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Authors

Smalley, Courtney M
Jacquet, Gabrielle A.
Sande, Margaret K.
et al.

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Impact of a Teaching Service on Emergency Department Throughput

Courtney M. Smalley, MD*

Gabrielle A. Jacquet, MD, MPH*

Margaret K. Sande, MD, MS*

Kennon Heard, MD†

Jeffrey Druck, MD†

* Denver Health Residency in Emergency Medicine, Denver Health & Hospital Authority, Denver, Colorado

† Department of Emergency Medicine, University of Colorado School of Medicine, Aurora, Colorado

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Introduction: There are 161 emergency medicine residency programs in the United States, many of which have medical students rotating through the emergency department (ED). Medical students are typically supervised by senior residents or attendings while working a regular shift. Many believe that having students see and present patients prolongs length of stay (LOS), as care can be delayed. Our institution implemented a unique method of educating medical students while in the ED with the creation of a teaching service, whose primary goal is education in the setting of clinical care. The objective of this study was to explore the effect of the teaching service on efficiency by describing LOS and number of patients seen on shifts with and without a teaching service.

Methods: This was a retrospective chart review performed over a 12-month period of visits to an urban academic ED. We collected data on all patients placed in a room between 14:00 and 19:59, as these were the hours that the teaching shift worked in the department. We categorized shifts as 1) a teaching service with students (TWS); 2) a teaching service without students (TWOS); and 3) no teaching service (NTS). LOS and median number of patients seen on days with a teaching service, both with and without students (TWS and TWOS), was compared to LOS on days without a teaching service (NTS).

Results: The median LOS on shifts with a dedicated teaching service without students (TWOS) was 206 minutes, while the median LOS on shifts with a teaching service with students (TWS) was 220 minutes. In comparison, the median LOS on shifts when no teaching service was present (NTS) was 202.5 minutes. The median number of patients seen on shifts with the teaching service with students (TWS) was 44, identical to the number seen on shifts when the teaching service was present without students (TWOS). When the teaching service was absent (NTS), the median number of patients seen was 40.

Conclusion: A teaching service in the ED is a novel educational model for medical student and resident instruction that increases total ED patient throughput and has only a modest effect on increased median length of stay for patients. [West J Emerg Med. 2014;15(2):165–169.]

INTRODUCTION

Medical students often rotate through emergency departments (EDs) as part of their medical education. There are currently 161 Emergency Medicine residency programs

in the United States, many of which have medical students rotating through the ED.¹ The ED is a somewhat unique environment for student education as the focus for supervising physicians is often on acuity of complaint, length of stay,

and prompt disposition.^{2,3} In this typical educational model, medical students present cases to the supervising resident or attending who are working a ED typical shift. A common belief is that medical students significantly delay patient length of stay (LOS) as care can be prolonged in the setting of presenting and teaching.^{4,7} In an era of ED crowding, LOS is a significant core measure for staff and administrators in providing efficient patient care.⁸

In 2007 our medical school instituted a required 2-week rotation for third-year medical students in the ED. At the same time, our emergency medicine (EM) residency hoped to improve the training of their residents in the disciplines of medical education and evidence-based practice. In light of this, a teaching service was created to satisfy the needs of both the medical school and the residency.

The teaching service is comprised of 1 attending physician, 2 third-year residents, and 4 to 6 third-year medical students. The teaching service is present in the ED seeing patients from 14:00-19:59 on Mondays, Tuesdays, Thursdays, and Fridays (excluding academic holidays). For 2 hours prior to the start of their clinical shift the teaching service meets for small group teaching. The first hour is resident-led didactics for the medical students. This provides residents with protected time to teach while also providing an opportunity to receive feedback on their teaching skills from an experienced attending. During the second hour the attending physician presents a topic from evidenced-based medicine or the "teaching how to teach" curriculum. One day of the week this 2-hour period is spent in simulation where residents lead cases with medical student involvement.⁹ It is worth noting that the teaching service is not restricted to low-level acuity patients. Because there is a dedicated attending and 2 third-year residents, the teaching service picks up patients in the same manner as the other providers without restrictions on triage level.

Since its creation, the teaching service has expanded. During the 2009-2010 academic year, a total of 162 third-year medical students rotated on the required EM rotation, with approximately two-thirds rotating as part of the teaching service at University of Colorado Hospital, a large-volume tertiary referral hospital. This study focuses exclusively on patient data from the University of Colorado ED, as the teaching service at other sites is organized differently.

Our study investigates the LOS and number of ED patients seen by the teaching service with students (TWS) when compared to the teaching service without students (TWOS), and when compared to no teaching service (NTS).

METHODS

This was a descriptive analysis single site study to determine median LOS and number of patients seen in the ED on shifts with a teaching service and without a teaching service. Our local institutional review board approved the protocol for this study, and informed consent was waived as no identifying patient data were collected.

