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Association Between Clinicians’ Average Patient Length of Stay and Patient Experience Scores

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ABSTRACT

Objective: Given the current emphasis on patient-centered care, emergency physicians are seeking ways to improve patients’ experience in the emergency department (ED). Length of stay (LOS) in the ED has previously been associated with patient experience ratings, however there is limited literature on this relationship at the clinician level. The objective of this study was evaluate the association between ED clinicians’ mean LOS and their individual patient experience scores.

Methods: This was a cross-sectional observational study of 240 ED clinicians’ average LOS and patient experience scores which took place across a regional healthcare system in the United States from July 1, 2020 through June 30, 2022. We performed both a univariate and a multivariate regression to assess for a correlation between our primary patient experience measure, Net Promoter Score (NPS), and mean LOS at the clinician level. In the multivariate regression, we controlled for triage acuity level, hospital site, clinician type (physician or physician assistant/nurse practitioner), and computed tomography (CT) usage.

Results: We found a significant negative association between clinicians’ average LOS and NPS scores, such that every minute increase in LOS was associated with a decrease in NPS of 0.07 (p = 0.001). This association was unchanged in the multivariate model.

Conclusions: In this cohort of 240 clinicians, longer average patient LOS was associated with lower patient experience scores. Further study is warranted to determine safe, effective, and patient important ways to improve ED throughput and decrease patient LOS.

Keywords: Patient satisfaction, Patient experience, Length of stay, Quality

1. Introduction

Patient experience or patient satisfaction is measured and reported across most hospitals and EDs in the United States as consumerism is increasingly embraced across healthcare systems. It is emphasized by many hospitals and is even being incorporated into some value based care models. Specific measures include the Press-Ganey and Net Promotor Score (NPS). Patient experience is a complex measure that may be affected by many factors. In the setting of emphasis on high-value care, emergency physicians and administrative teams are seeking ways to improve patients’ experience in the emergency department (ED) and reduce or eliminate wasteful use of resources, consequently reducing cost of care. ED patient experience has been linked to several factors including perceived provider empathy, pain control, and door to provider time. One of the more consistent factors associated with patient experience has been length of stay (LOS) in the ED. However, most previous scholarship on LOS and patient experience in the ED has been done at the national level by hospital, or at the patient level.
ED clinicians have some, although far from complete, control over their own average LOS, and the association between average clinician LOS and patient experience has not been well explored. Thus, a knowledge gap remains with respect to the association between LOS and patient experience at the clinician level. Individual clinicians, facing pressure to improve patient experience ratings, seek to better understand which factors, under their control or not, can possibly be manipulated or improved on to maximize their patient experience scores. In this study we measure the association between individual clinician’s average LOS and the clinician’s patient satisfaction scores in the ED setting of a large regional healthcare system.

2. Methods

2.1. Study design and setting

This was a cross-sectional observational study of ED clinician metrics across a regional healthcare system in the United States from July 1, 2020 through June 30, 2022. Since the study did not use any patient level identifiers, it was deemed not to be human subjects research by the local Institutional Review Board. The hospital system uses NPS as the patient experience metric, which was utilized for this study.

2.2. Selection of participants

Attending physicians and Non-physician practitioners (NPPs, either physician assistants or nurse practitioners) working in the EDs of any of the 15 non-pediatric hospitals included in the healthcare system were eligible. Clinicians were included if they had at least 500 adult patient encounters resulting in ED discharge over the 2-year study period. Residents and students were excluded. Only adult patient visits resulting in discharge from the ED were included in clinicians’ metric calculations. Pediatric visits were excluded because there is a wide range in the proportion of pediatric visits across the different included hospitals, and pediatric visits tend to have a much lower average LOS. Thus, inclusion of pediatric visits would be expected to substantially lower the average LOS for clinicians working at a higher pediatric volume ED compared to clinicians working at an ED with a lower proportion of pediatric patients. We chose to exclude pediatric visits to avoid this potentially substantial confounder.

2.3. Measurements

A quality improvement database was utilized for the study. Extracted data points, all calculated on the clinician level, included mean patient LOS, percentage of patients for whom a computed tomography (CT) scan was ordered, mean patient Emergency Severity Index (ESI) acuity, clinician type (physician vs NPP), hospital site, gender of the clinician, nocturnal clinician (yes/no) and NPS. LOS was calculated as time from registration at the ED to the time of discharge in minutes. ESI is a five-level, nursing-driven triage algorithm that stratifies patients based on their acuity and the expected resource needs. In the primary analysis, fixed effects are included for hospital site. NPS is a patient experience metric with scores ranging from −100 to +100. NPS surveys are sent to all discharged ED patients in the healthcare system, with a response rate of approximately 20%. Clinicians’ NPS score was calculated based on how their discharged patients responded to the question “How likely are you to recommend this hospital?”, with ordinal response categories ranging from 0–10. Patients who respond with a 9 or 10 are considered “Promoters”, 7s or 8s are considered “Neutrals”, and 0–6 are considered “Detractors.” NPS is calculated by the following formula:

\[
\frac{(\text{Promoters} - \text{Detractors})}{(\text{Promoters} + \text{Neutrals} + \text{Detractors})}
\]

