A Simple Intervention to Improve Hospital Flow From Emergency Department to Inpatient Units

Improving the flow of patients from the emergency department (ED) through the inpatient setting is one of the most vexing problems in hospital management. At Harbor-UCLA Medical Center, a public hospital and level 1 trauma center, patient flow from the ED to the inpatient setting is a serious and constant concern. Because ED wait times depend on the availability of inpatient beds capable of supporting the level of care required for admitted patients, we developed an intervention to assist physicians in identifying patients early in the day who could be transferred to a lower level of care.

Methods | We conducted a pre-post, quasiexperimental study comparing patient flow metrics after vs before the intervention. The study was deemed exempt by the institutional review board of the Los Angeles Biomedical Research Institute. On October 15, 2013, a nursing position was repurposed to create a coordinator who monitored all beds and, during weekday business hours, applied appropriate use criteria abstracted from hospital policy to patients in step-down units (SDUs). For patients who did not meet appropriate use criteria, the coordinator paged the patient’s supervising resident physician. Without the authority to initiate the transfer, the coordinator primarily served to initiate a dialogue regarding whether the transfer was possible, seeking to initiate transfers earlier in the day.

Results | From November 1, 2012, through March 14, 2014, a total of 4597 patients were admitted from the ED to a bed in the SDU (Table 1). The median hospital census during this period was 334 (interquartile range [IQR], 320-346; 85% capacity). The median emergency severity index level for admissions was 2 (IQR, 2-2). Overall, the median boarding time (the time spent in the ED between the admission decision and transfer to inpatient care) was 386 (IQR, 225-712) minutes.

Table 1. Univariate Analysis of Baseline vs Intervention Cohorts

<table>
<thead>
<tr>
<th>Variable at admission, median (IQR)</th>
<th>Baseline (2948 [64.1%])</th>
<th>Intervention (1649 [35.9%])</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital census, No.</td>
<td>331 (315-343)</td>
<td>338 (329-350)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Admission hour</td>
<td>14:00 (6:00-19:00)</td>
<td>14:00 (7:00-19:00)</td>
<td>.006</td>
</tr>
<tr>
<td>SDU nurses on shift, No.</td>
<td>32 (31-33)</td>
<td>32 (31-33)</td>
<td>.01</td>
</tr>
<tr>
<td>SDU census, No.</td>
<td>90 (86-93)</td>
<td>88 (83-91)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>ESI score</td>
<td>2 (2-2)</td>
<td>2 (2-2)</td>
<td>.40</td>
</tr>
<tr>
<td>Length of stay in the ED per admission, median (IQR), min</td>
<td>821 (590-1279)</td>
<td>730 (538-1032)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Time boarding in the ED (after admission) per admission, median (IQR), min</td>
<td>386 (225-712)</td>
<td>336 (213-553)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Age, median (IQR), y</td>
<td>54 (44-63)</td>
<td>54 (44-63)</td>
<td>.90</td>
</tr>
<tr>
<td>Admissions per season, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>863 (29.2)</td>
<td>932 (56.5)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Spring</td>
<td>939 (31.8)</td>
<td>87 (5.3)</td>
<td></td>
</tr>
<tr>
<td>Summer</td>
<td>831 (28.1)</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>315 (10.7)</td>
<td>630 (38.2)</td>
<td></td>
</tr>
<tr>
<td>Admissions per shift, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day</td>
<td>895 (30.3)</td>
<td>475 (28.8)</td>
<td>.03</td>
</tr>
<tr>
<td>Evening</td>
<td>1201 (40.7)</td>
<td>738 (44.8)</td>
<td></td>
</tr>
<tr>
<td>Night</td>
<td>852 (28.9)</td>
<td>436 (26.4)</td>
<td></td>
</tr>
<tr>
<td>Admissions per ESI score (1-5), No. (%)</td>
<td></td>
<td></td>
<td>.80</td>
</tr>
<tr>
<td>1</td>
<td>133 (4.7)</td>
<td>70 (4.4)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2179 (77.3)</td>
<td>1217 (76.7)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>491 (17.4)</td>
<td>293 (18.5)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>16 (0.6)</td>
<td>6 (0.4)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1 (0.04)</td>
<td>1 (0.1)</td>
<td></td>
</tr>
<tr>
<td>Male sex, No. (%)</td>
<td>1660 (56.3)</td>
<td>950 (57.6)</td>
<td>.40</td>
</tr>
<tr>
<td>Surgical services, No. (%)</td>
<td>563 (19.1)</td>
<td>307 (18.6)</td>
<td>.70</td>
</tr>
</tbody>
</table>

Abbreviations: ED, emergency department; ESI, Emergency Severity Index; IQR, interquartile range; NA, not available; SDU, step-down unit.
Limitations of this study include the lack of concurrent control and the fact that it was a single-center study. Although single-centered, a large number of patients were evaluated, and the patient flow problems encountered at our hospital are common and intrinsic to hospitals generally. Thus, the results are likely generalizable, but perhaps to varying degrees, depending on the severity of the baseline patient flow problems at individual institutions.

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Author Contributions: Drs Fleischman and Spellberg had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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Administrative, technical, or material support: Kaji, McKenzie, Van Natta, Spellberg.

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Table 2. Factors That Significantly Affected ED Boarding Time per SDU Admission by Multivariable Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Change in ED Boarding Time, Point Estimate (95% CI), min</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factors that decreased boarding time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention period</td>
<td>−100 (−74 to −126)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Admission hour of day (for every later hour)</td>
<td>−3 (1 to 4)</td>
<td>.004</td>
</tr>
<tr>
<td>Nurses staffing SDU at admission (for every increase of 1 nurse)</td>
<td>−12 (5 to 20)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Surgical service (vs nonsurgical services)</td>
<td>−141 (111 to 171)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Factors that increased boarding time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Census at admission (for every increase of 1 in census)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital</td>
<td>+3 (2 to 3)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>SDU nurses, No.</td>
<td>+5 (3 to 8)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Abbreviations: ED, emergency department; SDU, step-down unit.