, 87% of First Nations and non-First Nations patients had no comorbidities.⁷ We

dichotomized distance between patient residence and hospital as 5 km or less, compared with greater than 5 km. The median distance from hospital in our overall data set was 6 km for First Nations patients and 4 km for non-First Nations patients.⁷

To account for patients with multiple emergency department visits, we included a random effect for patients. Similarly, random effects for emergency department accounted for data clustering by emergency department. Finally, to evaluate our secondary outcome, we created a model that included interactions between First Nations status and all independent variables. We report odds ratios (ORs) and associated 95% confidence intervals (CIs) and considered *p* values of less than 0.05 as statistically significant. All analyses were performed in R software.⁴⁶

Ethics approval

Ethics approval was granted by the University of Alberta Health Research Ethics Board (Pro00082440). The AFNIGC has ensured compliance with the First Nations principles of Ownership, Control, Access to and Possession of research data.^{47,48}

Results

During the study period, there were 11 686 287 emergency department visits. Of these, we retained 11 216 238 (96%) visits after removing those with missing input variables. Table 1 provides descriptive results for all variables of interest for the data as analyzed (see Appendix 1B for results by CTAS, and Appendix 1C for information on the full data set and missing data). Relatively few visits with missing triage scores resulted in hospital admission (Appendix 1C), suggesting that we were correct in assuming that visits with missing triage scores were of lower acuity. Overall, 7.9% (*n* = 83 496) of First Nations visits and 11.8% (*n* = 1 198 159) of non-First Nations visits were triaged as higher acuity.

First nations status and triage scores

First Nations status was associated with lower odds of receiving higher acuity triage scores (OR 0.93, CI 0.92–0.94) after adjustment for other variables. Table 2 shows the model effects of all variables and Table 3 presents the ORs for First Nations status derived from our 5 disease category models and our 5 diagnosis models. Appendix 1A shows details of subgroup selection, Appendix 1D provides descriptive statistics on triage results for each subgroup and Appendix 1E presents the overall model for the trauma and injury subgroup (as an example of a subgroup model). First Nations status was associated with lower odds of acute triage for all 5 disease categories and for 3 of 5 diagnoses, including long bone fractures (OR 0.82, 95% CI 0.76–0.88), unspecified acute upper respiratory infection (OR 0.90, 95% CI 0.84–0.98) and unspecified anxiety disorder (OR 0.67, 95% CI 0.60–0.74). Results were not significant for opioid-related diagnoses or spontaneous abortion.

Interaction of First Nations status with other variables

As shown in Table 4, arriving by ambulance, having 1 or more comorbidities, arriving in the evening or overnight, and arriving at any of several facility types resulted in higher odds of higher acuity triage scores for both First Nations and non-First Nations

Table 1: Characteristics of patients and emergency department visits by First Nations status