CT rate was calculated as the percentage of all patients discharged after seeing that clinician for whom at least one CT was performed. Because this is a binary variable, patients receiving multiple CT scans were counted the same as patients who received a single CT. Patient encounters were attributed to the first clinician assigned to that patient in the Electronic Medical Record (EMR). The primary outcome was the association between clinicians’ mean LOS and mean NPS.

2.4. Analysis

First, we assessed for a raw association between LOS and NPS across all included clinicians using a simple linear regression. Second, a multivariate regression model was performed to account for differences in each clinician’s mean ESI, clinician type (physician vs. PA/NP), hospital site, and CT utilization rate. To account for the impact of different hospitals average NPS scores in the multivariable model, a hospital with NPS near the average across all 15 hospitals was chosen as the “dummy,” with its location coefficient to NPS defined as 1.0, and all other hospital locations are reported with location coefficients relative to the dummy hospital. Some clinicians in our system work at more than one hospital, and in those cases,
clinicians were assigned to the hospital where they work the largest percentage of their shifts. All statistical analyses were performed using Stata 17.0 BE.

3. Results

Across the 15 included hospitals, there were 248 clinicians who met the inclusion criteria. NPS scores were not available for 8 clinicians, leaving a final cohort of 240. Of these, 166 were physicians and 74 were NPPs. The dataset represents 403,382 patient encounters, for an average of 1681 encounters per clinician. Individual hospital NPS ranged widely, from 33.6 to 61.3. Table 1 displays median and interquartile range statistics for clinician metrics. Results of the multivariate regression model are displayed in Table 2.

In univariate analysis, clinician mean LOS was significantly associated with mean NPS (Fig. 1), such that each additional minute of LOS was associated with a decrease in NPS of 0.07 (p = 0.001). This result was unchanged in the multivariate model accounting for NPS differences between hospitals, clinician APP vs physician, CT rate, and mean ESI (Table 2). CT use, APP vs physician, and ESI level were not statistically significantly independently associated with NPS in the multivariable regression model. Compared to the dummy hospital, the coefficient for hospital location

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**Table 1.** Clinician statistics.

<table>
<thead>
<tr>
<th>Clinicians (N)</th>
<th>240</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians</td>
<td>166 (69%)</td>
</tr>
<tr>
<td>NPPs</td>
<td>74 (31%)</td>
</tr>
<tr>
<td>Median length of stay (IQR) in minutes</td>
<td>245 (185–311)</td>
</tr>
<tr>
<td>Median NPS (IQR)</td>
<td>42.3 (29.8–59.6)</td>
</tr>
<tr>
<td>Median patient encounters per clinician (IQR)</td>
<td>1681 (712–2700)</td>
</tr>
</tbody>
</table>

NPP = Non-physician practitioner; IQR = Interquartile range; NPS = Net promotor score

**Table 2.** Result of the multivariable logistic regression for impact of variables on net promoter score.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS (per minute)</td>
<td>−0.07</td>
<td>−0.1 to −0.03</td>
</tr>
<tr>
<td>APP vs physician</td>
<td>−1.03</td>
<td>−6.1 to 4.0</td>
</tr>
<tr>
<td>ESI (per 1 increase in ESI)</td>
<td>−8.0</td>
<td>−23.0 to 7.0</td>
</tr>
<tr>
<td>CT utilization (per 1% increase in use)</td>
<td>0.14</td>
<td>−0.16 to 0.45</td>
</tr>
<tr>
<td>Hospital location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#1</td>
<td>Null (0)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>#2</td>
<td>−7.4</td>
<td>−14.2 to −0.6</td>
</tr>
<tr>
<td>#3</td>
<td>1.8</td>
<td>−9.3 to 12.8</td>
</tr>
<tr>
<td>#4</td>
<td>−1.9</td>
<td>−10.8 to 6.9</td>
</tr>
<tr>
<td>#5</td>
<td>−10.1</td>
<td>−16.7 to −3.6</td>
</tr>
<tr>
<td>#6</td>
<td>0.5</td>
<td>−9.8 to 10.8</td>
</tr>
<tr>
<td>#7</td>
<td>−8.0</td>
<td>−19.9 to 4.0</td>
</tr>
<tr>
<td>#8</td>
<td>3.2</td>
<td>−4.5 to 10.9</td>
</tr>
<tr>
<td>#9</td>
<td>0.9</td>
<td>−7.3 to 9.1</td>
</tr>
<tr>
<td>#10</td>
<td>8.8</td>
<td>2.0 to 15.7</td>
</tr>
<tr>
<td>#11</td>
<td>−9.3</td>
<td>−20.6 to 1.9</td>
</tr>
<tr>
<td>#12</td>
<td>14.2</td>
<td>4.1 to 24.4</td>
</tr>
<tr>
<td>#13</td>
<td>9.3</td>
<td>−0.9 to 19.5</td>
</tr>
<tr>
<td>#14</td>
<td>4.3</td>
<td>−2.6 to 11.2</td>
</tr>
<tr>
<td>#15</td>
<td>−2.8</td>
<td>−15.5 to 9.9</td>
</tr>
</tbody>
</table>

