Effect of Using Pediatric Emergency Department Virtual Observation on Inpatient Admissions and Lengths of Stay

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ABSTRACT

OBJECTIVE: To determine whether using emergency department (ED) virtual observation for select pediatric conditions decreases admission rates for these conditions, and to examine effects on length of stay.

METHODS: The option of ED virtual observation care for 9 common pediatric conditions was introduced in 2009; associated order sets were developed. Retrospective secondary analyses of administrative data from our tertiary care pediatric ED and children's hospital were performed for the year before (year 0) and after (year 1) this disposition option was introduced. The proportion of visits admitted to the inpatient unit and length of stay (LOS) were determined for all visits considered eligible for ED virtual observation care on the basis of diagnosis codes for both study years.

RESULTS: There were 1614 observation-eligible visits in year 0 and 1510 in year 1. In year 1, 18% (n = 266) of observation-eligible visits received ED virtual observation care. Admission rates for observation-eligible visits were similar after this model of care was introduced (25% year 0, 29% year 1, $P = .02$). Median LOS for ED virtual observation visits was 8.8 hours (interquartile range 6.5–12.4). ED LOS was shorter for ED discharges (5.6 hours year 0, 5.1 hours year 1, $P < .001$) and unchanged for admissions (6.0 hours year 0, 5.8 hours, year 1, $P = .41$) after introducing ED virtual observation.

CONCLUSIONS: Admission rates for observation-eligible visits were not lower in the year after ED virtual observation care was introduced. LOS decreased for ED discharges and was unchanged for admissions. Reevaluation of the effects of pediatric ED virtual observation on admission rates and LOS after longer periods of use is indicated.

KEYWORDS: child; delivery of health care; emergency department; length of stay; observation medicine

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WHAT'S NEW

Providing emergency department (ED) virtual observation care for select pediatric conditions produced small positive effects on length of stay but no decrease in inpatient admissions the first year after introduction. Low use of emergency department (ED) observation the first year may have limited effects.

LIMITED CAPACITY IS common in children's hospitals, with high occupancy appearing to be the rule rather than the exception.[1] Additionally, a third of pediatric admissions are short stays, with patients spending 1 night or fewer in an inpatient bed.[2] For institutions struggling with high occupancy, use of inpatient beds for short-stay patients may block access to admission for children requiring longer inpatient stays. One strategy to alleviate inpatient unit capacity constraints is to develop alternative models of care for short stays.

One such alternative is use of geographically distinct observation units (OU) to care for children anticipated to need short (typically <24 hours) course treatment and frequent reassessment.[3] These may be ED or inpatient based, and they often provide care to children with well-defined illnesses by using standard protocols.[3] A handful of centers have reported on their positive experiences with geographically distinct pediatric OU, suggesting benefits including decreased admissions to inpatient units,[4–8] shorter lengths of stay (LOS),[4,7,9,10] and lower costs of care.[4,7,10,11] Although numbers of pediatric OU are not tracked,[3] a recent survey indicates that few children's hospitals have dedicated OU.[12] Pediatric EDs in institutions without OU may choose to provide observation care within the ED itself, ie, ED virtual observation, but descriptions of this model of care are lacking. In particular, it is unknown whether the benefits of pediatric OU as noted above can be

achieved without the separate space and dedicated staffing of an OU.

The primary objective of this study was to determine whether using ED virtual observation for select pediatric conditions decreases inpatient admission rates for these conditions. The secondary objective was to determine the effect of introducing ED virtual observation on LOS for ED patients with these conditions.

METHODS

STUDY DESIGN AND SETTING

Retrospective analyses of 2 years (April 1, 2008, through March 31, 2010) of health system administrative data were conducted. Year 0 represents the year before and year 1 represents the first year of ED virtual observation care. The study was conducted in the pediatric ED of a tertiary care referral center with approximately 20,000 annual visits, with an associated 132-bed (106 general care, 6 moderate care, and 20 intensive care) inpatient hospital (excluding neonatal intensive care and pediatric cardiothoracic intensive care). Children were treated in an 11-bed pediatric area adjacent to an adult ED, and pediatric emergency physician coverage was provided 24 hours a day. This study was approved by the University of Michigan institutional review board.