Characteristic	No. (%) of visits*	
	First Nations n = 1 055 043	Non-First Nations n = 10 161 195
Age, yr, mean ± SD	31.21 ± 20.36	38.46 ± 24.52
Gender		
Male	478 870 (45.4)	4 942 934 (48.6)
Female	576 173 (54.6)	5 218 261 (51.4)
Comorbidity		
None	339 824 (32.2)	2 925 455 (28.8)
1 or more	715 219 (67.8)	7 235 740 (71.2)
Income, \$		
< 42 000	445 829 (42.3)	1 948 075 (19.2)
≥ 42 000	609 214 (57.7)	8 213 120 (80.8)
Zone of patient residence		
South	108 197 (10.3)	861 299 (8.5)
Calgary	129 991 (12.3)	3 056 954 (30.1)
Central	156 393 (14.8)	1 631 661 (16.1)
Edmonton	1 59 128 (15.1)	2 419 038 (23.8)
North	501 334 (47.5)	2 192 243 (21.6)
Travel distance, km		
≤ 5	462 461 (43.8)	5 509 437 (54.2)
> 5	592 582 (56.2)	4 651 758 (45.8)
Ambulance arrival		
Yes	158 244 (15.0)	1 012 716 (10.0)
No	896 799 (85.0)	9 148 479 (90.0)
Shift		
Morning	121 112 (11.5)	1 177 637 (11.6)
Day	472 573 (44.8)	5 115 377 (50.3)
Evening	461 358 (43.7)	3 868 181 (38.1)
Facility type		
Community ambulatory or urgent care centre	69 228 (6.6)	1 410 937 (13.9)
Tertiary pediatric	28 837 (2.7)	569 843 (5.6)
Tertiary mixed	78 750 (7.5)	957 747 (9.4)
Regional hospital	174 717 (16.6)	3 010 641 (29.6)
Large community hospital	130 373 (12.4)	775 638 (7.6)
Medium community hospital	221 415 (21.0)	1 384 923 (13.6)
Small community hospital	351 723 (33.3)	2 051 466 (20.2)
Disposition		
Admitted	64 506 (6.1)	802 273 (7.9)
Discharged	902 137 (85.5)	8 804 266 (86.6)
Deceased in ED	430 (0.0)	6311 (0.1)
Transferred	19 354 (1.8)	182 550 (1.8)
Left without being seen	44 159 (4.2)	273 807 (2.7)
Left against medical advice	24 457 (2.3)	91 988 (0.9)

Note: ED = emergency department, SD = standard deviation.
*Unless indicated otherwise.

Table 2: Association of variables on higher triage acuity scores for all emergency care visits*

Variable	OR	95 % LCL	95 % UCL
First Nations status v. non-First Nations	0.93	0.92	0.94
Male sex v. female or other sex	1.12	1.11	1.12
Age, per 10-year increment	1.01	1.01	1.01
1 or more comorbidities v. 0 comorbidities	1.52	1.51	1.53
Neighbourhood income < \$42 000 v. ≥ \$42 000	1.02	1.01	1.02
Trip distance > 5 km v. ≤ 5 km	1.06	1.06	1.07
Arrival by air or ground ambulance v. not arriving by ambulance	2.60	2.59	2.62
Shift			
Day presentation (8:01–16:00)	Ref.	Ref.	Ref.
Evening presentation (16:01–00:00)	1.23	1.22	1.24
Night presentation (00:01–8:00)	1.34	1.33	1.35
Facility			
Large community hospital	Ref.	Ref.	Ref.
Community ambulatory or urgent care centre	1.24	1.23	1.26
Tertiary pediatric hospital	2.63	2.60	2.67
Tertiary mixed hospital	4.48	4.44	4.53
Regional hospital	3.25	3.22	3.28
Medium community hospital	1.06	1.04	1.07
Small community hospital	0.59	0.58	0.60
Zone			
Calgary	Ref.	Ref.	Ref.
North	0.37	0.36	0.37
Edmonton	0.55	0.55	0.56
Central	0.43	0.43	0.44
South	0.25	0.25	0.25

Note: LCL = lower confidence limit, OR = odds ratio, UCL = upper confidence limit, Ref. = reference.
 *Multivariable, multilevel logistic mixed-effects regression model, with levels for emergency department visit, patient and facility. Models adjust for patient age, patient sex, comorbidities, area income, distance between patient residence and nearest hospital, mode of arrival (i.e., by ambulance or not), facility type presented to and zone of patient residence.

patients. The effect was larger for First Nations patients arriving by ambulance, at urgent and ambulatory care centres and at pediatric hospitals than for non-First Nations patients. The effect of having 1 or more comorbidities was larger for non-First Nations patients.

The odds of higher acuity scores for patients living in low-income areas was lower for First Nations patients (OR 0.91, 95% CI 0.89–0.93) than for non-First Nations patients. Neighbourhood income did not substantially affect triage scores of non-First Nations patients (OR 1.01, 95% CI 1.01–1.02). Presenting to small community hospitals resulted in lower odds of receiving higher acuity triage scores for both First Nations (OR 0.47, 95% CI 0.44–0.49) and non-First Nations patients (OR 0.62, 95% CI 0.61–0.63), although the odds were lower for First Nations patients. In other words, First Nations patients had lower odds of receiving higher acuity triage scores than non-First Nations patients when presenting to small community hospitals. All of the interaction effects described above were statistically significant.

