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The impact of transport of critically ill pediatric patients on rural emergency departments in Manitoba

Gregory Hansen, MD, FRCP(C), MPH, MSc
Section of Pediatric Intensive Care, Department of Pediatrics and Child Health, University of Manitoba, Children's Hospital of Winnipeg, Winnipeg, Man.

Darcy L. Beer, MD, FRCP(C)
Section of Pediatric Emergency Medicine, Department of Pediatrics and Child Health, University of Manitoba, Children's Hospital of Winnipeg, Winnipeg, Man.

Jeff K. Vallance, PhD
Faculty of Health Disciplines, Athabasca University, Athabasca, Alta.

Correspondence to:
Gregory Hansen, Gregory.Hansen@umanitoba.ca

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Introduction: Although the interfacility transport (IFT) of critically ill pediatric patients from rural to tertiary health centres may improve outcomes, the impact of IFTs on the rural referring centre is not known. The purpose of this study was to investigate how the IFT of critically ill children affects staffing and functionality of rural emergency departments (EDs) in Manitoba.
Methods: In 2015, surveys were emailed to the medical directors of all 15 regional EDs within 2 hours' travel time from a tertiary pediatric hospital. The survey consisted of 9 questions that addressed baseline characteristics of the regional EDs and duration of ED staffing changes or closures due to IFT of critically ill pediatric patients.
Results: Ten surveys were received (67% response rate); a regional ED catchment population of about 130 000 people was represented. Interfacility transport caused most EDs (60%, with an average catchment population of 15 000) to close or to alter their staffing to a registered nurse only. These temporary changes lasted a cumulative total of 115 hours.
Conclusion: Interfacility transport of critically ill pediatric patients resulted in ED closures and staffing changes in rural Manitoba. These findings suggest that long-term sustainable solutions are required to improve access to emergency care.

Introduction : Même si le transfert entre établissements (TEE) des patients pédiatriques gravement malades des centres de santé ruraux vers des centres tertiaires peut améliorer les résultats, l'impact du TEE sur les centres ruraux d'origine est inconnu. Le but de cette étude était d'évaluer dans quelle mesure le TEE des enfants gravement malades affecte la dotation en personnel et la fonctionnalité des services d'urgence ruraux au Manitoba.
Méthodes : En 2015, des sondages ont été envoyés par courriel aux directeurs médicaux des 15 services d'urgence régionaux se trouvant à 2 heures de distance ou moins d'un hôpital pédiatrique de soins tertiaires. Le sondage comportait 9 questions qui portaient sur les caractéristiques de base des services d'urgence régionaux et la durée des changements de leur dotation en personnel ou leur fermeture en raison du TEE des patients pédiatriques gravement malades.
Résultats : Dix sondages ont été reçus (taux de réponse : 67 %); une population d'environ 130 000 personnes desservies par les services d'urgence régionaux se trouvait représentée. Le transfert entre établissements a entraîné la fermeture ou la modification de la dotation en personnel ramené à une seule infirmière dans la plupart des services d'urgence (60 %, desservant en moyenne une population de 15 000 personnes). Ces changements temporaires ont eu une durée cumulative de 115 heures.
Conclusion : Le transfert entre établissements des patients pédiatriques gravement malades a entraîné la fermeture des services d'urgence et des modifications de leur dotation en personnel dans les régions manitobaines rurales. Ces observations donnent à penser que des solutions viables à long terme sont nécessaires pour améliorer l'accès aux soins d'urgence.

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INTRODUCTION

It is estimated that half of the emergency care in Canada is managed in rural, remote or isolated health centres.[1] However, only 20% of the Canadian population is rural.[2] Delivering consistent, high-quality emergency care in a rural area is challenging. A disproportionally low distribution of physicians practise in rural areas,[3] which has resulted in limited access to surgeons, consultants and intensive care support.[4,5] Physicians[6] and nurses[7] may not have formal training in emergency care or may lack skills to manage the care of critically ill patients, and rural providers of emergency medical services (EMS) may have less training, less education and fewer opportunities to maintain competency than their urban counterparts.[8–10]

Data from the United States have suggested that 10% of prehospital EMS responses[11] and 27% of emergency department (ED) visits are for children,[12] and only 6% of EDs are completely equipped for pediatric emergencies.[13] Moreover, emergency care in rural centres may not be at the same standard as in urban EDs.[14] This may be partially attributed to the paucity of pediatric-trained emergency providers, infrequent contact with critically ill children and unfamiliarity with pediatric pathophysiologies.[15–17] This suggests that optimizing pediatric emergency care in these settings may be difficult.