INTRODUCTION OF ED VIRTUAL OBSERVATION CARE

Nine common pediatric conditions considered likely to respond to 4 to 24 hours of intensive treatment were selected for ED virtual observation care based on reports of successful treatment in pediatric OU (Table 1). For each condition, 2 pediatric emergency physicians wrote inclusion and exclusion criteria, order sets, and admission and discharge criteria for ED virtual observation care. The concept of ED virtual observation (designating ED patients under observation status), along with the order sets, were introduced to the pediatric emergency medicine section at our institution via e-mail and at section meetings. After a period for resolving all questions and concerns, the order sets were made available for use in April 2009. No physical space or staffing changes were made in the ED. Attending physicians used ED virtual observation at their discretion on the basis of inclusion and exclusion criteria, expectation that the patient would require 4 to 24 hours of care before disposition decision, and personal preference.

Table 1. Admission Rates and Return Visits by Condition

Condition	n (%)	Admission Rate (%)	30-d Return Rate (%)
Allergic reaction	10 (4)	0	20
Cellulitis and abscess	45 (17)	9	16
Dehydration	52 (20)	8	12
Diabetic ketoacidosis	2 (1)	0	0
Headache	5 (2)	0	40
Head injury	18 (7)	0	0
Ingestion	11 (4)	0	18
Respiratory illness (asthma, bronchiolitis, pneumonia)	121 (45)	26	7
Seizure	2 (1)	50	0
Total	266	15	10

VISIT SELECTION FOR OBSERVATION-ELIGIBLE CONDITIONS

The research team developed a list of International Statistical Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) codes a priori that were determined to represent observation-eligible conditions based on their mapping to 1 of the 9 ED virtual observation order sets. All visits made to the pediatric ED over the study years were searched for the presence of these ICD-9-CM code discharge diagnoses in the ED professional billing system (maximum of 3 diagnoses per visit).

Visits were excluded on the basis of ICD-9-CM codes determined to represent complex comorbidities (eg, immunosuppression) or extreme severity of illness (eg, septic shock) considered to be clinically inappropriate for ED virtual observation.

DEFINITION OF OBSERVATION-ELIGIBLE VISITS

For study purposes, observation-eligible visits were defined as those having an observation-eligible condition as described above, and satisfying the following LOS criteria: ED visit at least 4 hours in duration, and LOS $\leq$2 nights for visits that were admitted to the inpatient unit.

STUDY POPULATION

Patient and visit characteristics were retrieved from electronic hospital administrative data sources. Patient characteristics included age, gender, payer, and race. Visit characteristics collected included ICD-9-CM code diagnoses, mode of arrival, shift of arrival (0000–0759 hours, 0800–1559 hours, 1600–2359 hours), season (winter, January to March; spring/summer, April to August; fall, September to December), and higher versus lower ED volume days (1200 hours Friday through 2359 hours Monday vs 0000 hours Tuesday through 1159 hours Friday).

The 5-point Severity Classification System (SCS) score, part of the Diagnosis Grouping System developed by Alessandrini et al,[13] was used to estimate visit severity and ED resource utilization based on ICD-9-CM codes; a score of 1 represents minimum severity/low utilization and 5 represents maximum severity/high utilization. The SCS was applied to all ICD-9-CM codes associated with the observation-eligible visits, and the maximum SCS for each visit was assigned.

The total number of ED visits, proportion of ED visits admitted to the inpatient unit, and inpatient occupancy levels were obtained from administrative sources for each month of the study period.

OUTCOMES

ADMISSION RATES

Discharge home or admission to an inpatient unit was determined for all observation-eligible visits, including those visits receiving ED virtual observation care. For