ADVANCES

Capacity-related interfacility patient transports: patients affected, wait times involved and associated morbidity

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ABSTRACT

Objectives: The trend toward operating Canadian hospitals at full capacity necessitates in some settings the transfer of patients from one hospital's emergency department (ED) to another hospital for admission, due to lack of bed availability at the first hospital. Our objectives were to determine how many and which patients are transported, to measure how much time is spent in the peri-transport process and to document any morbidity or mortality associated with these periods of transitional care.

Methods: In this retrospective, observational health records review, we obtained health records during February, June and October 2002 for patients evaluated in any 1 of 3 adult EDs from a single Canadian city and subsequently transferred for admission to 1 of the other 2 hospitals. Data included the reason for transport, admitting service, transport process times and administration of key medications (asthma, cardiac, diabetes, analgesic or antibiotics).

Results: Five hundred and thirteen records of transported patients were reviewed, and 507 were evaluated. Of those, 372 (73.4%) transfers were capacity-related and 135 (26.6%) were transferred for specialty services. Of the capacity transports, 219 (58.9%) were admissions for psychiatry and 123 (33.1%) for medicine. Median wait time at the first hospital was 6.7 hours, being longest for psychiatric patients. Thirty patients (8.1%) missed 1 or more doses of a key medication in the peri-transport process, and 8 (2.2%) missed 2 or more.

Conclusions: Overcrowding of hospitals is a significant problem in many Canadian EDs, resulting in measurable increases in lengths of stay. Transfers arranged to other facilities for admission further prolong lengths of stay. Increased boarding times can result in missed medications, which may increase patient morbidity. Further study is needed to assess the need for capacity transfers and the possible risk to patients associated with periods of transitional care.

Key words: interfacility transfer; capacity

RÉSUMÉ

Objectifs : La tendance actuelle à faire fonctionner les hôpitaux canadiens à pleine capacité nécessite dans certaines situations le transfert pour admission de patients d'une urgence d'hôpital à une autre en raison de la pénurie de lits au premier hôpital. Nos objectifs étaient de déterminer le

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profil et le nombre des patients transportés, de mesurer la quantité de temps passée au processus entourant le transport et de documenter tout cas de morbidité ou de mortalité lié à ces périodes de soins transitoires.
Méthodes : Dans le cadre de cette revue de dossiers médicaux rétrospective et observationnelle, nous avons obtenu les dossiers médicaux de février, de juin et d'octobre 2002 pour les patients évalués dans n'importe lequel de trois services d'urgence pour adultes dans une même ville canadienne et ayant été par la suite transférés pour admission à l'un des deux autres hôpitaux. Les données comprenaient les raisons du transport, le service d'admission, le temps passé au processus de transport et l'administration de médicaments essentiels (asthme, problèmes cardiaques, diabète, analgésiques et antibiotiques).
Résultats : Cinq cent treize dossiers de patients transportés furent examinés et 507 furent évalués. Parmi ceux-ci, 372 (73,4 %) transferts étaient liés à la pénurie de lits et 135 (26,6 %) étaient pour des services spécialisés. Parmi les transports en raison d'une pénurie de lits, 219 (58,9 %) étaient des admissions en psychiatrie et 123 (33,1 %) en médecine. Le délai d'attente moyen au premier hôpital était de 6,7 heures, ce délai étant plus long pour les patients psychiatriques. Trente patients (8,1 %) ne reçurent pas une dose ou plus d'un médicament essentiel au cours du processus entourant le transport, et 8 patients (2,2 %) ne reçurent pas deux doses ou plus.
Conclusions : La surpopulation des hôpitaux représente un problème important dans plusieurs services d'urgence canadiens, entraînant des augmentations mesurables des durées de séjour. Les transferts organisés vers d'autres établissements pour admission prolongent davantage les durées de séjour. Les délais entourant le transport peuvent avoir pour résultat que les patients ne reçoivent pas certaines doses de leur médicament et, de ce fait, entraîner une augmentation de la morbidité. Des études plus poussées sont nécessaires pour évaluer le besoin de transferts en raison de pénuries de lits et le risque possible que représentent pour les patients les périodes de soins transitoires.