Interpretation

Our analysis showed that triage scores assigned in the emergency department are associated with First Nations status. We also conducted subgroup analyses evaluating triage of visits for specific disease categories and diagnoses to control for different reasons for accessing emergency care between First Nations and non-First Nations patients. First Nations status was associated with lower odds of receiving a higher acuity triage score within all 5 disease category models, and across 3 of 5 specific diagnoses.

Our findings are in keeping with related literature on triage and ethnicity, where patients belonging to racial minority groups receive lower acuity triage scores than those who are white.^{15–20} Vigil and colleagues found that, in assigning triage scores, clinical symptoms are systematically read differently depending on patient race.⁴⁹ A study that used ethnographic methods, found that triage nurses pay inadequate attention to physiologic data

Table 3: Association of First Nations status with higher acuity triage scores derived from models for emergency department visits related to disease categories and diagnoses*

Variable	OR	95 % LCL	95% UCL
Disease category			
Trauma and injury	0.91	0.89	0.93
Infection	0.90	0.88	0.93
Substance use	0.83	0.79	0.86
Obstetrics and gynecology	0.89	0.84	0.94
Mental health	0.90	0.87	0.94
Specific diagnoses			
Long bone fractures	0.82	0.76	0.88
Acute upper respiratory infection, unspecified	0.90	0.84	0.98
Opioid-related diagnoses	1.12	1.00	1.26
Spontaneous abortion	0.99	0.89	1.09
Anxiety disorder, unspecified	0.67	0.60	0.74

Note: LCL = lower confidence limit, OR = odds ratio, UCL = upper confidence limit.
*Multivariable, multilevel logistic mixed-effects regression model, with levels for emergency department visit, patient and facility. Models adjust for patient age, patient sex, comorbidities, area income, distance between patient residence and nearest hospital, mode of arrival (i.e., by ambulance or not), facility type presented to and zone of patient residence.

in assigning triage, while also considering such things as perceived patient ethnic characteristics (e.g., stereotypes of how Hispanic patients express pain).⁵⁰ Given such findings, and in light of qualitative reports of stereotyping and discrimination against Indigenous patients by health care providers,^{51–53} we consider it likely that systemic racism plays a role in the observed lower odds of First Nations patients receiving higher acuity triage scores. Lack of access to primary care services has also been reported for First Nations patients.^{54,55} This could affect emergency department use and subsequent triage scores. Indeed, provider stereotyping and lack of access to primary care may be related, given findings that many providers hold “a derogatory stereotype” of Indigenous people as “frequent-flyers... presumed to be misusing or overusing the health system, particularly the [emergency department].”⁵⁶ Separately, the perceived acuity of many health conditions may be affected by the timing of presentation during the disease course. As Indigenous patients report delaying acute care visits in response to previous negative experiences,^{9,57} it is plausible that delayed presentation may result in health conditions appearing less acute to triage nurses (e.g., if the patient reports living with their symptoms for some time). Other factors may also affect triage scores. For example, differences in the degree to which the health care system has earned the trust of First Nations patients, compared with non-First Nations patients, could influence interactions at triage. Finally, differences in first languages, communication styles,⁵⁸ varying English dialects^{58–61} and cultural contexts⁶² (including norms about when and how much to speak)⁵⁹ between patients and triage nurses could affect triage interactions.

An advantage of our study is our use of data from a provincial emergency health system, rather than 1 or a few hospitals. Another advantage is consideration of a number of health conditions and diagnoses, whereas some studies in this area limited their sample to a small number of conditions or diagnoses. Our finding that First Nations status was associated with lower odds of receiving higher acuity triage scores across a range of conditions suggests that differences in triage scores are not solely caused by differences in medical reasons for accessing emergency care between the First Nations and non-First Nations patients. Indeed, even for long bone fractures, our model shows that First Nations status is associated with lower acuity triage scores. We predicted that triage of such a directly observable medical condition would result in equivalent triage between groups.

