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Care of the Injured Patients at Nursing Stations and during Air Medical Transport

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A B S T R A C T

Introduction: Nursing stations are the only access point into the health care system for some communities and have limited capabilities and resources. We describe characteristics of patients injured in Northern Ontario who present to nursing stations and require transport by air ambulance. Secondary objectives are to compare interventions performed at nursing stations with those performed by flight paramedics and to identify systemic gaps in trauma care.

Methods: A retrospective cohort study was performed of all injured patients transported by air ambulance from April 1, 2014, to March 31, 2015.

Results: A total of 125 injured patients were transported from nursing stations. Blunt trauma accounted for 82.5% of injuries, and alcohol intoxication was suspected in 41.6% of patients. The most frequently performed interventions were intravenous fluids and analgesia. Paramedics administered oxygen 62.4% of the time, whereas nursing stations only applied in 8.8% of cases. Flight paramedics were the only providers to intubate and administer tranexamic acid, mannitol, or vasopressors.

Conclusion: Care for patients at nursing stations may be improved by updating the drug formulary based on gap analyses. Further research should examine the role of telemedicine support for nursing station staff and the use of point-of-care devices to screen for traumatic intracranial hemorrhage.

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In Canada, injury and poisonings are the leading causes of death for people under 45 years old and are the leading causes of potential years of life lost.¹ The establishment of modern trauma systems and timely access to definitive care have been shown to improve patient outcomes after injury.²⁻⁴ Many First Nation communities within Northern Ontario are remote, making timely access to hospital care challenging. Additionally, the only point of access into the health care system for some of these communities is a nursing

station, which often has limited capacity and resources compared with urban health care facilities.

Multiple studies from Canada and the United States have shown that indigenous communities have higher rates of both intentional and unintentional injuries when compared with nonindigenous communities.⁵⁻⁹ The social, political, economic, and environmental context of a community is intimately linked to its health. Canada's colonial legacy has contributed to a complex interplay of disparities in income, social status, access to education, physical environment, and access to health services (ie, the social determinants of health), which contribute to higher injury rates within remote First Nation communities compared with more urban communities.^{10,11} These inequities are compounded by severe deficiencies in the epidemiological and health

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records data concerning remote First Nation communities in Ontario. The last assessment of the burden of injury in the region was conducted in 1996, showing that injury is responsible for over 30% of deaths in remote First Nations in Northwestern Ontario.¹²

Little is known about the types of patients who are being transported from nursing stations or the reasons for transport. A better understanding of the injuries sustained by this population and the interventions performed can allow us to identify gaps in their care. Because of the vast geography of Northern Ontario, patients awaiting air transport from a nursing station may need to be stabilized for many hours before they can be flown out. Identifying critical interventions that can safely be performed by nursing station staff can help optimize patients before air transport and engineer methods to better support nursing stations.

The primary purpose of this study is to describe characteristics of patients injured in Northern Ontario who present to nursing stations and require transport by air ambulance to access hospital care. The secondary purposes are to outline interventions performed at nursing stations and those completed while under the care of flight paramedics and to identify systemic gaps in trauma care. A review of the drug formulary of medications currently stocked at First Nation nursing stations will also be performed. Describing these gaps may allow us to improve the systems of trauma care by identifying additional interventions that could improve outcome if performed early at nursing stations.

Methods

Setting

The First Nations and Inuit Health Branch (FNIHB) is a branch of Health Canada responsible for the delivery of primary health care to many First Nation communities. For some communities, these responsibilities include hiring nursing staff and maintaining the equipment and supplies required to provide care at nursing stations. For other nursing stations, the organization of care has devolved to the community itself and is facilitated by transfer payments from the FNIHB. Ornge is a provincially funded, paramedic-staffed air ambulance service that is responsible for all air ambulance transports within Ontario, Canada. Air ambulance is the only method of emergency medical transportation from many remote nursing stations in Ontario to hospitals that can provide definitive care.