Introduction

Emergency department (ED) overcrowding is being described as a national epidemic in Canada. Lack of inpatient beds is considered a key cause.[1] One effect of bed constraints is the need for interfacility transport of patients from the ED of the original hospital directly to an alternate hospital where beds are available, for admission (i.e., capacity transports). The status of interfacility transfer systems has only begun to be studied.[2] There are limited Canadian data on the frequency of these transports, the characteristics of the patients, the time involved, or the extent of morbidity and mortality associated with the extra wait time and lack of continuity of care for these patients.[3] As administrators attempt to heed budgetary restraints while maintaining quality of care for patients, it is important to understand the impact of new strategies. Redundant transports increase the financial burden on the health care system not only through direct expense but also possibly through the cost of increased patient morbidity and resultant extended length of stay (LOS).[4]

The potential risks associated with patient transfer include pre- and post-transport "boarding" times, personnel changes (as outlined below) and the transport itself. The risks of transport are well documented, especially when critical care patients are transported. Quality of care differences have been documented between "boarding" patients (admitted patients waiting in the ED for a bed) versus direct-admit patients.[5] Delays to the initiation of care at the receiving hospital may introduce additional risk. This delay to recommencing care has not been well quantified, although some ED intrahospital wait times have been documented.[6] Finally, there are concerns that changes in health care personnel carry significant risks for the patients under their care.[3] In capacity transports, the patient experiences regular shift changes and is cared for by a minimum of 3 sets of personnel (sending hospital, transport, receiving hospital). Inherent to multiple transfers of care is the risk of missed medication administration. The importance of regular administration of asthma, cardiovascular and diabetes medications is well known. The value of prompt and regular analgesics and antibiotics is also recognized.[7,8] Medicolegal issues may arise when bed constraints result in a reduced level of care for patients.[9]

Our objective was to document the process of such interhospital transfers. We wished to quantify how many and what type of patients require capacity transports (as opposed to transport for specialty services), the duration of transport, the frequency of missed medication administrations, and the change in mortality rates around the peritransport period. We hypothesized that some patients would miss 1 or more key medication doses.

Methods

The review was a retrospective, observational health records review. Patients were included if they were initially treated at 1 of the 3 adult EDs in the Calgary Health Region (CHR) (Foothills Medical Centre [FMC], Peter Lougheed Centre [PLC] and Rockyview General Hospital [RGH]) and then transported via the CHR transport system to 1 of the other 2 facilities for admission. Patients under age 17 were excluded because there is a dedicated pediatric hospital in the CHR. During the year, each of the 3 adult hospitals experience different pressures and occupancy rates. Thus, 3 evenly spaced months (February, June and October 2002) were chosen for the review period to account for variation. They were felt to accurately represent the year since numbers of transports in those 3 months were all within 1 standard deviation (SD) of the mean of 12 months, and the means of the 3 versus the 12 months were within 1.5% (192 v. 195 transports per month, respectively).

The CHR hospitals each have specific areas of specialization. It happens routinely, therefore, that patients are transferred not because of overcrowding, but because of need for specific care not available in the originating hospital. The first outcome measured was the proportion of capacity versus specialty service transports (of total interfacility ED-originating transports). Specialty service transports included trauma, neurology and coronary catheterizations at the FMC, vascular procedures at the PLC, and urology and ophthalmology at the RGH. These patients were identified and excluded from further analysis. The capacity transports were divided into 4 main categories: psychiatry, medicine (internal medicine and family practice), surgery (general and orthopedic) or critical care units (intensive care [ICU] and coronary care [CCU]).

Data for capacity transports were collected from patient health charts. Charts from the originating and receiving hospitals were evaluated. Data included the times involved in the capacity transport process, the administration — and timing of administration — of key medications, and discharge destination.

The total capacity-transport time was divided into 4 periods bordered by the 5 event times recorded:

1. initiation of assessment in the ED (the time the patient was first seen in an ED bed);
2. decision to admit the patient (the earliest time such a decision was evident in the charts whether through nursing notes, physician's admitting orders or consult notes);
3. departure of transport team (nursing notes);
4. arrival of patient at admitting hospital (nursing notes); and
5. arrival at destination ward (time of first notes written by accepting service, which may be the same as time of arrival) (Fig. 1).

The period between times 1 and 2 was termed "decision time" and between times 2 and 3, "boarding time." Together these 2 periods were indicative of "pre-transport" risk. The period between times 3 and 4 was considered to be when the patient was at "transport risk" and between times 4 and 5 was when the patient was at "arrival risk."

