The Development and Implementation of a Direct Admission System at a Tertiary Care Hospital

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KEY WORDS
communication, continuity of care/transitions, teamwork/interprofessional cooperation

ABBREVIATIONS
ED: emergency department; PCMC: Primary Children’s Medical Center

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Health care reform and changes in the levels and models of reimbursement have resulted in hospitals focusing on efficiency and examining patient flow, especially in emergency departments (EDs). Improving the throughput of patients in the ED has been addressed in various ways, including the development of direct admission systems in which patients needing admission but not emergent care can bypass the ED altogether. The development process of such systems has not been addressed in the medical literature. We review the development and implementation of a direct admission system at a tertiary care hospital, including a review of existing direct admission systems. Our new direct admission system replaced a confusing, ill-defined process that was a perceived and later survey-confirmed source of frustration for all involved and a source of resource waste and delays in care. This study also highlights a collaborative process among hospital personnel, including hospitalists, to address hospital efficiency in a meaningful way. The described process can be generalized to other hospitals.

Hospitals are under increasing pressure to improve the efficiency of health care delivery,1 especially in light of national health care reform2 and its impact on hospital reimbursement,3 notably a de-emphasis on fee-for-service payment and a movement toward payment based on the quality of the care provided rather than on the quantity of care provided.4 The emphasis on efficiency has necessitated an assessment of hospital admission and occupancy patterns in an effort to optimize patient flow (movement of patients into, between, and out of hospital departments and/or units).5,6 Enhancing patient flow is of particular importance to emergency departments (EDs), where patient overcrowding has been recognized as a significant problem diminishing ED care delivery capabilities7 and decreasing patient satisfaction.8,9 Patients in the ED awaiting admission reduce overall ED throughput.10,11 This is being addressed in a variety of ways, including streamlining admission procedures with the creation of innovative admission protocols12,13 and new hospital units such as observation units14,15 and “fast-track” units.16,17 However, there is a paucity of literature describing the development and use of a process to improve patient flow in the ED by the direct admission of patients to the inpatient setting, bypassing the ED entirely.

Our hospital recognized an opportunity to optimize a portion of patient flow by creating a formalized system for the direct admission of patients to the inpatient setting. The opportunity for improvement became apparent from anecdotal direct admission process concerns voiced by ED and referring physicians and from a survey of referring physicians, who acknowledged that many patients felt to need admission but not emergent care were unnecessarily being sent to the ED.

The objective of our quality improvement study was to design and implement a direct admission system to improve patient flow and referring physician satisfaction.
METHODS

Setting

The intervention was conducted at Primary Children’s Medical Center (PCMC), an academic children’s hospital in Salt Lake City, affiliated with the Department of Pediatrics, University of Utah. PCMC is a 289-bed hospital serving as a community pediatric hospital for Salt Lake County and a tertiary care pediatric hospital for Utah, Wyoming, Idaho, Montana, and Nevada. PCMC is owned and operated by Intermountain Healthcare, a regional, nonprofit, integrated health care delivery system.18

Planning the Intervention

A direct admission project team was assembled in 2006 to investigate the scope of the problem. Regular team members included stakeholders in the admission process at PCMC: the associate medical director, the chief nursing officer, a nursing supervisor, 2 individuals from the systems improvement department, an ED physician, and a pediatric resident. Several ad hoc consultants were involved, including a pediatric critical care physician, a referring physician, an education specialist, and individuals from hospital information systems and telecommunications.

A questionnaire regarding admissions to PCMC was developed and distributed to referring physicians (physicians noted to be the primary care provider or referring physician of record for ≥2 inpatients at PCMC in the 12 months before the survey) via electronic and standard mail. A Likert scale was used to gauge their satisfaction with the process of directly admitting patients to PCMC compared with admitting patients by sending them to the ED. Free-text comments were also elicited.

Representatives of each stakeholder group were interviewed about direct admissions at PCMC. Stakeholder interviewees were identified differently depending on stakeholder group.

