

## ORIGINAL ARTICLE

# The association between the transfer of emergency department admitted patients to inpatient hallways and outcomes of oncology patients

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## Abstract

**Objective:** A protocol was implemented to ease Emergency Department (ED) crowding by moving suitable admitted patients into inpatient hallway beds (HALL) or off-service beds (OFF) when beds on an admitting service's designated ward (ON) were not available. This study assessed the impact of hallway and off-service oncology admissions on ED patient flow, quality of care and patient satisfaction.

**Methods:** Retrospective and prospective data were collected on patients admitted to the medical oncology service from Jan 1 to Dec 31, 2011. Data on clinician assessments and time performance measures were collected. Satisfaction surveys were prospectively administered to all patients.

**Results:** Two hundred and ninety-seven patients (117 HALL, 90 OFF, 90 ON) were included in this study. There were no significant differences between groups for frequency of physician assessments, physical exam maneuvers at initial physician visit, time to complete vital signs or time to medication administration. The median (IQR) time spent admitted in the ED prior to departure from the ED was significantly longer for HALL patients (5.53 hrs [1.59-13.03 hrs]) compared to OFF patients (2.00 hrs [0.37-3.69 hrs]) and ON patients (2.18 hrs [0.15-5.57 hrs]) ( $p < .01$ ). Similarly, the median (IQR) total ED length of stay was significantly longer for HALL patients (13.82 hrs [7.43-20.72 hrs]) compared to OFF patients (7.18 hrs [5.72-11.42 hrs]) and ON patients (9.34 hrs [5.43-14.06 hrs]) ( $p < .01$ ). HALL patients gave significantly lower overall satisfaction scores with mean (*SD*) satisfaction scores for HALL, OFF and ON patients being 3.58 (1.20), 4.23 (0.58) and 4.29 (0.69) respectively ( $p < .01$ ). Among HALL patients, 58% were not comfortable being transferred into the hallway and 4% discharged themselves against medical advice.

**Conclusions:** The protocol for transferring ED admitted patients to inpatient hallway beds did not reduce ED length of stay for oncology patients. The timeliness and frequency of clinical assessments were not compromised; however, patient satisfaction was decreased.

**Key Words:** Emergency department, Crowding, Patient flow, Oncology, Inpatient hallway, Quality of care

## 1 Introduction

### 1.1 Background

Emergency department (ED) crowding is one of the most important issues facing the delivery of efficient and high-

quality medical care in North America<sup>[1]</sup> The underlying causes of ED crowding are complex and multifactorial, which include increasing patient complexity, decreasing hospital bed resources, and insufficient support staff resources.<sup>[2]</sup> However, studies have repeatedly found board-

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ing of admitted patients within the ED awaiting transfer to a ward bed to be the most important contributor to ED crowding.<sup>[3,4]</sup> The consequences of ED crowding include delays in antibiotic administration<sup>[5-7]</sup> poorer pain management,<sup>[8]</sup> increased adverse events<sup>[9]</sup> and increased patient mortality.<sup>[10]</sup> Patient satisfaction also declines as ED crowding and ED patient boarding become increasingly problematic.<sup>[11]</sup> The subset of oncology inpatients is not immune from the effects of a crowded ED. Cancer patients well known to a tertiary care center may be diverted to another hospital site without cancer expertise due to ED crowding.<sup>[12]</sup>

The Canadian Association of Emergency Physicians (CAEP) issued a position statement proposing that all admitted patients be transferred out of the ED within two hours of the decision to admit.<sup>[13]</sup> The Ontario Ministry of Health and Long Term Care also issued a province-wide mandate for admitted patients to remain in the ED for no longer than 24 hours. To meet these targets, CAEP has recommended implementing full capacity protocols that would involve transferring admitted patients from the ED to inpatient hallways. Viccellio *et al.* retroactively reviewed this approach at their institution.<sup>[14]</sup> With carefully selected patients chosen for temporary inpatient hallway placement, the authors did not find any increase in mortality or need for intensive care unit transfer for hallway bed admissions compared to standard bed admissions. However, the scope of this study was limited as it did not collect data on patient satisfaction, clinician assessments or time to interventions. Other studies have also found greater patient preference for inpatient hallway boarding and greater satisfaction compared to the option of remaining in the ED.<sup>[15,16]</sup>

## 1.2 Importance

There have not been any studies addressing hallway transfers specifically in an oncology patient population. Oncology patients are a unique subgroup of medical inpatients as their care typically involves a highly specialized interdisciplinary team of clinicians and nurses. The complex nature of their disease and complications of chemotherapy or radiation treatment are also distinguishing factors.<sup>[2]</sup> Lastly, there are often psychosocial and symptom management issues for oncology patients, particularly those with advanced disease or those receiving end-of-life care.