Another unexpected finding was the relatively larger effect of First Nations status on triage of visits that result in eventual diagnosis of unspecified anxiety disorder. These presentations may begin with a range of symptoms, from chest pain to highly agitated behaviour. Our findings may reflect provider bias about the overuse of emergency care by First Nations members,^{56,57} which may lead to First Nations patients who are perceived as suffering from anxiety being considered to be less in need of urgent medical care.

In our model that evaluated the interaction of First Nations status with other factors, the interaction effect was statistically significant for most factors. Notably, the odds of receiving higher acuity triage scores was lower for First Nations patients living in lower income areas, though there was no association between income and triage of non-First Nations patients. The association between socioeconomic status and triage scores for the majority population has differed across studies.^{16,63} The intersection of income with First Nations status and triage is concerning from a health equity perspective. These differences could reflect discrimination toward people of low income, compounding discrimination toward First Nations patients, as described by Tang and colleagues,²¹ or could represent differences in access to health care for low-income First Nations communities.

Although we intend to evaluate several outcomes in the overall project in addition to triage (e.g., leaving without being seen, return visits to the emergency department), we focused on triage first on the advice of partners and in light of prevalent concerns about discrimination at triage.

Future research could explore triage decision-making qualitatively through observational methods or analysis of nurses' written notes to understand interactions between providers and patients, biases and decision-making. In addition, more research could focus on the relation between First Nations status and certain facility types. We cannot explain why First Nations patients had higher odds of high acuity triage than non-First Nations patients at pediatric sites, while the reverse was true for small community hospitals. The role of ambulance transport patterns on patient triage acuity could be explored in future research. First Nations patients tend to live in more rural areas than non-First Nations patients in Alberta,⁷ and ambulances may more frequently bypass small community hospitals when transporting acute cases.⁶⁴ Future research to distinguish triage outcomes across more ethnic groups in Canada would also be valuable.

Table 4: Interaction of First Nations status with variables predicting higher triage acuity for all emergency department visits*

Variable	First Nations			Non-First Nations			p value†
	OR	95 % LCL	95 % UCL	OR	95 % LCL	95 % UCL	
Male sex v. female sex	1.13	1.11	1.15	1.12	1.11	1.12	0.42
Age, per 10-year increment	1.00	0.99	1.00	1.01	1.01	1.01	< 0.001
1 or more comorbidities v. 0 comorbidities	1.31	1.28	1.34	1.57	1.56	1.58	< 0.001
Neighbourhood income < \$42 000 v. ≥ \$42 000	0.91	0.89	0.93	1.01	1.01	1.02	< 0.001
Trip distance > 5 km v. ≤ 5 km	1.04	1.01	1.06	1.06	1.05	1.06	0.35
Arrival by air or ground ambulance v. not arriving by ambulance	3.57	3.50	3.64	2.51	2.50	2.53	< 0.001
Shift							
Day presentation (8:01–16:00)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	
Evening presentation (16:01–00:00)	1.18	1.16	1.20	1.24	1.23	1.24	< 0.001
Night presentation (00:01–8:00)	1.38	1.35	1.47	1.32	1.31	1.33	< 0.001
Facility							
Large community hospital	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	
Community ambulatory or urgent care centre	1.41	1.35	1.47	1.24	1.23	1.26	< 0.001
Tertiary pediatric hospital	4.15	3.97	4.34	2.56	2.52	2.59	< 0.001
Tertiary mixed hospital	4.58	4.43	4.72	4.55	4.50	4.60	0.74
Regional hospital	3.30	3.20	3.39	3.27	3.24	3.30	0.60
Medium community hospital	1.05	1.01	1.08	1.08	1.06	1.09	0.11
Small community hospital	0.47	0.44	0.49	0.62	0.61	0.63	< 0.001
Zone							
Calgary	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	
North	0.36	0.35	0.37	0.37	0.37	0.37	0.35
Edmonton	0.51	0.49	0.52	0.55	0.55	0.56	< 0.001
Central	0.43	0.41	0.44	0.43	0.42	0.43	0.96
South	0.21	0.20	0.22	0.26	0.25	0.26	< 0.001

Note: LCL = lower confidence limit, OR = odds ratio, UCL = upper confidence limit.