Each referring physician who had filed an unsolicited direct admission related complaint was interviewed, along with a convenience sample of interviewees from each of these stakeholder groups: hospital administration, hospitalists, ED leadership (nursing and physician), nursing supervisors, housestaff, and referring physicians who had not filed complaints. Twenty-three interviews were conducted. Interviewee responses were condensed into 2 principle concerns.

The first principle concern was “inefficient contacts,” which referred to the numerous and variably productive phone calls made by referring physicians in their attempts to facilitate a direct admission through various PCMC personnel, none of whom seemed enabled to make admission decisions. The second principle concern was referring physicians’ feelings of being disrespected by PCMC personnel.

The preintervention direct admission process at PCMC was defined, including the role of each stakeholder group and the process decisions made. Interviews of individuals of each stakeholder group were performed, as noted, as were direct observations of stakeholders in the process of facilitating direct admissions. Stakeholders’ difficulties and concerns were documented, and time and case volume data were obtained. The project team produced a diagram that displayed the multiple contacts and time needed to perform a direct admission (Fig 1). In light of the collected data, the project team determined that a formalized direct admission system was needed.

Direct admission systems in existence at other hospitals were identified. Representatives from these hospitals were interviewed by telephone. A comparison of the identified systems is presented in Table 1.

The direct admission project team had the responsibility of selecting the most appropriate system to test for the intervention, implementing a system, and overseeing the system after implementation.

Several key principles were established for the direct admission process. A system that operated 24 hours a day, 7 days a week was desired because this was felt to be the most convenient for referring physicians. The decision to admit the patient was left in the hands of the referring physician, who was considered an expert on the needs of the patient. The “admissions officer” (the on-call hospitalist) was considered an expert on the hospital’s resources and ability to provide for the needs of the patient as conveyed by the referring physician. Also, it was felt that the experience and knowledge of the involved parties were sufficient to determine the needs of the patient, so the core project team did not require that the patient be seen within a certain time frame before direct admission and did not standardize the interrogation of the referring physician by the admissions officer.

The Intervention

A call center system, in which customer service representatives act as a hub connecting all other necessary
personnel, was chosen. This system model addressed the needs of referring physicians, fit our existing resources best, and was the least expensive to implement and operate with those existing resources. In addition, the project team felt that this type of system, which more heavily involves a physician, was superior in that it allows for direct communication between the referring physician and the accepting physician, which likely results in better patient handoffs. Other noted advantages of this type of system were its timeliness, ability to standardize calls, and ease of record keeping, especially the recording of calls. Disadvantages were a lack of medical knowledge of the initial call taker, the possibility of a low volume of calls that would not merit continuous clerical staffing, and a risk of confusion due to multiple individuals entering and exiting the conversation at different times.

Several of the resources necessary for a call center system already existed at PCMC. An in-house physician group (the University of Utah Division of Pediatric Inpatient Medicine) was willing to provide the needed round-the-clock physician resources. A readily accessible call center (the Intermountain Healthcare Physician Referral Center) was willing to contract with PCMC for services and to provide system-specific clerical personnel and the necessary training. The PCMC nursing supervisors, with their real-time knowledge of bed space and nursing resources, were willing to provide round-the-clock nursing coverage. An information tracking system (Patient Tracker) was in use at PCMC and was accessible to all involved personnel. Patient Tracker was flexible and allowed for a new module and software to be added for the new system.

The new system is detailed in Fig 2. A recognizable and memorable phone number was chosen (801-66ADMIT). To engage the new system, referring physicians phoned the call center and spoke with a dispatcher, who...
took primary responsibility for the caller. The dispatcher simultaneously paged the nursing supervisor and contacted the admissions officer via a hands-free communication device (Vocera, Vocera Communications, San Jose, CA). The referring physician, the admissions officer, and the nursing supervisor were connected by the dispatcher and discussed the needs of the patient, including transportation. The admissions officer recorded patient-specific clinical information, and the nursing supervisor recorded the patient’s disposition and any special care needs in Patient Tracker. If the patient was to arrive on foot or by car, he or she was directed to the admitting office at PCMC. If the patient was to be transported by PCMC-based Life Flight, the on-call pediatric critical care physician was contacted in his or her role as the “control physician” for the patient’s transport because of his or her ability to stay in contact with the transport team via radio equipment not readily available to the admissions officer.