Our institution implemented a full capacity protocol in October 2009 to ease ED crowding by moving suitable admitted patients from the ED into inpatient hallway beds. A similar policy was implemented in which patients were admitted to available beds in other areas of the hospital (off-service beds), if a bed designated for the admitting medical service (on-service bed) was not available.

## 1.3 Goals

This study assessed the impact of hallway and off-service admissions on patient flow in the ED, clinician assessments

and patient satisfaction for cancer patients admitted to the medical oncology service. We hypothesized that the transfer of ED admitted patients to inpatient hallways would improve ED patient flow. Furthermore, we hypothesized that the unique complex care needs of oncology patients would make them unsuitable for hallway admission and that their clinical care and patient satisfaction would be adversely affected.

## 2 Methods

### 2.1 Study design

We prospectively identified a cohort of patients admitted to the medical oncology service from the ED between January 1 and December 31, 2011. All patients admitted to inpatient hallway beds under the medical oncology service during this time period were considered. The hospital full capacity protocol specified that patients could only be admitted to hallway beds if they did not have requirements for infection control isolation, telemetry, suctioning of secretions, or excessive supplementary oxygen. For each patient admitted to a hallway bed, one patient admitted to an on-service bed and one patient admitted to an off-service bed was randomly selected for review. Computerized bed assignment reports were reviewed daily, and on each instance where an inpatient hallway admission occurred, a randomly chosen on-service and off-service patient with the same date of admission was selected for review. On days where patients were admitted to a hallway bed but there were no corresponding admissions to on-service or off-service beds, only patients in hallway beds were included. This yielded comparison groups of 90 patients admitted to on-service and off-service beds respectively. Patients admitted to the radiation oncology or surgical oncology services were not included. Patients were excluded if they were transferred from outside hospitals, admitted from outpatient clinics, admitted on an elective basis, or transferred from the ICU to an inpatient unit. We approached all study participants to administer patient satisfaction surveys and we subsequently collected retrospective data from chart reviews.

### 2.2 Outcomes

Our primary clinical outcomes were time-in-motion measures of ED flow, including time from triage to admission and ED length of stay. These were derived from electronically captured time stamps including time of ED triage, time of admission decision, and time of ED departure. Secondary outcomes included patient-reported satisfaction markers including overall satisfaction with care during their admission as well as attitudes towards hallway admission and care. Other secondary outcomes included timeliness and frequency of clinician assessments.

## 2.3 Study ethics

The study was approved by our institution's research ethics board. Financial support for this study was provided through the Academic Health Science Center Alternative Funding Plan Innovation Fund, funded by the Ontario Ministry of Health and Long Term Care.

## 2.4 Study setting and population

Sunnybrook Health Sciences Center (SHSC) is a university-affiliated teaching hospital located in Toronto, Ontario with an annual ED census of 54,070 in 2011. The Odette Cancer Center (OCC) located on the SHSC campus is a highly specialized comprehensive cancer center serving southern Ontario and is the 6th largest cancer center in North America. OCC oncology patients in need of emergent inpatient care are most often admitted to an oncology ward in SHSC via the ED. In 2011, 1,013 patients were admitted to the inpatient medical oncology service.

SHSC implemented a full capacity protocol involving the transfer of admitted patients boarding in the ED to inpatient hallway beds that became effective on October 20, 2009. Suitable patients had no requirement for isolation, telemetry, suctioning of secretions, or excessive supplementary oxygen. Each inpatient unit accommodated up to two patients in hallway beds. When the appropriate trigger was met, the hospital bed flow coordinator was notified and hallway beds were assigned to admitted patients boarding in the ED. Another policy facilitating the admission of patients to beds other than those located on the admitting service's designated ward (off-service beds) was also in place. Patients could be admitted to off-service beds regardless of whether the full capacity protocol was activated or not.

