Reducing Patient Placement Errors in Emergency Department Admissions: Right Patient, Right Bed

Niels K. Rathlev, MD*
Christine Bryson, DO, FHM*
Patty Samra, MS, RN*
Lynn Garreffi, MS, RN, CNL*
Haiping Li*
Bonnie Geld*
Roger Y. Wu, MD, MBA†
Paul Visintainer, PhD*

* Baystate Medical Center, Springfield, Massachusetts
† Rhode Island Hospital, Department of Emergency Medicine, Providence, Rhode Island

Supervising Section Editor: Jeffrey Druck, MD
Submission history: Submitted March 7, 2014; Received May 4, 2014; Accepted May 27, 2014
Electronically published June 26, 2014
Full text available through open access at http://escholarship.org/uc/uciem_westjem
DOI: 10.5811/westjem.2014.5.21663

Introduction: Because lack of inpatient capacity is associated with emergency department (ED) crowding, more efficient bed management could potentially alleviate this problem. Our goal was to assess the impact of involving a patient placement manager (PPM) early in the decision to hospitalize ED patients. The PPMs are clinically experienced registered nurses trained in the institution-specific criteria for correct unit and bed placement.

Methods: We conducted two pilot studies that included all patients who were admitted to the adult hospital medicine service: 1) 10/24 to 11/22/2010 (30 days); and 2) 5/24 to 7/4/2011 (42 days). Each pilot study consisted of a baseline control period and a subsequent study period of equal duration. In each pilot we measured: 1) the number of "lateral transfers" or assignment errors in patient placement, 2) median length of stay (LOS) for "all" and "admitted" patients and 3) inpatient occupancy. In pilot 2, we added as a measure code 44s, i.e. status change from inpatient to observation after patients are admitted, and also equipped all emergency physicians with portable phones in order to improve the efficiency of the process.

Results: In pilot 1, the number of "lateral transfers" (incorrect patient placement assignments) during the control period was 79 of the 854 admissions (9.3%) versus 27 of 807 admissions (3.3%) during the study period (P<0.001). We found no statistically significant differences in inpatient occupancy or ED LOS for "all" or for "admitted" patients. In pilot 2, the number of "lateral transfers" was 120 of 1,253 (9.6%) admissions in the control period and 42 of 1,229 (3.4%) admissions in the study period (P<0.001). We found a 49-minute (352 vs. 401 minutes) decrease in median LOS for "admitted" ED patients during the study period compared with the control period (P=0.04). The code 44 rates, median LOS for "all" patients and inpatient occupancy did not change.

Conclusion: Inclusion of the PPM in a three-way handoff conversation between emergency physicians and hospitalist providers significantly decreased the number of "lateral transfers." Moreover, adding status determination and portable phones for emergency physicians improved the efficiency of the process and was associated with a 49 (12%) minute decrease in LOS for admitted patients. [West J Emerg Med. 2014;15(6):687-692]

INTRODUCTION

Lack of inpatient capacity is the single most important factor associated with emergency department (ED) crowding.[1] Consequently, more efficient bed management can potentially alleviate ED crowding and reduce overall ED length of stay (LOS). This is particularly true in institutions such as ours, where boarding of inpatients in the ED is a significant problem. The determination of proper bed and unit placement for admitted patients is typically guided by hospital-specific protocols. For example, a peritoneal dialysis patient with pneumonia may be admitted to the Renal Floor with nurses trained to handle dialysis care, rather than on the respiratory floor based on the diagnosis of pneumonia. Lack of adherence to protocols may cause "waste" associated with improper bed and unit placements. Unnecessary hand-offs and delays in treatment by improper bed assignment may adversely affect quality patient care and satisfaction. These concerns prompted an organization-wide project in our 650-bed institution to expedite the admissions process to the hospital medicine service, which accepts more than three quarters of all admissions. Our hospital is a Level I trauma and tertiary care referral medical center. The ED has an annual volume of 110,000 visits and supports a training program in emergency medicine with 36 residents. It is also the training site for medical students and rotating residents from other specialties.