Implementation Plan

The new system was piloted during daytime hours for 5 sequential days to identify problems and make adjustments, followed by another 5 sequential days to finalize the process. The new system was then fully implemented.

The Study of the Intervention

The project team was charged with the ongoing evaluation of the new system. Criteria to evaluate the success of the new system and optimize performance were developed and incorporated into a scorecard that was updated and reviewed quarterly. The performance measures centered on the completeness and accuracy of information gathering and distribution and the response times of the nursing supervisor and the admissions officer (from initial page to return call to the call center). A benchmark of 5 minutes was set for the response time of the admissions officer and the nursing supervisor. A follow-up e-mail and paper questionnaire regarding direct admissions at PCMC (again using Likert scale scoring) was distributed to 629 referring physicians 26 months after the system was fully implemented.

RESULTS Implementation

The new direct admission system was piloted during daytime hours September 10–14, 2007. The new system was well received by the 4 participating referring physicians and was felt to function well by the participating admissions officer and nursing supervisor, all of whom were
interviewed after their participation in the pilot. The Vocera device was felt to be intrusive, and a process-specific pager was substituted. The process was again piloted October 22–26, 2007, after which no adjustments were felt to be necessary. During both pilots the number of direct admission calls averaged 5 per day. The new system was fully implemented December 1, 2008.

Outcomes: Successes

Most notably, the new system has been operating continuously 24 hours a day, 7 days a week with little alteration since fully implemented and has become an integral part of the daily operation of PCMC.

The importance of the system to PCMC can be demonstrated by the number of direct admissions and the percentage of all admissions that were direct (Fig 3). The weekly direct admission percentage of total admissions to PCMC from February 2008 through December 2012 could be divided into 2 phases, demonstrating that the system became increasingly integrated into hospital operations after implementation.

During the first phase, the daily number of direct admissions averaged 3 with a range of 0 to 13, and during the second phase, the daily number of direct admissions averaged 5, with a range of 0 to 14.

The most important available measures of the functioning of the new direct admission system are the response times of the admissions officer and the nursing supervisor, which represent the time necessary for a referring physician to wait before speaking to the individuals empowered to accept a patient for admission (the admissions officer) and to give the patient a bed assignment (the nursing supervisor). Our response time data originate from an audit of 25 randomly selected calls to the call center per month. The available data, from May 2009 through May 2012, show that 49% (602 of 1225) of audited calls involved the admissions officer and 73% (894 of 1225) of audited calls involved the nursing supervisor; the overall average response time for these calls was 3.2 minutes for the admissions officer and 2.7 minutes for the nursing supervisor, well below our benchmark of 5 minutes. Other calls were for consults of subspecialists, requests for the direct admission of patients to the ICUs (which do not participate in the system), or other queries not requiring the input of the admissions officer or nursing supervisor. The average response times for both groups from May 2009 through May 2012 are shown in Fig 4. We do not have baseline response time data for the admissions officer or the nursing supervisor, given that no defined mechanism for the direct admission of patients or for...
the measurement of response times existed before the implementation of the new system. However, the available information gathered during the observation of shareholders facilitating direct admissions before the implementation of the new system suggests that the time required for a referring physician to be connected to individuals definitively empowered to make admission decisions was either much longer than these times, as noted in Fig 3, or could not be measured.

Although the response rate to both surveys was low, the March 2011 follow-up survey addressing referring physician satisfaction with the new direct admission system showed that the responding physicians’ experience of directly admitting patients to PCMC improved (Table 2).

Outcomes: Problems and Solutions
After system implementation, the project team received reports of directly admitted patients who had been transferred to the ICU immediately or shortly after direct admission, raising the concern that some patients had been inappropriately triaged by the system to the inpatient units instead of the ICU. These reports came through the hospital’s adverse event reporting system, for which a case review trigger is the unplanned transfer of a patient to the ICU within 12 hours of admission. Admission officers were subsequently encouraged to obtain vital signs on the patients to be directly admitted to identify potentially unstable patients and route them to the ED or the ICU. Data regarding such instances are being collected with the intention of optimizing patient triage if problematic patterns are recognized.