Multivariate regression controlling for clinician type (Non-physician Provider vs Physician), average clinician Emergency Severity Index, hospital, and clinician percent CT utilization

LOS = Length of stay; APP = Advanced practice provider; ESI = Emergency severity index
ranged from −10.1 to +14.2. All variables impact on the multivariable model are displayed in Table 2.

Mean LOS was also associated with CT use rate, such that for each 1% absolute increase in CT rate, a clinician’s mean LOS increased by 1.1 minutes (p = 0.02). In the multivariate logistic regression model, CT use was not independently significantly associated with NPS.

4. Discussion

Our results demonstrate a negative association between LOS and NPS at the clinician level which persists when adjusting for several potential confounders including mean patient acuity, CT utilization, ED site, and clinician type. Higher CT utilization by provider was paradoxically associated with increased LOS but was not independently associated with NPS, suggesting the complex interaction of different components of care in the ED and how they affect patient satisfaction.

Overall, our findings are consistent with existing literature which demonstrates a correlation between LOS in the ED and patient experience measures.1,4,6 While prior analyses have typically been performed at the patient visit level, our analysis advances this literature by demonstrating that the relationship between LOS and overall patient experience score is statistically significant at the clinician level as well. Thus, clinicians who decrease their patients’ LOS may see improvements in their overall patient experience, although our work is unable to determine whether this association is causal.

In the setting of staffing shortages among both clinician and nursing staff, efficient use of resources, including clinician time, is essential. Addressing operational challenges such as inpatient boarding and unstaffed care spaces must be a fundamental aspect of achieving patient experience aims. However, clinicians can also use their understanding of the role of LOS in patient experience to assist with their clinical decision making. For example, if a patient is going to be swabbed for viral infections such as COVID-19 or influenza, and the results of these swabs will not change management, clinicians can solicit patient preferences for obtaining results and, when possible, allow patients to access them through online portals, call backs, or while waiting in a ‘results pending’ room or other designated area. When large numbers of ED care spaces are consumed by boarding inpatients, operational initiatives may permit patients to be seen and discharged from triage areas. The use of advanced imaging continues to increase7-10 and may also contribute to LOS, again providing the opportunity to embrace shared decision making when considering low-yield radiology or other time consuming tests.11

Finally, our work demonstrates the need for further research on the role of hospital level operations on ED patient experience. While emergency clinicians may have control over many aspects of patient care, it is clear that patients respond to elements of ED care delivery beyond their interactions with clinicians, and often outside of the clinicians’ control. Further, while we and others have found an association between LOS and experience metrics, this has not been shown to be a causative relationship.

5. Limitations

Our study has several limitations. First, this is an observational study and although we corrected our results for some known or suspected confounders of NPS, there are likely other confounders not accounted for in our models. Of note, we were unable to include patient level variables, which could contribute to LOS and experience metrics. While we would assume that differences in patients seen between clinicians at the same facility would even out over 2 years, this may or may not have been the case. We were also unable to obtain clinician years in practice to be included in the regression model. Only adult encounters were utilized for our clinician metrics, and the association we identified may not hold true for pediatric patients or at pediatric EDs. ESI may not fully capture differences in acuity and may not be applied identically by all triage clinicians. We cannot distinguish in our data whether LOS is being driven by wait times prior to arriving in a care space (door to clinician) or wait times once already in a care space, but over the course of 2 years, clinicians at a single hospital should be roughly equally affected by waiting room times, and we adjusted for differences between hospitals. The NPS response rate at our institutions is approximately 20%, so most of the patients seen in our EDs do not contribute to this metric. However, this is consistent with how patient experience metrics are congregated and reported nationally in most healthcare systems, so we believe our findings are generalizable to similar ED clinicians.

6. Conclusions

In this cohort of 240 clinicians, longer average patient LOS was associated with lower patient experience
scores. Further study is warranted to determine safe, effective, and patient important ways to improve ED throughput, decrease patient LOS, and potentially improve patient experience.

References