The criteria for assigning admitted patients to inpatient beds are not only complicated, but may also change over time. It became evident that admitting hospitalists and emergency physicians (EP) in our institution were insufficiently trained and informed to uniformly follow the protocols. A project was undertaken to assess the impact of involving a patient placement manager (PPM) early in the decision to hospitalize. The PPMs are clinically experienced registered nurses who are trained in the institution-specific criteria for correct unit and bed placement depending on the admission diagnosis and acuity level. Their specialty practice experience (typically in critical care, telemetry nursing or supervisory roles) supports decision-making related to placing patients in the right bed at the right level of care. In order to facilitate their task, the PPMs were trained in determining status (observation versus inpatient) and level of care (intermediate or intensive care unit versus floor bed) using InterQual (McKesson Company®), our hospital's case management support tool. This clinical decision support tool is used as a guide for case managers to answer questions about appropriate levels of care and resource use.[2]

Our goal was to systematically improve communication and decision making via a single three-way phone call that involved the EP, hospitalist and PPM. The purpose was to provide the appropriate hand-off and also determine the appropriate unit/bed selection for all hospital medicine patients admitted through the ED. At the same time, it was important to ensure that any changes minimized delays to ED departure as studies have shown that such process changes may otherwise be associated with increased inpatient LOS and inpatient cost.[3]

METHODS

We conducted two pilot studies that included all patients who were admitted to the adult hospital medicine service: 1) 10/24 to 11/22/2010 (30 days); and 2) 5/24 to 7/4/2011 (42 days). The first pilot study was intended to assess feasibility, to serve as a "training" period for the PPMs and providers and to uncover additional opportunities for process improvement. We expected efficiency to improve in the second pilot as changes were implemented and the PPMs were fully trained in the decision support tool. Each pilot study consisted of a baseline control period and a subsequent study period of equal duration. Standard procedure was followed during the control periods i.e. the ED attending physician would decide upon admission and page the admitting adult hospitalist physician. The patient's presentation, admitting diagnosis and assignment to observation versus inpatient status was discussed by phone or in person. In a separate process, a PPM received this information electronically from the ED and found the patient a bed.

During each study period, a direct three-way phone call was instituted between the PPM and the emergency and admitting hospitalist physicians at the time of the admission decision. As a first step during pilot 1, the EP paged the PPM with only the patient name, medical record number and admitting diagnosis, and an initial triage conversation (by phone or in person) took place between these two individuals. In pilot 2, the patient information was sent directly to the PPM by electronic page and the initial triage conversation was omitted. After obtaining the admission information, the PPM paged the hospitalist with an expected response time of 15 minutes or less. The PPM then participated in a three-way telephone conversation that included the EP and the hospitalist to discuss the patient presentation, working diagnosis, indication for admission and plan of care. After consensus was reached, the patient information was placed electronically into the bed management software by the PPM and the initial bed assignment was provided.

We hypothesized that this process would improve our ability to get patients to the right bed the first time and would decrease the need for "lateral transfer" after the patient arrived on the initially designated floor. The definition of a "lateral transfer" was improper assignment resulting in transfer of the patient to a different floor within six hours of arrival on an inpatient unit. The designation of improper patient assignment was based on acuity or nursing unit according to hospital protocols. An example would be a patient requiring telemetry monitoring that arrives on a unit that does not have this capability. Patients that required a higher level of care due to progression of disease - that could not have been predicted in the ED - were excluded at the discretion of the PPM. Moreover, we measured differences in median LOS, inpatient occupancy and observation versus inpatient status changes between control and study periods.

In the first pilot study, we gathered data for a 15-day control period (10/24/10 to 11/7/2010) before the intervention

Table 1. Results of pilot study 1, which examined the feasibility of using nurses trained in the criteria for correct unit and bed placement.