*Multivariable, multilevel logistic mixed-effects regression model, with levels for emergency department visit, patient and facility, and interaction terms between First Nations status and all independent variables. Models adjust for patient age, patient sex, comorbidities, area income, distance between patient residence and nearest hospital, mode of arrival (i.e., by ambulance or not), facility type presented to and zone of patient residence.

†p value represents significance of difference for the interaction of First Nations and non-First Nations status.

Finally, our results incidentally showed greater odds of higher acuity triage scores in Calgary than other zones; we cannot explain this finding, so this could be an object of future research.

This project has been codesigned with First Nations organizations and individuals who are directly affected by triage. Partners, the Elder advisory group, patient attendees at presentations, and health and research students at a First Nations college, kindly shared their perspectives on our data. This engagement prompted us to consider and include discussion of how differences in first languages, dialects, trust and culture (of both nurses and patients) may affect triage interactions.

Limitations

Within our data set, some First Nations members are inadvertently misclassified as non-First Nations, including those who do not

have legal First Nations status. Our analysis will therefore underestimate the true impact of First Nations identity on triage score. The impacts of incomplete population registries for Indigenous health research are well described by Smylie and Firestone.⁶⁵ Although we recognize that Métis and Inuit populations face discrimination and health care barriers, and that this is also an essential subject of research, we did not have access to identifiers for Métis or Inuit patients for this study. We controlled for different diagnoses by running models for specific disease categories and diagnoses, but we cannot control for the fact that First Nations identity may also affect diagnosis decisions. Income data are only reflective of the average income in the areas where patients live. We could not control for the characteristics of triage nurses, such as age and years of experience, because these data were not available. These characteristics have been shown to be

associated with triage scoring.^{66,67} Recategorizing triage scores into 2 categories removed some granularity. Our data pertain to a period before the COVID-19 pandemic. Although COVID-19 reduced the volume of visits to the emergency department,⁶⁸ we have no reason to believe that these reductions will be sustained, nor do we report data on the impact of COVID-19 on emergency department use.

Conclusion

First Nations status was associated with triage acuity overall, and for all of the disease categories and 3 of 5 diagnoses evaluated. Systemic racism, stereotyping and differential access to health care resources (especially primary care), as well as factors such as communication and level of patient trust in the health care system, may all contribute to differences in triage scores between First Nations and non-First Nations patients. Overall, our study supports previous findings that First Nations patients receive differential treatment in the health care system and underscores a need for intervention research to promote equity in health care delivery.