## 2.5 Data collection

Retrospective data was collected from multiple sources including inpatient charts, the electronic patient record (Oasis) and the emergency department information system (iSoft). A trained research associate abstracted data for all included patients. A second research associate reviewed a random sample of 20 charts to ensure data validity. Demographic information was collected including gender and current treatment regimens. We collected clinical data including assessments by nurses and physicians, medication administration and diagnostic investigations. We examined time-in-motion performance markers including time from triage to admission decision, time from admission decision to departure from ED, and time spent in hallway beds. Lastly, we collected data on hospital bed occupancy rates from computerized bed management administrative databases.

A research associate approached all included patients within 24 hours of their arrival at the designated inpatient unit and asked them to complete a survey instrument that assessed their comfort with their hallway/standard bed admission,

their perceived safety in care, and their attitudes towards wait times. The research associate then administered surveys after obtaining informed consent recording either written responses or verbal responses. All patients were asked about their overall satisfaction during their admission using a 5-point Likert scale with 5 defined as completely satisfied, 3 defined as neutral and 1 defined as completely unsatisfied.

## 2.6 Data analysis

Data analysis was performed using GraphPad Prism software (La Jolla, California, USA). Descriptive analysis was performed to determine the effect of the policy on ED time measures, time to key interventions, and patient satisfaction. Continuous data were reported as means with standard deviations (*SD*) or medians with interquartile range (*IQR*) and binary data were reported as proportions. Comparisons between the hallway and standard bed groups were done using ANOVA and Student's *t*-test for continuous variables or  $\chi^2$  test for categorical variables.

## 3 Results

We identified 117 patients admitted to an inpatient hallway bed under the oncology service and included them in our analysis. In our analysis of ED patient flow, there were no significant differences in the median time from ED triage to admission decision (see Table 1). The median (*IQR*) time spent admitted in the ED (*i.e.* from admission decision to ED departure) was significantly longer for HALL patients (5.53 hrs [1.59-13.03 hrs]) compared to OFF patients (2.00 hrs [0.37-3.69 hrs]) and ON patients (2.18 hrs [0.15-5.57 hrs]) ( $p = .0004$ ). Similarly, the median (*IQR*) total ED length of stay from triage to ED departure was significantly longer for HALL patients (13.82 hrs [7.43-20.72 hrs]) compared to OFF patients (7.18 hrs [5.72-11.42 hrs]) and ON patients (9.34 hrs [5.43-14.06 hrs]) ( $p = .0006$ ).

Upon arrival to the designated ward, median (*IQR*) time to first complete vital signs and median (*IQR*) time to first medication administration for HALL patients was 0.37 hrs (0.06-1.21 hrs) and 6.02 hrs (1.63-14.88 hrs) respectively. There were not any significant differences between groups for these clinical time performance measures. The median (*IQR*) time spent in the hallway for HALL patients was 5.72 hrs (2.20-14.05 hrs). Of 117 HALL patients, 12 (10%) were in the hallway for less than one hour, 71 (61%) were in the hallway between 1-12 hours, and 34 (29%) were in the hallway for more than 12 hours. Five (4%) HALL patients voluntarily discharged themselves against medical advice, whereas no OFF or ON patients had voluntary discharges.

During the study period, total hospital occupancy at SHSC exceeded 100% for 180 days (49%). For inpatient beds allocated to the medical oncology service, occupancy exceeded 100% for 312 days (85%) and exceeded 110% for 273 days

(75%). Baseline characteristics for patients admitted to inpatient hallways (HALL), off-service non-oncology wards (OFF) and the on-service oncology ward (ON) were similar (see Table 2). The site of primary malignancy for patients in each group is also described in Table 2. HALL patients were seen by physicians an average of 6.3 ( $\pm$  3.3) times in

the first 48 hours and 43% had a documented chest or abdominal exam at the first physician visit after arrival to the inpatient ward. There were no significant differences between groups for either frequency of physician clinical assessments in the first 48 hours or physical exam maneuvers at initial physician assessment.