Study Setting

The investigative site was a 410-bed academic tertiary care urban teaching hospital with approximately 65,000 ED visits per year. The staffing model centers on resident education. Each 8-hour shift is staffed by 2 EM attending physicians supervising a second- and third-year EM resident. This team is independent of the teaching service. A varying number of interns and fourth-year medical students also work in the ED and staff patients with third-year residents, with attending oversight. Physician assistants also staff the ED and see lower acuity patients; we excluded from analysis patients seen by physician assistants.

Study Population

The study population consisted of patients seen in the ED from July 1, 2009 to June 30, 2010. We included all patients roomed in the ED between the hours of 14:00 and 19:59 as this is the time the teaching service actively sees patients in the ED. Any patient roomed during this time was included, even if their workup or disposition was determined later in the evening. Eligible patients were those seen in the ED with the following dispositions: (1) discharge from the ED, (2) discharge after medical screening exam, and (3) discharge to nursing home. We excluded patients if they were admitted or discharged to a psychiatric facility, as LOS would likely be skewed by the amount of time patients were awaiting their beds or awaiting placement by psychiatry at an outside facility. Patients were also excluded if they left without being seen. We determined LOS and number of patients seen for patients who were placed in a room between 14:00 and 19:59 and were ultimately discharged from ED. Attending, resident and medical student schedules were reviewed to determine which providers were part of the teaching service for each day of the study period, and were classified into 3 categories for analysis: (1) teaching service present (TWS); (2) teaching service present but without medical students (TWOS); and (3) no teaching service (NTS). The teaching service is present in the ED on Mondays, Tuesdays, Thursdays, and Fridays. Days designated as 'teaching service present but without medical students' include academic holidays when the students were excused and the final Friday of each -week rotation, when the students are administered their exam for the rotation and do not have clinical duties in the department. On these days, the 2 third-year residents work one-on-one with the attending and function as an extra independent physician team. Lastly, on weekends and conference days (Wednesdays, Saturdays, and Sundays), the department functions without a teaching service (NTS). The students work exclusively as part of the teaching service. They do not work with independently with core clinical faculty on any Wednesdays, weekends, or holidays. Of note, fourth-year medical students are integrated in normal work flow, and as such, were not studied as a group. As the fourth-year medical students are randomly distributed throughout the days, their effect was considered marginal.

Table 1.

14:00-19:59	Teaching service with students (TWS)	Teaching service without students (TWOS)	No teaching service (NTS)
Total patients seen (number of patients)	6880	2188	6333
Median length of stay (minutes)	220	206	202.5
Median # of Patients per Shift	44	44	40

Table 2. Comparison of teaching service groups versus no teaching service.

	No teaching service (NTS)	
	Length of stay	Number of patients seen
Teaching service with students (TWS)	p<0.001	p<0.001
Teaching service without students (TWOS)	p=0.3	p=0.007

Data Collection

We collected LOS in minutes for all study patients in a de-identified manner. Patients were categorized by teaching service status. As LOS was not expected to be normally distributed, we used median and interquartile range (IQR) to describe the data. As an exploratory analysis, we compared LOS between TWS and the remaining groups (TWOS, NTS). We believed that the LOS might differ between weekdays and weekends. We determined median LOS for the NTS group (the only option for weekends) in 2 ways: including weekends and excluding weekends. Finally, we compared median LOS and number of patients treated among the groups with the Wilcoxon Rank Sum Test using JMP 9.0 (SAS Institute, Cary NC). A p-value <0.05 was considered significant. We also performed a post-hoc analysis to determine if the median LOS and number of patients evaluated in 2 teaching service groups differed from the no teaching service using Dunnett's test on the ranked LOS values. As this was an exploratory analysis, we did not do a formal sample size or power calculation.

RESULTS

There were a total of 63,000 visits to the ED over the 12-month study period. After applying set exclusion criteria, we included 15,401 patients in our analysis. All but 1 day of the 365 days of the study window had provider schedule information that enabled them to be correctly categorized.

The median (IQR) LOS for patients seen on shifts when TWS was present (n=6880) was 220 (146 to 320) minutes. The median LOS for patients seen on shifts when TWOS was present (n=2188) was 206 (140 to 300) minutes. The median LOS for NTS was 202.5 (37 to 292) minutes when weekend days were included (n=6333) and 216 (146 to 313) minutes when only weekdays were evaluated (2210). The median LOS for the TWS group was significantly different from the NTS group (p<0.001), but the medians for the TWOS group and the NTS group were not significantly different (p=0.3) (Tables 1 and 2).