References

- Gracey M, King M. Indigenous health part 1: determinants and disease patterns. *Lancet* 2009;374:65-75.
- King M, Smith A, Gracey M. Indigenous health part 2: the underlying causes of the health gap. *Lancet* 2009;374:76-85.
- Axelsson P, Kukutai T, Kippen R. The field of Indigenous health and the role of colonisation and history. *J Popul Res (Canberra)* 2016;33:1-7.
- Kim PJ. Social determinants of health inequities in Indigenous Canadians through a life course approach to colonialism and the residential school system. *Health Equity* 2019;3:378-81.
- Lavoie JG, Kornelsen D, Boyer Y, et al. Lost in maps: regionalization and Indigenous health services. *Healthc Pap* 2016;16:63-73.
- The Indigenous Health Writing Group of the Royal College. Indigenous health primer. Ottawa: Royal College of Physicians and Surgeons of Canada; 2019.
- McLane P, Barnabe C, Holroyd B, et al. First Nations emergency care in Alberta: descriptive results of a retrospective cohort study. *BMC Health Serv Res* 2021;21:423.
- Browne AJ, Smye VL, Rodney P, et al. Access to primary care from the perspective of Aboriginal patients at an urban emergency department. *Qual Health Res* 2011;21:333-48.
- McLane P, Bill L, Barnabe C. First Nations members' emergency department experiences in Alberta: a qualitative study. *CJEM* 2021;23:63-74.
- Feagin J, Bennefield Z. Systemic racism and US health care. *Soc Sci Med* 2014; 103:7-14.
- Murray M, Bullard M, Grafstein E. Revisions to the Canadian Emergency Department Triage and Acuity Scale Implementation Guidelines. *CJEM* 2004;6:421-7.
- James CA, Bourgeois FT, Shannon MW. Association of race/ethnicity with emergency department wait times. *Pediatrics* 2005;115:e310-5.
- Lopez L, Wilper AP, Cervantes MC, et al. Racial and sex differences in emergency department triage assessment and test ordering for chest pain, 1997-2006. *Acad Emerg Med* 2010;17:801-8.
- Arslian-Engoren C. Gender and age bias in triage decisions. *J Emerg Nurs* 2000; 26:117-24.
- Vigil JM, Alcock J, Coulombe P, et al. Ethnic disparities in emergency severity index scores among U.S. Veteran's Affairs emergency department patients. *PLoS One* 2015;10:e0126792.
- Schrader CD, Lewis LM. Racial disparity in emergency department triage. *J Emerg Med* 2013;44:511-8.
- Dennis JA. Racial/ethnic disparities in triage scores among pediatric emergency department fever patients. *Pediatr Emerg Care* 2020; Mar 2. doi: 10.1097/PEC.0000000000002072. [Epub ahead of print].
- Zook HG, Kharbanda A, Flood A, et al. Racial differences in pediatric emergency department triage scores. *J Emerg Med* 2016;50:720-7.
- Johnston-Leek M, Sprivilus P, Stella J, et al. Emergency department triage of Indigenous and non-Indigenous patients in tropical Australia. *Emerg Med (Fremantle)* 2001;13:333-7.
- Curtis E, Paine SJ, Jiang Y, et al. Examining emergency department inequities in Aotearoa New Zealand: Findings from a national retrospective observational study examining Indigenous emergency care outcomes. *Emerg Med Australas* 2021; Oct 14. doi: 10.1111/1742-6723.13876. [Epub ahead of print].
- Tang SY, Browne AJ, Mussell B, et al. "Underclassism" and access to healthcare in urban centres. *Social Health Illn* 2015;37:698-714.
- Alberta Region. Ottawa: Indigenous Services Canada; 2021. Available: <https://www.sac-isc.gc.ca/eng/1100100020655/1614278941889> (accessed 2021 Nov. 21).
- About Alberta Health Services. Edmonton: Alberta Health Services; 2020. Available: <https://www.albertahealthservices.ca/about/about.aspx> (accessed 2021 Nov. 19).
- Vision, mission, values & strategies. Edmonton: Alberta Health Services; 2020. Available: <https://www.albertahealthservices.ca/about/Page190.aspx> (accessed 2021 Nov. 19).
- Edmonton Zone. Edmonton: Alberta Health Services; 2016. Available: <https://www.albertahealthservices.ca/assets/zone/ahs-zn-edmonton-map-brochure.pdf> (accessed 2021 Nov. 19).