Given these limitations, regionalization has been suggested as the solution, by which patients are matched to appropriate resources.[18] In many instances, this involves the interfacility transport (IFT) of critically ill pediatric patients to higher levels of care. Although these IFTs may improve morbidity and mortality,[19–21] the impact on the rural referring centre is not known. In some health regions such as Manitoba, the referring centre may be responsible for managing the pediatric IFT to the tertiary centre, but potentially at the expense of losing ED personnel for that transport. In smaller centres, a loss of human resources may influence how emergency services are delivered.

The purpose of this study was to investigate how the IFT of critically ill children affects staffing and functionality of rural EDs in Manitoba.

METHODS

Manitoba's transport system

Critically ill pediatric patients in Manitoba and Nunavut are transported to a single pediatric tertiary hospital in Winnipeg, Man. Accepting emergency or intensive care physicians, together with rural health providers, review management and transport plans, and triage according to the severity of the patient's illness. Beyond Winnipeg's concentric 250-km road network, health care providers in rural, remote and isolated centres use government-operated, fixed-wing IFTs, led by specialty air medical crews. However, 77% of the catchment population lives within the 250-km concentric network.[22] Here, ground transport is employed and managed by the referring site's emergency physician and its regional EMS.

Procedure

We identified rural communities with an ED within 2 hours' travel time of Winnipeg. Contact information from ED medical directors was gathered from hospital directories and local sources. In 2015, surveys were emailed to all 15 medical directors within the concentric network. We used research electronic data capture (REDCap) to collect data.[23] REDCap is a Web-based application to support research data capture that ensures secure layer encryption, anonymous responses and secure Web authentication.[23] A link to the REDCap survey was emailed to each medical director. Second and third reminder emails were sent to nonresponders at 4-week intervals. No incentives were provided and no follow-up phone calls were made.

The Health Research Ethics Board at the University of Manitoba approved the study protocol.

Survey

The survey consisted of 9 questions assessing baseline characteristics of the ED (e.g., ED catchment population, staffing and hours of operation) and institutional experiences of pediatric IFTs (e.g., number of transports per year, duration of IFT and the effects of IFTs on ED staffing and closure) over the previous 2 years. The duration of IFTs was defined as the time that rural physicians were physically absent from their ED. An embedded branching logic algorithm facilitated responses if an emergency physician managed the IFT. Anonymous data were exported into a password-protected database in a locked office at the University of Manitoba.

Analyses

Catchment population, daily operating hours and staffing for rural EDs were represented as proportions. Number of IFTs per year and impact of IFT to EDs were also calculated as proportions. Duration of

ED staffing changes or closures due to IFTs were calculated by multiplying the number of IFTs per year with the total duration of the IFT.

RESULTS

A total of 10 survey responses were received (67% response rate) (Table 1), representing a regional ED catchment population of about 130 000. Catchment populations varied from less than 5000 to more than 20 000 people. Emergency department hours ranged from less than 12 hours per day (10%) to 24-hour coverage (70%), and staffing varied from registered nurses only (30%) to registered nurses and 2 or more physicians (40%).

During the previous 2 years, 20% of centres had no IFTs per year, 10% had 1 per year, 20% had 2–5 per year and 50% had more than 5 per year (Table 2). Interfacility transports caused most EDs (60%) to close or to alter their staffing to a registered nurse only. With these 6 centres combined, the duration of total yearly ED closures was 30 hours (affecting a catchment population of 20 000), ED closure or change to registered nurse–only staffing totaled 50 hours (affecting a population of 30 000) and change to registered nurse–only staffing totaled 35 hours (affecting a population of 40 000).