The incidence of missed medication administration was examined as a surrogate for potential increased morbidity. Regular and newly prescribed medication categories (i.e., asthma, cardiovascular, diabetes, analgesics and antibiotics) were assessed. Patients were considered to require any of the 5 medication categories if the patient had 1) a list of scheduled medications on arrival to the ED that included any of the key medications; 2) orders written while in the ED; or 3) admitting orders written in the ED for any of the key medications. Medications were considered missed if there was no documentation when more than half of the prescribed amount of time had passed after the time the medication should have been given. For example, a

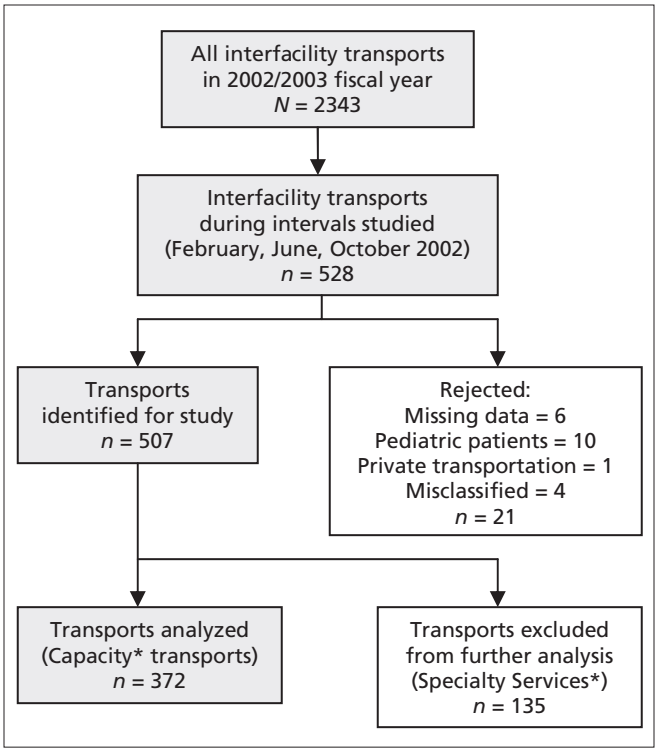

Fig. 1. Summary of selection process for capacity transports that occurred during the study intervals: February, June and October 2002. *See Methods section for definitions of Capacity and Specialty Services.

medication prescribed q.i.d. (every 6 hours) would be considered missed if given more than 3 hours after being scheduled. Consecutive versus non-consecutive doses were not differentiated if more than 1 dose was missed.

Mortality was assessed for each patient in the 3 periods of risk (i.e., pre-transport, transport and arrival) and within 24 hours of arrival at the admitting hospital.

No major changes in interfacility transport protocol, patient care protocol or charting practices were implemented in the year 2002. Data were abstracted to a standardized data form in Microsoft Access© (Microsoft Corp., Redmond, Wash.). The quality assurance nature of this evaluation precluded the need for Institutional Review Board (IRB) approval as per IRB guidelines for the CHR.

Results

Capacity

A total of 2343 patients were transported from 1 hospital ED to another hospital between April 2002 and March 2003. Five hundred and twenty-eight transports occurred during the 3 study months. Six patients were excluded because of missing chart data and 15 did not meet the inclusion criteria, thus 507 patient transfers were analyzed (Fig. 2). Of these, 135 (26.6%) were transported for specialized services and 372 (73.4%) were capacity transports. The sites consistently had different patterns of referral and reception of specialty and capacity transports (Table 1). The FMC transported almost entirely psychiatry and medicine patients, whereas the PLC transported only a few patients from each admitting service category. The RGH transported primarily psychiatry patients. The majority of capacity transports were to psychiatry (58.9%) and medicine (33.1%). Corporate data for the CHR showed occupancy rates for these hospital units to be, on average, at or near capacity (Table 1).

Pre-transport wait times

The average pre-transport wait time for patients requiring capacity transport to any admitting service was 10.6 hours. Due to right-skewed data, median times were calculated for comparisons to avoid undue influence of isolated long-stay patients. The median pre-transport wait time in the ED was 6.7 hours, which was composed of a 4.9-h decision time and a 1.8-h boarding time, with psychiatry and medicine patients waiting the longest (Table 2). Decision time was included to capture waits for consulting services. Though most patients received prompt processing, psychiatry patients waited up to 31.9 hours for decision time and 63.8 hours for boarding time. Medicine patients waited a maximum of 17.4 and 27 hours decision and boarding times, respectively.

For psychiatry patients there was no significant difference in either decision time ($p = 0.74$) or boarding time ($p = 0.68$) between hospitals. Likewise, no difference was found between decision time ($p = 0.73$) or boarding time ($p = 0.19$) for medicine patients.

Missed medication administrations, and mortality

Of the 372 patients, 127 had scheduled doses of at least 1 of the 5 drug types studied. Thirty patients (8.1%) missed at least 1 key medication administration, and 8 (2.2%) missed 2 or more (Table 3). Of the patients who missed any doses, 8 (2.2%) missed them while in the original ED and 24 (6.5%) missed 1 or more after transport.

Two of the 372 capacity-transport patients died within 8 hours of arriving at the admitting hospital. Both patients were being transported for palliative care.