DISCUSSION
Direct admission systems have been developed at many hospitals but the process of how this was done and the effects that the systems have had have not been well documented. Through an investigation and analysis of direct admission systems existing at other hospitals and an evaluation of our existing resources, a team of stakeholders successfully designed and implemented a new direct admission system for PCMC. Our new system replaced a confusing process that was inefficient and not user-friendly. Available survey data suggest that referring physician satisfaction has improved, and available response time data suggest that referring physicians need to wait, on average, <5 minutes to speak to those empowered to facilitate a direct admission at PCMC.

We believe that our process of developing a direct admission system by using quality improvement methodology can be duplicated at other hospitals and can thereby improve a portion of a hospital’s patient flow. We have documented several system types that may serve as models. Our system was
modeled after an existing system used at a large integrated health care delivery system (Intermountain Healthcare) by using a locally developed clinical information tracking system (Patient Tracker); other system models may be more appropriate to other institutions given existing resources.

Ongoing evaluation is required to ensure that our system is functioning optimally and that referring physician satisfaction continues to improve. Modification of the system may be necessary in the future to optimize patient triage; in particular, the identification of children who would be more appropriately admitted to the ICU.

Our study highlights a collaborative effort among hospital personnel to improve systems within the hospital. Being hospital based, hospitalist groups have a vested interest in the functioning of hospital operations, including those that involve patient flow. As such, the hospitalist group at PCMC was involved in the identification of our direct admission problem and later in the development and integration of a new direct admission system into hospital operations. The increasing role of hospitalists has afforded opportunities for services within hospitals to cooperate to optimize resource utilization and to improve patient care. Collaboration involving hospitalists and ED physicians, in particular, has become increasingly important given how their interaction can have a large effect on hospital efficiency. Although our intervention does not involve ongoing collaboration between the ED and the hospitalist group, it was developed with input from both groups.

The documentation of existing direct admission systems and the development of our system add to the growing focus on hospital throughput and its relation to resource utilization. Further analysis of hospital admission systems, including direct admission systems, would be valuable to the health care community.

Our study has a number of limitations. Objectively measuring the success of our new system has been limited by a lack of data before the intervention. The baseline number of direct admissions and ED visits by nonemergent patients felt to need admission before the intervention could not be established. Data were also not available to show the time that referring physicians and hospital personnel spent facilitating direct admissions to PCMC before implementation. The total amount of time required to facilitate a direct admission and patient satisfaction.

Chadaga et al developed a hospital medicine ED team that improved patient flow in a tertiary care academic center. Howell et al improved ED patient flow by incorporating hospitalist-led “bed management rounds” in the ICU and active facilitation of admissions from the ED. A combined pediatric ED/inpatient unit that has had positive effects on throughput, billing, and patient satisfaction was developed at a community hospital by Krugman et al. These studies highlight the unique position hospitalists occupy and their ability to fill new roles and facilitate collaboration to improve hospital efficiency. Although our intervention does not involve ongoing collaboration between the ED and the hospitalist group, it was developed with input from both groups.
admission after implementation has not been adequately tracked, so some of the efficiency of the system cannot be assessed. Given the variability of calls, most notably the variability in a patient’s medical complexity, such time data may not be instructive. The measure of referring physician impressions of the new system was limited by the use of a nonvalidated survey instrument. Although the survey results showed statistical significance, they may not be reflective of the referring physicians as a whole because of the low response rates. Arguably the biggest impact of the system is its effect on hospital efficiency, particularly in the ED, but this cannot be adequately quantified.

CONCLUSIONS
We have developed a system for the direct admission of patients that has become an integral part of daily operations at PCMC and has improved referring physician satisfaction. We used quality improvement methods to assess the scope of the problem and assembled a varied stakeholder group to design, implement, and evaluate a new direct admission system. Although it is difficult to capture preintervention data with this type of intervention, we believe that other programs intent on improving their hospital throughput may find that this study provides guidance.

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