The median (IQR) number of patients seen on shifts when TWS was present (n=159) was 44 (39 to 48). The median (IQR) number of patients seen on shifts when TWOS was present (n=49) was 44 (40 to 47). The median (IQR) number of patients seen on shifts when NTS was 40 (37 to 45) when weekend days were included (n=156) and 40.5 (37 to 48) when only weekdays were evaluated (n=52). Both teaching groups were significantly different from the NTS group (p<0.001 for the TWS group p=0.007 for the TWOS group) (Tables 1 and 2).

DISCUSSION

This study had 2 key findings. First, median LOS for patients treated during a shift with TWS was approximately 15 minutes longer than shifts with TWOS (an extra physician team) and shifts where there was no teaching service (normal ED staffing). We would advocate that this is a minimal increase given the value added in both student and resident education from the care of these patients. The presence of a teaching service was also associated with approximately 4 more patient evaluations per shift, and the number of patients seen did not decrease when third-year students were a part of the teaching service team.

A handful of studies have examined LOS in EDs in the setting of medical student education. Generally, previous studies have shown that students were associated with prolonged ED patient LOS.^{4,7} A 2009 study by James et al quantified the effects of trainees on LOS when staffing with a preceptor and found that in their pediatric ED, LOS was 9% higher in patients seen by trainees.⁴ Another study by Gerbeaux et al⁵ corroborated these findings during a medical student strike and found that during the 4 days without medical students the LOS decreased by 24%. The James study correlates well with our own results of a 6.8% increase in LOS of the TWS service as compared to the TWOS. Both studies suggest a reduction in efficiency when students are added to care teams, as evidenced by increased LOS. However, these data were compiled in the setting of the

trainee staffing patients with the attending physician alongside the other resident providers. Other studies show no significant change in LOS under different models of teaching or were unable to quantify changes on LOS. Our study supports this finding; although there is no doubt that there was an effect on LOS, this effect was minimal. Of note, none of these studies examine fourth-year medical students, who may contribute more to patient care and LOS considering they have more clinical training.¹⁰⁻¹²

Limited research has been done examining the general flow of the ED in the setting of separating out trainee students. This is the first study to examine the LOS and number of patients seen during shifts with and without students on a dedicated teaching service. Our study differs from previous research in that medical student teaching can be done in a manner that does not tax the ED by significantly changing LOS or number of patients seen.

There are a few limitations of this study. First, we only evaluated LOS and number of patients seen during a specific time period (14:00 – 19:59), which impacts the generalizability of our findings to other times of day. The optimal study design to measure the effect of the teaching service on LOS would be to randomly assign the teaching service to shifts and compare LOS between shifts with and without the teaching service. However, in our setting this design is not feasible secondary to constraints of the student schedule. Given these inherent limitations, we were unable to evaluate the impact of teaching service on LOS during other times of day such as early day or night shifts. In addition, volume fluctuation on weekends and holidays when the teaching service was not present may also affect the generalizability of our results. It is also worth noting that this study looked at a teaching service with third-year medical students who are early in their clinical training; therefore, one may not be able to directly apply these findings to groups teaching medical students who are further along in their training. We did not analyze results with regard to calendar time during the academic year, nor were we able to factor in any improvement in students' efficiency. Lastly, we were unable to correlate patient acuity levels to the different subgroups to determine if the TWS group saw lower acuity level patients and if this in turn impacted LOS or number of patients seen; however, this would be an interesting area of future study.

Finally, this model requires an increase in resident and attending coverage, which could increase overall cost for extra faculty. It is likely that a teaching service without additional staff may have a greater effect on LOS and decrease patient throughput. It is unclear how this study would fare at other institutions since our model requires additional staff to run the teaching service. We also did not examine fourth-year medical students, as at our institution the third- and fourth-year medical students rotate in separate entities with the fourth years being considered the level of an "intern," and

therefore staff their patients as such. During NTS days, there are no third-year medical students present in the department and therefore they are not dispersed among clinical faculty. The fourth-year medical students are always dispersed among clinical faculty and are not included in the dedicated teaching service model.

CONCLUSION

Further investigation of this teaching model is necessary to validate the effects of LOS and number of patients seen at other facilities. A prior study reveals the teaching service is well regarded,¹² but to date neither an assessment of student or resident skill has been done nor outcomes studied to evaluate the effect of a teaching service on patient care.

A teaching service in the ED is a novel educational model that provides dedicated teaching time to both students and residents amidst a busy urban academic ED. This study comprises the first evaluation of LOS and number of patients seen with the advent of a dedicated teaching service to instruct medical students. The effect of such a teaching service increased the number of patients seen during a shift and had a minimal effect on patient median length of stay.

Address for Correspondence: Courtney M. Smalley, MD. Denver Health & Hospital Authority, Department of Emergency Medicine, Campus Box B-215, 12401 E. 17th Avenue, Aurora, CO 80045. Email: courtney.smalley@ucdenver.edu.

Conflicts of Interest: By the WestJEM 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.

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