Discussion

This study quantifies the numbers of ED patients needing to be transported to other hospitals for admission due to lack of inpatient beds — over 4 patients per day in one

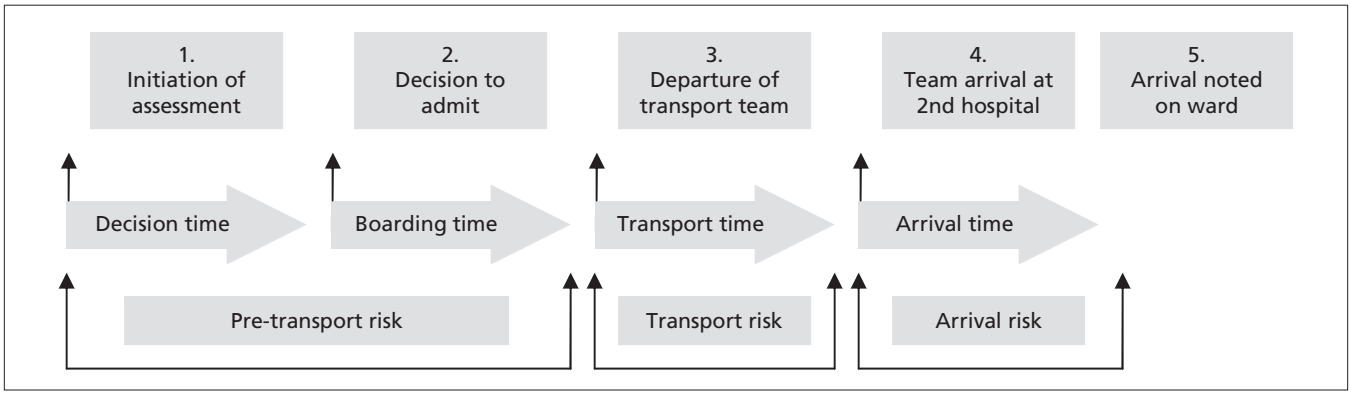

Fig. 2. Intervals involved in capacity transport process

Canadian city. Psychiatry and medicine patients most often required transport to another hospital for admission. Critical care capacity transports (directly to the ICU or CCU) are the most worrisome interfacility transports and represented 4.8% of our sample.

The average 10.6-h interhospital transport wait time was longer than average wait times for *intra*hospital admissions for the city hospitals (9.57 h in 2001/2002 and 9.49 h in 2002/2003). Difference of definition prevents direct comparison between data, however. A US study of ED "boarding" patients due to overcrowding found a median of 2.0 hours boarding time for intrahospital admissions to a floor bed and 1.5 hours to an ICU bed,[6] similar to our findings of 1.8 hours overall boarding time and 1.5 hours to an ICU. A study from a similar sized Canadian city found mean decision times (3.4 h) and boarding times (0.7 h) for intrahospital admissions from the ED[10] compared with our findings of 4.9 hours and 1.8 hours, respectively.

The time spent at the admitting hospital before orders were written (arrival risk) was also short, with only 1 patient spending >3 hours awaiting written orders in the second hospital. Even so, 6.5% of patients missed at least 1 dose of medication after arrival at the admitting hospital.

Overall, 8.1% of patients missed doses of key medications. This was a higher rate than that found in inpatient studies when interhospital patient transport was not involved. One study found a medication error rate of 5.3% of all inpatient orders, with half involving at least 1 missed

Table 1. No. of patients transported from each of the 3 facilities, admitting hospital's service category and occupancy rate of each service

Originating hospital; reason for transport, no. (%) of patients	Admitting service	
	Category (occupancy rate)	No. (%) of patients
Foothills Medical Centre (FMC)		
Capacity,* 158 (87.8)	Psychiatry (97.4)	72 (45.5)
	Medicine† (93.5)	70 (44.3)
	Surgery‡ (n/a)	2 (1.3)
	Critical care§ (n/a)	14 (8.9)
Specialty services,¶ 22 (12.2)		
Peter Lougheed Centre (PLC)		
Capacity,* 19 (20.7)	Psychiatry (91.3)	5 (26.3)
	Medicine† (97.7)	7 (36.8)
	Surgery‡ (n/a)	3 (15.8)
	Critical care§ (n/a)	4 (21.1)
Specialty services,¶ 73 (79.3)		
Rockyview General Hospital (RGH)		
Capacity,* 195 (83.0)	Psychiatry (99.3)	142 (72.8)
	Medicine† (100)	46 (23.6)
	Surgery‡ (n/a)	7 (3.6)
	Critical care§ (n/a)	0 (0.0)
Specialty services,¶ 40 (17.0)		
Totals from all 3 facilities		
Capacity,* 372 (73.4)	Psychiatry (95.9)	219 (58.9)
	Medicine† (97.1)	123 (33.1)
	Surgery‡ (n/a)	12 (3.2)
	Critical care§ (n/a)	18 (4.8)
Specialty services,¶ 135 (26.6)		

