

TITLE: : impact of coordination of care and direct admissions on emergency department volumes

Running title: Patient transfers utilizing a central call center to triage and coordinate care

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This is the author's manuscript of the article published in final edited form as:

Webber, E. C., Bauer, B. D., Marcum, C. K. M., Nitu, M. E., Walthall, J. D. M., & Saysana, M. S. (n.d.). Before the Flood: Impact of Coordination of Care and Direct Admissions on Emergency Department Volumes. Pediatric Emergency Care. <http://doi.org/10.1097/PEC.0000000000000610>

INTRODUCTION

The transfer of patients to tertiary care is a high cost, high risk process that has become increasingly important as health care delivery is more regionalized (1). Pediatric critical care transportation teams have improved outcomes for critically ill patients (2,3); however, these teams are not available for all pediatric transfers. Frequently, transfer occurs due to the need to access additional expertise, to delineate the urgency of care, and to facilitate the diagnosis and management of the underlying condition. Pediatric hospitals provide both a depth and breadth of expertise which result in request for transfer from referring ambulatory clinics, emergency departments (ED) and inpatient hospital wards.

Due to the urgency of transfer and uncertainty regarding the final disposition for patients, transfers may be made from the referring provider to the emergency department of the accepting facility. A high volume of referrals to a pediatric ED may challenge patient throughput and decrease overall efficiency (4). EDs also incur overall costs approaching \$6 billion dollars annually in the treatment of children (5) and face the burden of managing patients under laws like emergency medical treatment and active labor act (6). Therefore, an effective strategy to evaluate patients and identify those suitable for direct admission can expedite care and allow ED resources to be more effectively allocated.

One such strategy is the use of a central call center to gather clinical data and triage patients referred to pediatric medical centers (7). Additionally, call centers provide an opportunity to coordinate discussions between multiple subspecialists at the onset of the transfer process, allowing them to develop clinical care plans and address logistics of transfer. This provides optimum throughput and disposition for the transferred patient.

At our institution, a central transfer call center was established in 2008. For the pediatric facility, the transfer call center is well positioned to coordinate a direct admission when appropriate. This includes dispatching the transport teams and assigning the bed. This effective method of transfer coordination has been designed to eliminate barriers physicians might encounter in arranging for a direct admission.

To delineate the impact of the transfer center, we reviewed the information collected in the coordination of transfers to our pediatric academic center to evaluate the distribution of transferred patients between inpatient wards, intensive care unit (ICU) beds, and emergency department (ED). We also sought to identify variability in utilization of direct admissions and ED referrals between different clinical service lines at our institution. Finally, for patients referred to the ED via the transfer center, we examined the ultimate disposition of those patients to the inpatient setting versus discharge from the ED.

METHODS

We analyzed demographic data on pediatric patients managed through the central transfer call center for our health system between June 1, 2011 and May 31, 2012. This data is documented at the time of referral in an administrative database. Registered nurses (RNs) triage requests for transfer and manage the coordination of the transfer process. The data collected includes transferring hospital and provider information, accepting physician and service, time and date of transfer initiation and completion, mode of transport and disposition. Disposition occurred to regular medical ward, pediatric intensive care (PICU), neonatal intensive care unit (NICU), or ED. Accepting services are able to determine disposition of patients to a ward bed or the ICU directly (a “direct admission”), or the ED. The eventual disposition (admission or

discharge) of patients referred to the ED was evaluated using the encounter number generated at the initiation of the transfer process for each patient. NICU referrals were excluded from the disposition analysis as patients referred to that location were taken to the NICU 100% of the time.

RESULTS

A total of 3982 transfers to our tertiary care children's hospital occurred during the 12 month analysis period. Of those, 3463 resulted in admission. Over 150 different referral sites (including emergency departments, hospitals, ambulatory centers and offices) were identified. 74% of all transfers occurred using ground transportation and 12% by air utilizing various transport medical teams, while 13% were transported by private automobile. Of the 2946 transfers completed utilizing a medical transport team, 2042 (69.3%) occurred using our institution's transport service, a specialized RN, respiratory therapist (RT) or Paramedic Critical Care Transport Team.