- Calgary Zone. Edmonton: Alberta Health Services; 2016. Available: <https://www.albertahealthservices.ca/assets/zone/ahs-zn-calgary-map-brochure.pdf> (accessed 2021 Nov. 19).
- Central Zone. Edmonton: Alberta Health Services; 2016. Available: <https://www.albertahealthservices.ca/assets/zone/ahs-zn-central-map-brochure.pdf> (accessed 2021 Nov. 19).
- North Zone. Edmonton: Alberta Health Services; 2016. Available: <https://www.albertahealthservices.ca/assets/zone/ahs-zn-north-map-brochure.pdf> (accessed 2021 Nov. 19).
- South Zone. Edmonton: Alberta Health Services; 2016. Available: <https://www.albertahealthservices.ca/assets/zone/ahs-zn-south-map-brochure.pdf> (accessed 2021 Nov. 19).
- Interactive health data application: First Nations indicators. Edmonton: Alberta Health Services, Alberta Health Analytics, Performance Reporting Branch; 2019. Available: http://www.ahw.gov.ab.ca/IHDA_Retrieval/selectCategory.do?dataBean.id=121&command=doSelectSubCategory&cid=121 (accessed 2021 Nov. 19).
- Alberta opioid response surveillance report: First Nations People in Alberta. Edmonton: Alberta Health; 2021. Available: <https://www.alberta.ca/substance-use-surveillance-data.aspx> (accessed 2021 Nov. 22).
- Moore SP, Antoni S, Colquhoun A, et al. Cancer incidence in Indigenous people in Australia, New Zealand, Canada, and the USA: a comparative population-based study. *Lancet Oncol* 2015;16:1483-92.
- Ospina MB, Rowe BH, Voaklander D, et al. Emergency department visits after diagnosed chronic obstructive pulmonary disease in Aboriginal people in Alberta, Canada. *CJEM* 2016;18:420-8.
- National ambulatory care reporting system metadata (NACRS). Ottawa: Canadian Institute for Health Information; 2017. Available: <https://www.cihi.ca/en/national-ambulatory-care-reporting-system-metadata> (accessed 2021 Nov. 19).
- Facility peer group development for performance reporting. Edmonton: Alberta Health Services; 2015.
- Alberta health facility and functional centre definitions and facility listing. Edmonton: Alberta Health; 2020. Available: <https://open.alberta.ca/dataset/a18c14dc-c816-481a-a8c0-f1cd2496e25d/resource/36cc1a54-0706-4a5f-9bd7-e83a8fc4c57d/download/health-ahcip-facility-listing-2020-01.pdf> (accessed 2021 Nov. 19).
- Rural service access guidelines for emergency department and acute medical inpatient service planning. Edmonton: Alberta Health Services; 2013.
- Data products, 2016 census. Ottawa: Statistics Canada; 2016. Available: <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/index-eng.cfm> (accessed 2021 Nov. 19).
- Charlson ME, Pompei P, Ales KL, et al. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis* 1987;40:373-83.
- Quan H, Vijaya S, Halfon P, et al. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Med Care* 2005;43:1130-9.
- Beveridge R, Clark B, Janes L, et al. Canadian emergency department triage and acuity scale: implementation guidelines. *CJEM* 1999;1:S1-24.
- Clinical risk grouping software definitions manual. Update for v1.11 ed2013. Wallingford (CT): 3M Health Information Systems; 2013.
- Singhal A, Tien YY, Hsia RY. Racial-ethnic disparities in opioid prescriptions at emergency department visits for conditions commonly associated with prescription drug abuse. *PLoS One* 2016;11:e0159224.
- Dickason RM, Chauhan V, Mor A, et al. Racial differences in opiate administration for pain relief at an academic emergency department. *West J Emerg Med* 2015;16:372-80.
- Newton AS, Rosychuk RJ, Dong K, et al. Emergency health care use and follow-up among sociodemographic groups of children who visit emergency departments for mental health crises. *CMAJ* 2012;184:E665-74.
- R Core Team. R: A language and environment for statistical computing. Vienna (Austria): R Foundation for Statistical Computing; 2019.
- Schnarch B. Ownership, control, access, and possession (OCAP) or self-determination applied to research: a critical analysis of contemporary First Nations research and some options for First Nations communities. Ottawa: National Aboriginal Health Organization; 2005.