Outcome measure	Control period Oct 24 –Nov 7, 2010 15 days 4,436 total visits 1,102 total admissions	Study period Nov 8-22, 2010 15 days 4,397 total visits 1,066 total admissions	p-value
Total emergency department (ED) visits	4436	4397	
Total # admissions (% of all visits)	1102 (24.8%)	1066 (24.2%)	0.51
# Admissions to hospital medicine (% of all admissions)	854 (77.4%)	807 (75.7%)	0.32
# Lateral transfers (% of admissions to hospital medicine)	79 (9.3%)	27/807 (3.3%)	< 0.001
ED length of stay (LOS), minutes All patients [median (min, max)]	244 (184, 298)	241 (178, 290)	0.69
ED LOS, minutes All admitted patients [median (min, max)]	391 (311, 506)	402 (313, 548)	0.56
Inpatient occupancy [median (min, max)]	29.7 (14.0, 39.9)	31.3 (22.7, 41.3)	0.82

and a 15-day study period (11/8/2010 to 11/22/2010) after the PPMs became involved directly in the admission process. For each period, we measured the numbers of: 1) registered visits, 2) total admissions (inpatient and observation), 3) admissions to hospital medicine and 4) "lateral transfers." In addition, we measured: 5) LOS for "all" and "admitted" patients and 6) inpatient occupancy. Median LOS in minutes was measured as the time from arrival to departure for home (discharged patients) or inpatient floor (admitted patients). We calculated inpatient occupancy as the median number of patients per day per floor that occupied 11 inpatient floors that accepted hospitalist patients.

In the second pilot, we collected data for a 21-day control period (5/24/2011 to 6/13/2011) prior to intervention and a 21-day study period (6/14/2011 to 7/4/2011) during which the PPMs were again involved directly in the admission decision. In this pilot, the decision regarding status, i.e. either observation or inpatient admission, was added as a measure using InterQual admission criteria. In addition, the initial triage conversation between PPMs and ED physicians was omitted and the latter were provided with portable phones for call back; in the first pilot study, the major complaint by EPs was time spent waiting for calls. This change enhanced their "buy-in" and their ability to continue work while waiting for calls. For each period, we repeated measurement of the outcomes listed in pilot 1. Moreover, we measured the number of code 44s, i.e. patients with change from inpatient to observation status after admission.

Patient identifiers were not recorded with any data. For LOS outcomes, we compared study and control periods using the Wilcoxon rank-sum test on the mean LOS per day. The median and range (minimum to maximum) are reported for each study group. The Chi-square test was used for comparison of study periods on dichotomous outcomes. We performed all analyses in Stata (version 12.1, College Station, TX). The study was approved by the local institutional review committee.

RESULTS

In the first pilot (two 15-day periods), the numbers of total and hospital medicine admissions were not statistically significantly different between during the control period (1,102 and 854) and the study period (1,066 and 807) (Table 1). The number of "lateral transfers" admitted to hospital medicine during the control period was 79 of the 854 admissions (9.3%) versus 27 of 807 admissions (3.3%) during the study period (P<0.001). We found no statistically significant differences in median inpatient occupancy or ED LOS for "all" or for "admitted" patients.

During the second pilot (two 21-day periods), the numbers of total and hospital medicine admissions were again not statistically significantly different between during the control period (1,572 and 1,253) and the study period (1,591 and 1,229) (Table 2). The number of "lateral transfers" resulting from admissions to hospital medicine was 120 of 1.253 (9.6%) in the control period and 42 of 1.229 (3.4%) in the study period (P<0.001). A reduction in the number of "lateral transfers" was therefore duplicated in the second pilot. In addition, we found a 49-minute (352 vs. 401 minutes) decrease in median LOS for "admitted" ED patients during the study period compared with the control period (P=0.04). The code 44 rates, median LOS for

Table 2. Results of pilot study 2.

Outcome measure	Control period May 24-June 13, 2011 21 days	Study period June 14-July 4, 2011 21 days	p-value
Total emergency department (ED) visits	6576	6476	
Total # admissions (% of visits)	1572 (23.9%)	1591 (24.6%)	0.38
# Admissions to hospital medicine (% of all admissions)	1253 (79.7%)	1229 (77.2%)	0.09
# Lateral transfers (% of admissions to hospital medicine)	120 (9.6%)	42 (3.4%)	< 0.001
# Code 44s (% of admissions to hospital medicine)	36/1253 (2.9%)	32/1229 (2.6%)	0.69
ED length of stay (LOS), minutes All patients [median (min, max)]	271 (225, 317)	262 (225, 304)	0.51
ED LOS, minutes All admitted patients [median (min, max)]	401 (284, 468)	352 (282, 457)	0.04
Inpatient occupancy [median (min, max)]	30.2 (19.2, 40.2)	27.9 (17.8, 39.8)	0.55
Inpatient occupancy [median (min, max)]	29.7 (14.0, 39.9)	31.3 (22.7, 41.3)	0.82

"all" patients and inpatient occupancy did not change.