During the study period, our institution had 10,638 admissions and 30,503 emergency department visits. The 3463 admissions processed by the transfer center during the study period accounted for 32.55% of all admissions. Transfers accepted by non-surgical services accounted for 82% of the transfers, while 18% were facilitated by one of the surgical services. Among the non-surgical services involved in facilitating transfers, the pediatric hospitalist group accounted for 18% of all transfers during the 12 month period, followed by the ED (16.7%), PICU (14.1%), NICU (10.8%), gastroenterology service (4.1%) and pulmonary service (3.3%). Of the surgical services, general surgery, orthopedic surgery and neurosurgery had the highest volumes of transfer center referrals with 7.7%, 4.6%, and 2.9%, respectively (see Table 1 for additional

detail). Many subspecialty services (including rheumatology, metabolism, adolescent medicine and rehabilitation) manage inpatients in collaboration with the hospitalist of other services and thus are not noted separately in Table 1.

Further analysis was performed to determine the most common initial disposition for services receiving high volumes of referrals. Patients accepted via transfer center were either triaged to the ED or directly admitted to the ward or PICU (Table 2). Utilizing encounter number and billing data, the disposition of the majority of patients was identified. Of the 3982 patients transferred, 179 patients had incomplete encounter numbers reported to the transfer center and were not able to be included in the analysis (Figure 1).

In this data set, 2101 patients (55.2% of all accepted via the transfer center) were sent to the ED. Of the patients referred to the ED for evaluation, 83.7% were ultimately admitted, while 16.3% were able to be discharged from the ED (were not admitted to the hospital).

DISCUSSION

The utilization of a central call center has improved physician ability to move and track patients quickly and efficiently. Within large and complex health systems, a central call center is able to quickly identify and bring together the clinical experts to decide on a course of action. Therefore, this model of coordinating transfers has become an integral part of our hospital admission and ED referral process for patients who require expedited access to the system.

In this data set, we found that over half of the patients transferred to our institution utilizing the central transfer call center are assessed and triaged in the ED. However, there is great variability in ED utilization among the accepting services, with some groups referring over 80% of all incoming calls to the hospital ED, while others utilized this venue for less than a quarter of

their referrals. This variation does not seem to be exclusively tied to whether or not the accepting service has in-house attending present, as the services with the highest and lowest ED referral rate, both have in-house 24 hour attending faculty present. This variability highlights the importance of exploring which factors contribute to the decision to admit a transferred patient directly to the floor.

Of the patients evaluated in the ED, 16.3% were discharged and did not require admission to the hospital. This highlights an important tension in the transfer process when looking at appropriate use of the ED and the overall utilization of resources. In this case, triage and evaluation by in an ED specializing in pediatric care provides opportunity to complete additional evaluation and work-up where needed. Additional pediatric expertise and equipment are available in a pediatric ED, which may make it possible complete a more extensive evaluation and discharge the patient home. This can help avoid hospitalization.

However, the majority of patients in our study who were referred to the ED were eventually admitted. Evaluation and treatment of these patients forced the ED to process additional patient volumes and costs, as well as decreasing patient throughput in the ED. Distinguishing which patients are ideal for direct admission and which patients should be triaged through the ED remains a significant challenge.

Pediatric clinical course changes rapidly and lacks a specific tool to predict need for admission. To date, studies of prediction tools such as the Pediatric Risk of Admission Score (PRISA) have not proven to be practical in predicting hospital and ICU admission (8). Pediatric early warning system (PEWS) scores are designed to predict risk of cardiopulmonary resuscitation, not likelihood of need for hospitalization (9).

We reviewed the rationale behind our direct admission workflow and found several possible explanations for the findings. In evaluating the medical patients who were accepted as direct admissions, some trends emerged as possible factors in determining disposition.

1. **Attending faculty availability.** While all services at our institution have medical coverage using house-staff, not all services maintain faculty in-house 24 hours per day. Among the medical services, both the ICU and pediatric hospitalist programs have 24 hour faculty in the hospital, which allows both services the ability to manage new admissions at any time of day. Pediatric ICU began this practice in October 2006, and pediatric hospitalists in August 2010. For other medical sub-specialties without faculty available to closely supervise, referral to the ED may be a necessary step for patient safety and clinical consistency. Surgical services also have faculty available in-house 24 hours a day; however, the patient populations referred may be trauma patients requiring urgent stabilization or evaluation prior to emergent transfer to the operating room.
2. **Consultation priority.** In addition to the potential lack of in house faculty, physician staffing ratios may differ between day and night. Overnight, limited staff may have to prioritize ED evaluations and consultations. Referral to ED setting may be needed in order to appropriately prioritize evaluation of new patients by necessary subspecialty medical and surgical services. As noted previously, at our institution the vast majority of patients accepted by pediatric general surgery are referred to the ED for primary evaluation. In the ED setting, the team can perform an assessment with a higher ratio of nurses to patients, as well as the support of experienced ED staff for bedside sedations and procedure assistance. This level of support is not available with a direct admission to a regular ward unit.