48. First Nations principles of OCAP. Akwesasne (ON): First Nations Information Governance Centre; 2020. Available: <https://fnigc.ca/ocap-training/> (accessed 2021 Nov. 19).
49. Vigil JM, Coulombe P, Alcock J, et al. Patient ethnicity affects triage assessments and patient prioritization in U.S. department of Veterans Affairs emergency departments. *Medicine (Baltimore)* 2016;95:e3191.
50. Wolf L. Acuity assignment: an ethnographic exploration of clinical decision making by emergency nurses at initial patient presentation. *Adv Emerg Nurs J* 2010;32:234-46.
51. Ly A, Crowshoe L. 'Stereotypes are reality': addressing stereotyping in Canadian Aboriginal medical education. *Med Educ* 2015;49:612-22.
52. Wylie L, McConkey S. Insiders' insight: discrimination against Indigenous Peoples through the eyes of health care professionals. *J Racial Ethn Health Disparities* 2019;6:37-45.
53. Goodman A, Fleming K, Markwick N, et al. "They treated me like crap and I know it was because I was Native": the healthcare experiences of Aboriginal Peoples living in Vancouver's inner city. *Soc Sci Med* 2017;178:87-94.
54. Lavoie JG, Wong ST, Ibrahim N, et al. Underutilized and undertheorized: the use of hospitalization for ambulatory care sensitive conditions for assessing the extent to which primary healthcare services are meeting needs in British Columbia First Nation communities. *BMC Health Serv Res* 2019;19:50.
55. Tompkins JW, Mequanint S, Barre DE, et al. National Survey of Indigenous primary healthcare capacity and delivery models in Canada: the TransFORMATION of IndiGENous PrimARy HEALthcare delivery (FORGE AHEAD) community profile survey. *BMC Health Serv Res* 2018;18:828.
56. Turpel-Lafond M. In plain sight: addressing Indigenous-specific racism and discrimination in B.C. health care. Vancouver: Community-Based Research Centre; 2020.
57. Browne A, Smye VL, Rodney P, et al. Access to primary care from the perspective of Aboriginal patients at an urban emergency department. *Qual Health Res* 2011;21:333-48.
58. Fadden L. Communicating effectively with Indigenous clients. Toronto: Aboriginal Legal Services Toronto; 2018.
59. Peltier S. Facilitating language and literacy learning for students with Aboriginal English dialects. *Can J Native Edu* 2010;32:114-42S, 15S.
60. Ball J, Bernhardt B. First Nations English dialects in Canada: implications for speech-language pathology. *Clin Linguist Phon* 2008;22:570-88.
61. Fadden L, LaFrance J. Advancing Aboriginal English. *Can J Native Edu* 2010;32:143-55.
62. Wark J, Neckoway R, Brownlee K. Interpreting a cultural value: an examination of the Indigenous concept of non-interference in North America. *Int Soc Work* 2019;62:419-32.
63. Khan Y, Glazier RH, Moineddin R, et al. A population-based study of the association between socioeconomic status and emergency department utilization in Ontario, Canada. *Acad Emerg Med* 2011;18:836-43.
64. Jiang HY, MacLean A, Yoon J, et al. Evaluation of trauma resources in rural northern Alberta identifies opportunities for improvement. *Can J Surg* 2020;63:E383-90.
65. Smylie J, Firestone M. Back to the basics: identifying and addressing underlying challenges in achieving high quality and relevant health statistics for Indigenous populations in Canada. *Stat J IAOS* 2015;31:67-87.
66. Stanfield LM. Clinical decision making in triage: an integrative review. *J Emerg Nurs* 2015;41:396-403.
67. Sanders SF, DeVon HA. Accuracy in ED triage for symptoms of acute myocardial infarction. *J Emerg Nurs* 2016;42:331-7.
68. Rennert-May E, Leal J, Thanh NX, et al. The impact of COVID-19 on hospital admissions and emergency department visits: a population-based study. *PLoS One* 2021;16:e0252441.

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