DISCUSSION

Communication failures during the transition from ED to inpatient care has been identified as a major source of error in diagnosis, treatment, and disposition.[4,5] In some models of care, hospitalist physicians successfully facilitate appropriate placement of ED patients with positive outcomes.[6,7,8] In large, complex organizations, however, proper bed assignment and placement of inpatients is often delegated to case management in collaboration with ED and admitting physicians. With the use of clinical decision support tools, case managers are successful in determining the proper status and bed placement of hospital admissions (full inpatient admission or 23-hour observation) in collaboration with physicians.[9,10] Moreover, failures in communication resulting in improper patient placement can significantly impact a hospital's bottom line financial performance.[11,12] A coordinated and objective process through a bed management center staffed by clinically experienced nurses can significantly decrease the number of avoidable hospital days, decrease denials of payment by payers and increase net revenue.[13,14]

In our study, adding the PPM to the handoff conversation between EPs and hospitalist providers significantly decreased "lateral transfers" or assignment errors in patient placement. Changing the process of admission was associated with a decrease in "lateral transfers" in both pilots. In pilot 2, omission of an initial triage call, and, the addition to the intervention of status determination, further training, and portable phones for EPs was associated with a 49-minute (12%) decrease in LOS for admitted patients. The plausible explanation is that moving patients to a different bed/floor after they have initially been placed on an inpatient unit requires a lot of re-work and impedes efficient transfer of ED admissions to the floor. Outfitting EPs with portable phones and eliminating the initial two-way triage phone call may also have contributed.

The "waste" due to incorrect patient placement assignments occurred in over 9% of admissions during the control periods. Based on their subjective assessment, PPMs excluded from the number of "lateral" transfers patients with an unexpected deterioration in condition. This occurred in only a small minority of cases. Saving time and effort on the inpatient side may therefore have expedited the admissions process. This occurred despite no significant changes in inpatient occupancy or the numbers of ED visits or admissions between study and control periods. We believe that a 9% "lateral" transfer rate is significant in a large, complex teaching institution where ED boarding is a ma-

jor problem and the ED LOS for admitted patients is long. The same concerns may not apply to institutions where ED boarding is not an issue and the choices for inpatient beds are limited e.g. intensive care unit versus floor bed.

The additional expense incurred in permanently adopting our process included approximately $6,000 for the purchase of 10 portable phones for the providers. Moreover, we hired an additional 1.7 RN FTEs to consistently staff the PPM role at a total cost of approximately $216,000 in salaries plus benefits. Per our hospital finance department, a conservative estimate of the expense for housekeeping, PPM and nursing time as well as supplies totaled $106 for every improper assignment. The process change resulted in estimated annualized institutional savings of $232,000 assuming that the gains could be sustained.

LIMITATIONS

We encountered a number of barriers during this pilot. Suboptimal staffing of PPMs and large volumes of calls at once to the hospitalist led to delay in call backs to EPs. The ED staff perceived this as adding delays to patient flow and care, and a waste of EP time may have been a hidden cost as well. PPMs may not have been able to determine if a "lateral" transfer to a higher level of care was due to progression of disease that could not have been predicted in the ED – rather than an assignment error in placement. We believe that this reason for "lateral" transfer occurred in only a small minority of cases. Moreover, we have no reason to believe that the number of patients who were "lateral" transfers because of deterioration in condition was greater in number during the control periods than during the study periods.

We did not quantify delays experienced in the admissions process during the study periods; however, the perception of the EPs was that addition of portable cell phones in the second pilot significantly alleviated interference with their workflow and prevented delays in call backs from hospitalists. Inpatient occupancy was measured during the control and study periods, but we did not measure inpatient LOS. We also did not measure patient, nursing or physician satisfaction with these changes, but expect patient satisfaction to increase with fewer "in-house" transfers needed after admission from the ED. We did not perform a formal cost-effectiveness analysis.