DISCUSSION

The purpose of this study was to investigate how IFTs of critically ill children affect rural EDs in Manitoba. In our survey of rural ED directors, we found that pediatric IFTs caused 60% of EDs to either close or alter their staffing to registered nurses only. These temporary changes lasted a cumulative total of 115 hours across 6 centres with an average catchment population of 15 000.

Rural physicians who accompany pediatric patients on IFTs are in compliance with Canadian recommendations for rural and remote ED care.[24] They facilitate regionalization by transporting critically ill patients to the most appropriate resources.[18] Their presence also remedies the discomfort and lack of experience that EMS providers may have with a critically ill child, particularly if their scope of practice is limited to that of an emergency medical responder, or primary care paramedic. However, for the 60% of rural EDs surveyed that did not have 2 or more emergency physicians per shift, the temporary loss of a single physician on transport may have broader implications.

Closures and change of staffing to a registered nurse model only were the major impact EDs experienced from pediatric IFTs. Patients seeking timely access to emergency care within their catchment area may not have received adequate or standard treatment. Although our study did not investigate these possibilities, ED closures may have unintended ripple effects on patient outcomes.[25] Even with ambulance

Table 1: Characteristics of regional emergency departments (*n* = 10)

Characteristic	No. (%)
Catchment population	
< 5000	2 (20)
5000–9999	4 (40)
10 000–20 000	2 (20)
> 20 000	2 (20)
Daily operating hours	
< 12	1 (10)
12 to < 24	2 (20)
24	7 (70)
Emergency department staffing	
RN only	3 (30)
RN and physician	3 (30)
RN and ≥ 2 physicians	4 (40)

RN = registered nurse.

Table 2: Characteristics of pediatric interfacility transport from 10 regional emergency departments

Characteristic	No. (%)*
No. of IFTs per year	
0	2 (20)
1	1 (10)
2–5	2 (20)
> 5	5 (50)
Effect of IFTs on ED	
No notable effects	4 (40)
Closure	2 (20)
Closure or change to RN-staffing only	2 (20)
Change to RN-staffing only	2 (20)
Total duration if ED affected, h (*n* = 6)	
< 3	1 (17)
< 4	2 (33)
> 5	3 (50)
Duration of ED changes, h/yr	
Closure	30
Closure or change to RN-staffing only	50
Change to RN-staffing only	35
Catchment population exposed to changes	
Closure	20 000
Closure or change to RN-staffing only	30 000
Change to RN-staffing only	40 000

ED = emergency department; IFT = interfacility transport; RN = registered nurse.
*Unless stated otherwise.

diversion policies, closures can lead to longer prehospital transport times and have an impact on walk-in patients. Furthermore, even a transition to a nurse practitioner model may have an impact on the management of higher-acuity conditions.[26] Some of these negative effects may have been mitigated given that 30% of EDs were not open for 24 hours at baseline, which implies that alternatives were in place for access to emergency care. Nevertheless, the collective effect may not be insignificant, and more sustainable solutions need to be considered.

Although the timing of rural pediatric IFTs is unpredictable, contingency plans are required when they are necessary. Only 2 larger rural centres had created IFT call lists or were able to quickly assemble transport teams without causing deficits in human resources at the ED. However, this was not employed with the remaining smaller remote centres, which suggests limitations of human resources and real difficulties in creating reliable transport strategies. Enhanced telemedicine may address some of the disparities in urban versus rural care for critically ill children[27,28] but cannot directly alleviate the issues with human resources pertaining to IFTs. Implementation of a specialty IFT program using ground and/or air transportation may be the most viable long-term solution to ensure consistent access to emergency care by mitigating rural ED closures and staffing changes. Transport teams could also implement effective outreach and educational activities in rural centres, helping to facilitate the best possible management before transport.[29]

Limitations

The major limitation of our survey was the small sample of 10 responses. However, our unit of analysis was regions and not a single person, and given our study catchment population of more than 130 000, a greater response rate may not have dramatically changed our observations. Second, whether ED closures or staff changes altered patient care could not be determined by this survey. This question has been addressed by other Canadian studies that have examined regional hospital closures.[30]

CONCLUSION

Interfacility transport of critically ill pediatric patients resulted in ED closures and staffing changes in Manitoba's rural EDs. These findings suggest that long-term sustainable solutions are required to optimize access to emergency care.

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