Ornge operates the largest air medical transport fleet in Canada, serving over 13 million people and over 1 million square kilometers. Ornge has 9 bases that operate rotor or fixed wing aircraft. During the study period, air transportation for northern nursing stations for high-acuity trauma cases was primarily covered by 5 of those bases and included a fleet of 2 AgustaWestland AW-139 helicopters, 1 Sikorsky S76 helicopter, and 4 Pilatus Next Generation PC-12 airplanes. They are staffed by advanced and critical care paramedics who are trained in a number of advanced procedures including facilitated intubation and airway management, rapid sequence intubation, needle thoracostomy, and cricothyrotomy.

Patients and Study Design

We conducted a descriptive study using a database of electronic patient care records held at Ornge to identify all patients with physical injuries and burns who were transported by aircraft (fixed wing and rotor wing) from Northern Ontario nursing stations during a 12-month period (April 1, 2014 to March 31, 2015). Demographic and arrival characteristics were abstracted from the electronic patient care records, including age, sex, mechanism of injury, initial vital signs, and Glasgow Coma Scale (GCS) on arrival of flight paramedics as well as the time from when the patient transfer was accepted to the arrival of paramedics at the nursing station. Further chart abstraction from the Ornge electronic patient record was per-

formed to identify interventions performed by the staff at nursing stations before the arrival of air ambulance and any interventions done while under the care of the flight paramedics.

Patients with suspected alcohol intoxication were defined as patients who stated they had been drinking, had the smell of alcohol on their breath, or had positive ethanol levels on blood work. Possible alcohol intoxication was examined as a confounder for level of consciousness in patients with potential brain injuries. Heart rate, systolic blood pressure, and respiratory rate were analyzed according to the Revised Trauma Score.¹³ Interventions that were initiated at the nursing station and continued during air medical transport were considered performed by both the nurses at the nursing station and the flight paramedics. This allowed for the assessment of interventions that were started by nursing station staff and discontinued by flight paramedics.

Statistical Analysis

Descriptive statistics were performed on patient demographic and baseline characteristics. Statistical analysis was performed using SAS 9.4 (SAS Institute Inc, Cary, NC). This study was approved by our academic research ethics board.

Results

From April 1, 2014, to March 31, 2015, Ornge aircraft transported a total of 1,752 patients from Northern Ontario nursing stations. Of those patients, 125 were transferred to a center that could provide definitive care for traumatic injuries (Table 1), and these were included in this study. The mean age of trauma patients transferred was 38.1 years, and 64.8% of them were male. Blunt trauma accounted for 82.5% of mechanism of injuries, with penetrating trauma and burns making up the remaining 15% and 2.5%, respectively. The most common injuries sustained were assault (26.4%), fall from standing (19.2%), stabbing (12%), and all-terrain

Table 1
Characteristics of Injured Patients Transported from Nursing Stations

	Overall (N = 125)
Age, mean (SD)	38.1 (15.8)
Sex, n (%)	
Male	81 (64.8)
Female	44 (35.2)
Overall mechanism of injury, n (%)	
Blunt	103 (82.5)
Penetrating	19 (15.0)
Burn	3 (2.5%)
Breakdown of mechanism of injury, n (%)	
Assault	33 (26.4)
Fall from standing	24 (19.2)
Stabbing	15 (12.0)
All terrain vehicle/snowmobile collision	12 (9.6)
Motor vehicle collision	7 (5.6)
Fall down stairs	6 (4.8)
Fall from height	6 (4.8)
Burn	3 (2.4)
Sporting injury	3 (2.4)
Struck by object	3 (2.4)
Other	13 (10.4)
Suspected alcohol intoxication, n (%) ^a	52 (41.6)
Initial vital signs, n (%)	
Heart rate > 100beats/min	20 (16.0)
Systolic blood pressure < 90 mm Hg	0 (.0)
Respiratory rate < 10 or > 29 breaths/min	3 (2.4)
Glasgow Coma Scale, n (%)	
13-15	119 (95.2)
9-12	3 (2.4)
< 8	3 (2.4)

^a Defined as patients who stated they had been drinking, had the smell of alcohol on their breath, or had it confirmed on blood work.

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