**Table 1:** Key time performance measures for patients admitted to inpatient hallways, off-service beds and on-service beds

	Hallway (n = 117)	Off-service (n = 90)	On-service (n = 90)	P value
<b>ED Length of Stay (hrs)</b>				
Time from triage to decision to admit (median, IQR)	6.15 (3.17-8.97)	5.30 (3.05-7.33)	5.56 (3.31-9.70)	.56
Time from decision to admit to departure from ED (median, IQR)	5.53 (1.59-13.03)	2.00 (0.37-3.69)	2.18 (0.15-5.57)	.0004
Total ED length of stay (median, IQR)	13.82 (7.43-20.72)	7.18 (5.72-11.42)	9.34 (5.43-14.06)	.0006
<b>Time to Clinical Interventions (hrs)</b>				
Time to first complete vital signs (median, IQR)	0.37 (0.06-1.21)	0.30 (0-2.06)	0.29 (0-2.45)	.078
Time to medication administration (median, IQR)	6.02 (1.63-14.88)	6.04 (2.19-13.88)	6.57 (2.16-15.46)	.85
Total Time in Hallway (hrs) (median, IQR)	5.72 (2.20-14.05)			
Time in Hallway < 1 hr	12 (10%)			
Time in Hallway 1-12 hrs	71 (61%)			
Time in Hallway 12-24 hrs	27 (23%)			
Time in Hallway > 24 hrs	7 (6%)			

**Table 2:** Patient characteristics and clinical assessments for patients admitted to inpatient hallways, off-service beds and on-service beds

	Hallway (n = 117)	Off-service (n = 90)	On-service (n = 90)	P value
<b>Gender</b>				
Female	51 (44%)	47 (52%)	43 (48%)	
Male	66 (56%)	43 (48%)	47 (52%)	.47
<b>On Active Chemotherapy</b>				
Yes	27 (23%)	14 (16%)	26 (29%)	
No	91 (77%)	76 (84%)	64 (71%)	.10
<b>Site of Primary Malignancy</b>				
Breast	17 (15%)	14 (16%)	10 (11%)	
Central Nervous System	5 (4%)	1 (1%)	2 (2%)	
Dermatologic	2 (2%)	3 (3%)	5 (6%)	
Gastrointestinal	28 (24%)	20 (22%)	23 (26%)	
Genitourinary	10 (8%)	7 (8%)	10 (11%)	
Head and Neck	4 (3%)	1 (1%)	2 (2%)	
Hematologic	23 (20%)	28 (31%)	15 (17%)	
Lung	16 (14%)	7 (8%)	14 (15%)	
Prostate	10 (8%)	4 (4%)	4 (4%)	
Unknown	2 (2%)	5 (6%)	5 (6%)	
<b>Clinical Assessments</b>				
MD visits within first 48 hours (mean, SD)	6.28 (3.27)	5.48 (1.83)	5.78 (2.57)	.10
Chest or Abdomen exam at first MD visit	50 (43%)	29 (32%)	30 (33%)	.22

We attained a 37% response rate (113 of 297) for patient satisfaction surveys. Patients in all three groups mostly agreed that wait times were acceptable and that every effort was made to make them comfortable (see Table 3). There were significant differences in the proportion of patients that were satisfied with their overall care between the HALL (67%), OFF (92%) and ON (87%) patient groups. HALL patients gave significantly lower overall satisfaction scores with the mean (*SD*) satisfaction scores for HALL, OFF and ON patients being 3.58 (1.20), 4.23 (0.58) and 4.29 (0.69) respec-

tively ( $p = .0008$ ). Of the 36 HALL patient respondents, 26 (72%) were told why they were placed in the hallway and 10 (28%) were given the option to transfer to a hallway bed. Twenty-one (58%) HALL patients felt uncomfortable being transferred into the hallway and 13 (33%) did not feel that they were receiving appropriate care in the hallway. Hallway patients indicated in qualitative responses that their primary concerns were lack of privacy, too much noise and light, lack of communication devices, and increased risk of infection transmission.