3. **Need for intervention:** A number of referrals meet clear indication for ICU level care, such as those with the need for vasopressors or ventilator support. However, in cases with an evolving clinical picture, or the need for rapid reassessment, such as in the case of pediatric trauma, the ED evaluation offers the most rapid triage pathway to either OR, PICU or ward admission protocol.

Our study has some limitations. Our retrospective analysis utilized data from the transfer center and reflects the information verbally reported by the referring center. We did not have data about referrals received prior to the creation of the institution's central call center, and thus were not able to measure any increased efficiency that utilizing the call center itself provides. Finally, some of our analysis relied on billing codes to determine patient disposition to ICU, medical ward, emergency department or discharge. Billing lacks the clinical context to further determine the reason behind the disposition.

Despite these limitations, this analysis provides important information about how patient referrals to a tertiary care children's hospital are facilitated. Further evaluation of how the transfer process continues to ensure rapid and effective triage and avoid wasteful resources utilization must be ongoing. If aligned with clinical workflow, the direct admission process can avoid unnecessary ED costs and delay in care (7); however, the clinical criteria must be objectively defined to allow clinicians to adhere to best practice. The need for uniform criteria for PICU admission has been previously described (10); however, PICU level acuity does not address the many other pediatric referrals. Not all patients referred to a pediatric hospital require admission. Sometimes assessment by appropriate specialists in the ED setting at a tertiary care hospital may prevent unnecessary admission. When to best use these options and setting

appropriate expectations for referring hospitals as well as the patient being transferred is important for success of this model.

As Van Blarcom and colleagues observed in the development of their own direct admissions process (8), ED and hospitalist collaboration can have a major impact on the efficiency of the hospital. Other models focused on expediting the admission process and ED throughput have included a hospital medicine ED team (11) and rounding as well as hospitalists running an ED/inpatient unit (12). Regardless of the model details, collaboration between the physicians on the referring and accepting teams (including ED, hospitalists and intensivists) requires effective coordination and communication.

The central call center has supports this coordination of care, and has been shown to have a positive impact on resource utilization at other institutions as well (13). Facilitation of real time dialogue between physicians, submission of bed requests and transport coordination offers consistency and clarity. As our transfer center process has matured over the 7 years since its implementation, the level of detail and assessment during a transfer center call has become consistent and efficient. Although not measured in this study, the intake process should also be considered an important factor in successful triage. Collecting information about our referrals centrally allows our institution to facilitate direct admissions to an inpatient unit when possible, ICU admissions when needed, and ED transfers when necessary.

CONCLUSIONS

The direct admission process as well as the early coordination of patient transfers may improve the patient's experience, reduce redundant ED assessments, and expedite care; however, the practice requires coordinated workflow elements and clinical cooperation between referring and accepting medical teams. Referrals to tertiary and quaternary ED services will still be needed

when certain access and services are required. The use of centralized call centers to coordinate discussions between physicians can help expedite and streamline patient disposition. Future projects through the transfer center may include the implementation of appropriate prediction tools such as the pediatric early warning scores (PEWS) at the time of the transfer to help objectively determine appropriate patient triage.

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FIGURE LEGEND

Table 1. Distribution of transfer center accepting services.

Table 2. Disposition to ED versus direct admission for selected services.

Figure 1. Disposition of transfer center patients referred to ED.