n/a = not applicable
*Patients transferred not because of overcrowding, but because of need for specific care not available in the originating hospital.
†Internal medicine and family practice
‡General and orthopedic
§Intensive care unit or cardiac care unit
¶Specialty service transports included trauma, neurology and coronary catheterizations at the FMC, vascular procedures at the PLC, and urology and ophthalmology at the RGH. These patients were identified and excluded from further analysis.

dose of medication.[11] In another study 1.4% of prescribed doses were missed.[12] Adverse effects can also arise from factors such as delayed tests, consults or surgical procedures, higher stress levels from waiting, increased infection rates from exposure to more people and environments, and lack of continuity of care.

In lieu of orders, ED physicians may request that the admitting physician be contacted for assessment as soon as the patient arrives, thus ensuring that the patient does not have to wait to see the accepting physician. This practice may delay medical start up as new orders must be received.

We were able to track all patients moving between the 3 hospital sites due to a regional health care system. This also ensured availability of corporate and universal (standard) charts, avoiding selection bias. Finally, hand searching charts for evidence of medicine administration with comprehensive and exhausting tracking ensured missed medication administrations were noted.

Table 2. Median wait times for the 4 admitting service categories

Admitting service, no. of patients	Wait times (range), h	
	Mean decision time*	Mean boarding time†
Psychiatry, 219	6.4 (0.2–31.9)	2.1 (0.2–63.8)
Medicine,‡ 123	4.3 (0.2–17.4)	1.6 (0.2–27.0)
Surgery,¶ 12	2.8 (0.2–10.7)	1.6 (0.1–16.1)
Critical care,§ 18	3.2 (0.7–12.2)	1.5 (0.2–22.3)
Overall, 372	**4.9 (0.2–31.9)**	**1.8 (0.1–63.8)**

*Time between initiation of ED assessment (i.e., the time the patient was first seen in an ED bed) and the decision to admit the patient (the earliest time such a decision was evident in the charts, whether through nursing notes, physician's admitting orders or consult notes).
†Time between decision to admit the patient (the earliest time such a decision was evident in the charts, whether through nursing notes, physician's admitting orders or consult notes) and departure of transport team (nursing notes).
‡Internal medicine and family practice
¶General and orthopedic
§Intensive care unit or cardiac care unit

Limitations

The review period chosen limited the ability to do a time series analysis and may have missed key overcrowding times such as the peak influenza season or holidays, which could create a need for additional transports. The retrospective nature of this review and the use of handwritten patient charts as a source of data were limitations in that incompleteness may have introduced recording or measurement bias. In addition, because the decision time was determined by finding written evidence of an admission decision, it may have been overestimated and boarding time underestimated when the decision was recorded late. Assessment of the impact of transports on patients was limited as the clinical relevance of missed key medication administrations, as defined here, has not been assessed and remains theoretical. Finally, this was a single-city study and the degree to which findings can be generalized is uncertain.

Conclusions

Our findings are relevant both to health care administrators and providers. The review quantifies one of the negative consequences of full-capacity hospitals: increased interfacility transport of patients, at an average rate of 4 each day in the CHR, including critically ill and dying patients. Further additions to wait times for admission are important for health administrators to consider as they evaluate the practice of transporting patients due to bed constraints, and as they assess patient-flow issues in the ED. The review shows health care providers that definable risk, in terms of missed medication administrations, exists. Further study, such as a case–control comparing morbidity with patients not transported, is needed to investigate other morbidity associated with capacity transports.

Competing interests: None declared.

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Table 3. No. of transported patients who did not receive 1 or more doses of key medications

Risk period	Type of medication					Total no. of patients (%)
	Asthma	Cardiac	Diabetes	Analgesic	Antibiotic	
Pre-transport*	2	4	0	0	3	8 (2.2)
Arrival†	3	15	3	1	3	24 (6.5)‡
Total	5	18‡	3	1	4‡	30 (8.1)‡

*Sum of "decision" and "boarding" times. See Table 2 for a definition of these times.
†Time between arrival of patient at admitting hospital (nursing notes) and arrival at destination ward (time of first notes written by accepting service, which may be the same as time of arrival) (see also Fig. 2).
‡The totals are less than the sum because categories are not mutually exclusive.

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