**Table 3:** Satisfaction survey results for patients admitted to inpatient hallways, off-service beds and on-service beds

	Hallway (n = 36)	Off-service (n = 39)	On-service (n = 38)	P value
Wait times were acceptable and reasonable for treatment	26 (72%)	30 (77%)	28 (74%)	
Every effort was made to make the patient comfortable	28 (78%)	31 (79%)	28 (74%)	
<b>Satisfaction with care under admission to Oncology</b>				
Satisfied to some degree	24 (67%)	36 (92%)	33 (87%)	
Score (mean, <i>SD</i> )	3.58 (1.20)	4.23 (0.58)	4.29 (0.69)	.0008

## 4 Discussion

There are many anticipated benefits to rapid patient transfer out of the ED to inpatient hallways including improved ED flow and moving patients geographically closer to inpatient physicians and nursing staff.<sup>[15]</sup> In addition, an inpatient hallway transfer protocol makes overflow a hospital-wide problem as opposed to an ED-only problem, therefore shifting more accountability to inpatient units and giving them greater incentive to improve patient flow.<sup>[17]</sup> However, the potential flow benefits of such a policy need to be weighed against the impact on patient safety and patient satisfaction. Oncology patients in particular may be more adversely affected by hallway admission due to the complex nature of their disease, associated psychosocial issues, and unique dependence on highly specialized interdisciplinary skill sets to address their care needs. To our knowledge, this study is the first to examine the impact of hallway admission specifically for an oncology patient population.

We did not find any negative impact on physician clinical assessments for HALL patients compared to patients admitted to standard ward beds. There were no significant delays in having complete vital signs done or administering medications for HALL patients. These findings are consistent with previous studies that found no association between hallway boarding and medication delays or adverse events.<sup>[14, 18]</sup> We acknowledge that the eligibility criteria for inpatient hallway admission may introduce some selection bias. However, these criteria were developed and implemented institution-wide as temporary hallway beds did not have infrastructure capabilities to support isolation, telemetry or high flow oxygen. Though we did not report on mortality in our prospectively evaluated patient population, transfers to inpatient hallways did not appear to compromise

direct patient care.

Implementing the full capacity protocol at SHSC did not reduce the median ED length of stay for oncology patients. Instead, HALL patients spent significantly more time admitted in the ED prior to departure from the ED compared to patients admitted to standard ward beds. There was no significant difference in ED length of stay for patients admitted to off-service or on-service beds. This finding was not congruent with several other studies that have found reduced ED length of stay with moving admitted patients out of the ED.<sup>[19-21]</sup>

Many contributing factors may explain this discrepancy. Firstly, the increased ED length of stay may have been more closely linked to overall hospital occupancy rates rather than ED volumes and crowding. Overall hospital occupancy exceeded 100% for nearly half of the study period. Though we were unable to correlate day-to-day hospital occupancy with ED length of stay, we hypothesize that ED length of stay for hallway patients would be most affected when hospital occupancy exceeded its surge capacity. In this scenario, hallway transfers may be ineffective if all potential hallway beds are occupied, leaving no further physical space for transferring admitted patients awaiting inpatient beds in the ED. Therefore, the increased ED length of stay may have reflected the underlying conditions triggering activation of the hallway transfer protocol, rather than the impact of the protocol itself. Secondly, the scope of this study was focused on a cohort of oncology patients and did not capture data for patients admitted to other hospital services. Our study focused specifically on medical oncology patients, and there was only a single inpatient unit where hallway beds could be assigned for these patients. In contrast, other studies examined broader patient populations where patients could be

assigned to multiple inpatient units. Thirdly, unlike other investigators that had extensive experience with inpatient hallway transfers at their institutions,<sup>[14,21,22]</sup> the full capacity protocol at SHSC was implemented only one year prior to the study period and was not yet a mature corporate procedure.

Despite increases in ED boarding time for HALL patients, the ED length of stay for oncology patients at SHSC was not significantly greater compared to studies at other institutions. A 2010 study by Wong *et al.* at another Toronto hospital reported median ED length of stay between 5 to 8 hours for oncology inpatients and between 12 to 16 hours for general internal medicine inpatients.<sup>[24]</sup> Garson *et al.* reported mean ED length of stay between 8 to 12 hours among all patients boarding in the ED.<sup>[15]</sup> In our study, 10% of patients admitted to hallway beds spent less than 1 hour in the hallway. Singer *et al.* and Viccellio *et al.* reported that the proportions of hallway patients that were moved to an inpatient ward bed in less than one hour were 53% and 50% respectively.<sup>[22,23]</sup> This may have reflected the greater experience with the hallway transfers protocol at their institution or greater inpatient bed capacity.