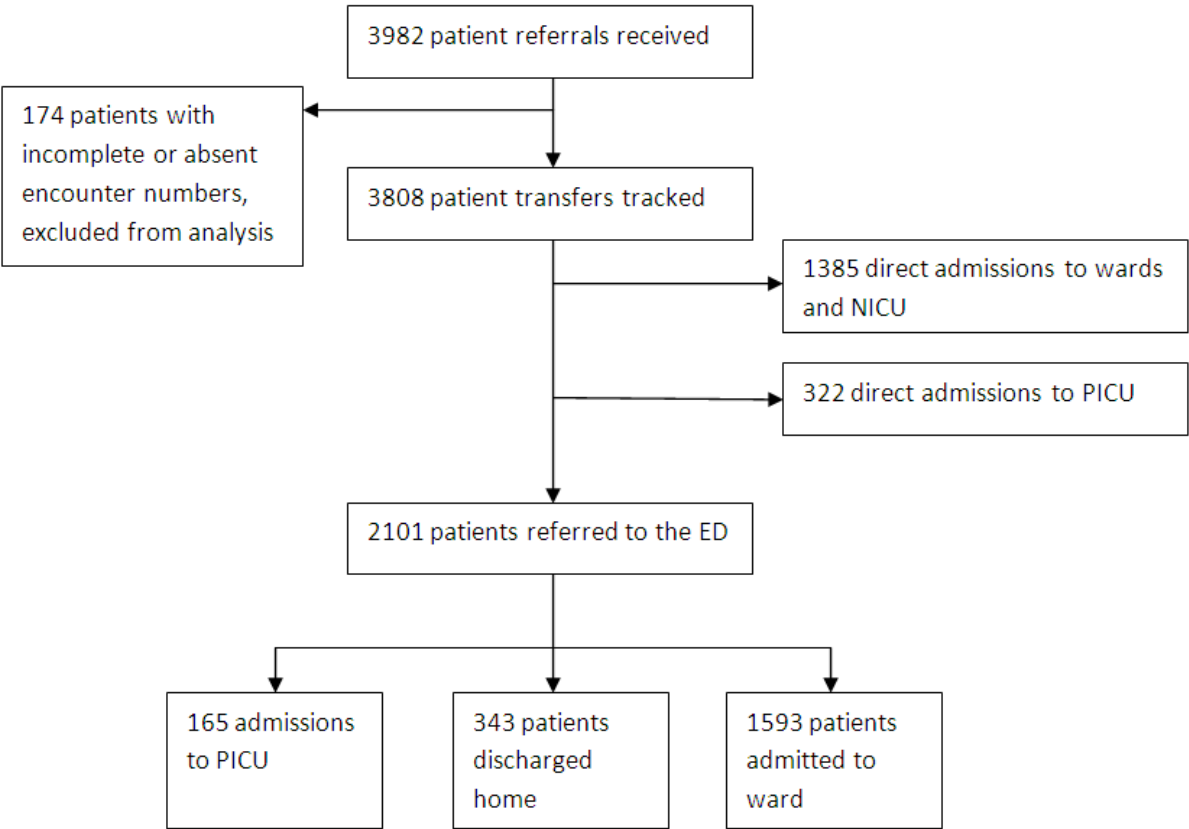
Table 1. Distribution of transfer center accepting services.

Accepting service	Referrals (N)	(%)
Hospitalist	752	18.9%
Emergency Department	666	16.7%
PICU Pediatric Critical Care Medicine	560	14.1%
NICU Neonatal Intensive Care	429	10.8%
General Surgery	309	7.8%
Orthopedics	183	4.6%
Gastroenterology	163	4.1%
Pulmonary	131	3.3%
Neurosurgery	116	2.9%
Hematology-Oncology	97	2.4%
Neurology	93	2.3%
Infectious Disease	79	1.2%
Developmental Pediatrics	71	1.8%
Cardiology	56	1.4%
Endocrinology	56	1.4%
Urology	44	1.1%
Plastic Surgery	43	1.1%
Nephrology	41	1.0%

Table 2. Disposition to ED versus direct admission for selected services.

	To Emergency Department	Direct admission to Ward	Direct admission to PICU	Other	Total referrals to service
	Percentage of total referrals to service (n)	Percentage (n)	Percentage (n)	Percentage (n)	
General Surgery	75.4% (233)	22% (70)	0.6% (2)	1.3% (4)	100% (309)
Hospitalist	30.4% (173)	75.7% (569)	1.1% (8)	0.3% (2)	100% (752)
PICU	35.6% (189)	1.1% (6)	63.9% (358)	1.3% (7)	100% (560)
Pulmonary	41.8% (54)	56.6% (73)	2.3% (3)	0	100% (130)
GI	39.8% (65)	58.3% (95)	0	0.6% (1)	100% (161)
Developmental	32.3% (23)	67.6% (48)	0	0	100% (71)

Figure 1. Disposition of transfer center patients referred to ED.



Total direct admissions (to ward, NICU and PICU):	1707	(44.8% of 3808)
Total ED referrals:	2101	(55.2% of 3808)
Total ED referrals admitted:	1758	(83.7% of 2101)
Total ED referrals discharged:	343	(16.3% of 2101)