CONCLUSION

In our institution, including the PPM in the three-way handoff conversation between EPs and hospitalist providers significantly decreased the number of "lateral transfers" or assignment errors in patient placement. Moreover, eliminating the initial PPM/ED physician triage call plus adding status determination and portable phones for EPs to the intervention resulted in a 49-minute (12%) decrease in LOS for admitted patients. This occurred despite no change in inpatient occupancy and the number of ED admissions.

Address for Correspondence: Niels K. Rathlev, MD, Department of Emergency Medicine, Baystate Medical Center, 759 Chestnut St., Springfield, MA, 01199. Email: Niels.Rathlev@baystatehealth.org.

Conflicts of Interest: By the *West*JEM article submission agreement, all authors are required to disclose all affiliations, funding sources and financial or management relationships that could be perceived as potential sources of bias. The authors disclosed none.

REFERENCES

1. Richardson DB, Mountain D. Myths versus facts in emergency department overcrowding and hospital access block. *Medical Journal of Australia*. 2009;190:369-74. Available at: http://www.ncbi.nlm.nih.gov/pubmed/19351311.
2. Mitus AJ. The birth of InterQual: evidence based decision support criteria that helped change healthcare. Prof Case Manag. 2008; 13:228-33.
3. Huang Q, Thind A, Dreyer JF, et al. The impact of delays to admission from the emergency department on inpatient outcomes. *BMC Emergency Medicine*. 2010;10:16. Available at: http://www.ncbi.nlm.nih.gov/pubmed/20618934.
4. Horwitz LI, Meredith T, Schuur JD, et al. Dropping the baton: a qualitative analysis of failures during the transition from emergency department to inpatient care. *Ann Emerg Med*. 2009;53:701-10.e4. Available at: http://www.ncbi.nlm.nih.gov/pubmed/18555560.
5. Apker J, Mallak LA, Applegate EB, et al. Exploring emergency physician-hospitalist handoff interactions: development of the Handoff Communication Assessment. *Ann Emerg Med*. 2010;55:161-70. Available at: http://www.ncbi.nlm.nih.gov/pubmed/19944486.
6. Chadaga SR, Shockley L, Keniston A, et al. Hospitalist-led medicine/emergency department team: associations with throughput, timeliness of patient care and satisfaction. *J Hosp Med*. 2012; 7:562-6. Available at: http://www.ncbi.nlm.nih.gov/pubmed/22865827.
7. Howell E, Bessman E, Kravet S, et al. Active Bed Management by Hospitalists and Emergency Department. *Ann Int Med*. 2008; 149:804. Available at: http://www.ncbi.nlm.nih.gov/pubmed/19047027.
8. Briones A, Markoff B, Kathuria N, et al. A model of a hospitalist role in the care of admitted patients in the emergency department. *J Hosp Med*. 2010; 5:360-4. Available at: http://www.ncbi.nlm.nih.gov/pubmed/20803676.
9. Conn AD, Shimkus GV, Inbornone R. Eyeing the ED's open door: how case managers can reduce unnecessary admissions. *Dimensions of Critical Care Nursing*. 2000;19:35–hyhen. Available at: Available at: http://www.ncbi.nlm.nih.gov/pubmed/10876497.
10. Niemi K. Tracking Patients, Tracking Costs. *Nursing Management*. 1999; 30:47. Available at: http://www.ncbi.nlm.nih.gov/pubmed/9987387.
11. Baugh CW, Venkatesh AK, Bohan JS. Emergency department observation units: A clinical and financial benefit for hospitals. *Health*

Care Management Review. 2011;36:28-37. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21157228.

12. ED case managers save $4.5 million. *Hosp Case Manag*. 2011; 19:117, 122-123. Available at: http://www.ncbi.nlm.nih.gov/.pubmed/21789904.
13. Pascuzzi T, Quenzer R. Getting care levels right from beginning to end. *Healthcare Financial Management : Journal of the Healthcare Financial Management Association*.2009;63:92-5. Available at: http://www.ncbi.nlm.nih.gov/pubmed/19161036.
14. ED case managers are crucial to help maximize reimbursement. *Hosp Case Manag*. 2011;19(8):113-6. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21789903.