Multiple studies have shown patient preference for inpatient hallway boarding over ED boarding.<sup>[16,25]</sup> However, these surveys were conducted in ED patients prior to their actual admission. Our study focused on satisfaction and perceived quality of care for patients that actually experienced hallway admission compared to patients admitted to standard ward beds. We found that oncology patients were generally unhappy with their care in the hallway as shown by the increase in voluntary discharges and the significant decrease in overall satisfaction scores. More than half of patients assigned to hallway beds were uncomfortable with being transferred to the hallway, and only 67% of hallway patients agreed they were receiving appropriate care in the hallway.

The satisfaction survey results indicated that implementing the full capacity protocol at our institution had a negative impact on patient satisfaction. This finding contrasted previous studies in a broader patient population where patients preferred inpatient hallway boarding with no change in satisfaction scores.<sup>[15]</sup> Unique characteristics specific to the oncology patient population may explain this difference. Firstly, active or recent treatment with immunosuppressing chemotherapy may heighten the sensitivity of oncology patients towards enforcing adequate infection control measures relative to other patients. In addition, oncology patients may experience more frequent and prolonged hospital admissions due to complications from their disease. This may also predispose to greater hesitancy with hallway admission as opposed to more familiar ward bed admission. These findings support our hypothesis that oncology patients are poor candidates for hallway admission due to their unique care requirements and complex disease.

Our findings demonstrate a need to refine the existing full capacity protocol and implement alternative strategies to improve patient flow at our institution. Reducing overall hospital occupancy rates remains a key corporate priority. A CAEP position statement recommends that governments invest in additional hospital infrastructure and acute care beds to achieve target hospital occupancy rates of 85%.<sup>[26]</sup> In addition, coordinating early discharge of inpatients before noon has been extremely effective in reducing ED boarding in simulation models<sup>[27]</sup> and is recommended as a high impact solution to ED crowding by the American College of Emergency Physicians Boarding Task Force.<sup>[28]</sup> Our institution is actively incentivizing early discharge planning across all inpatient wards.

Several limitations apply to our study. Our study was conducted at a single academic institution with a designated inpatient medical oncology service, thus limiting the generalizability of the data. As with any retrospective chart review, incomplete chart documentation result in missing data is an inherent weakness. The research associate abstracting data was aware of the study protocol and hypothesis. However, main time measures including admission, transfer and medication administration times were taken from administrative data to reduce bias. Our prospective sample size was not large enough to comment on clinical outcomes such as mortality or medical complications. However, clinician assessment performance markers did not indicate any compromise in care received by any of the study groups. There may have been selection bias between the HALL, ON and OFF patient groups, due to the eligibility criteria for hallway admission outlined in the full capacity protocol. The survey data is limited by possible response bias as 37% of patients completed the survey. Some patients could not be approached for surveys if they were admitted after hours when a research associate was not available. The administration of the survey by a research associate during the hospitalization may have also introduced bias. Patient participants may have been reluctant to reveal their true opinions for fear of compromising their care in hospital, even though the survey instructions explicitly stated that their answers would not impact their clinical care.<sup>[15,25]</sup> Lastly, our study did not address staff satisfaction with the full capacity protocol. Buy-in from health care providers is a key element to successfully implementing a full capacity protocol, and further studies are needed to investigate hospital and staff factors influencing strategies to address overcrowding.

## 5 Conclusions

Implementing a full capacity protocol involving transferring ED admitted patients to inpatient hallway beds at our institution did not meet its objective of reducing ED length of stay for oncology patients. We found that for oncology patients, hallway admission did not compromise direct clinical care but decreased patient satisfaction. It is unclear if this policy

is beneficial to patient care or to relieving hospital crowding pressures. While full capacity protocols have been successfully implemented at other institutions, our study demonstrates a need for further research into patient, staff and hospital factors that influence the success of such strategies. Further refinements to the existing full capacity protocol and alternative solutions such as early discharge timing and increasing acute care bed capacity need to be considered.

## Disclosure

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