Creating a Rapid Assessment Zone with Limited Emergency Department Capacity Decreases Patients Leaving Without Being Seen: A Quality Improvement Initiative

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The Problem

- ED Overcrowding caused:
  - Long wait times
  - High LWBS
  - Increased risk
  - Long Length of Stay (LOS)

Solution

- Creation of ED Throughput Team
- Implementation of a Rapid Assessment Zone with vertical care
- Budget neutral solution better utilizing current space and staff

Outcomes

- DECREASED LWBS rate
- Door to Provider times
- Discharge LOS times
CREATING A RAPID ASSESSMENT ZONE WITH LIMITED EMERGENCY DEPARTMENT CAPACITY DECREASES PATIENTS LEAVING WITHOUT BEING SEEN: A QUALITY IMPROVEMENT INITIATIVE

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Abstract

Introduction: Patients leaving the emergency department before treatment (left without being seen) result in increased risks to patients and loss of revenue to the hospital system. Rapid assessment zones, where patients can be quickly evaluated and treated, have the potential to improve ED throughput and decrease the rates of patients leaving without being seen. We sought to evaluate the impact of a rapid assessment zone on the rate of patients leaving without being seen.

Methods: A pre- and post-quality improvement process was performed to examine the impact of implementing a rapid assessment zone process at an urban community hospital emergency department. Through a structured, multidisciplinary approach using the Plan, Do, Check, Act Deming Cycle of process improvement, the triage area was redesigned to include 8 rapid assessment rooms and shifted additional ED staff, including nurses and providers, into this space. Rates of patients who left without being seen, median arrival to provider times, and discharge length of stay between the pre- and postintervention periods were compared using parametric and nonparametric tests when appropriate.

Results: Implementation of the rapid assessment zone occurred February 1, 2021, with 42,115 ED visits eligible for analysis; 20,731 visits before implementation and 21,384 visits after implementation. All metrics improved from the 6 months before intervention to the 6 month after intervention: rate of patients who left without being seen (5.64% vs 2.55%; $\chi^2 = 258.13; P < .01$), median arrival to provider time in minutes (28 vs 11; $P < .01$), and median discharge length of stay in minutes (205 vs 163; $P < .01$).

Discussion: Through collaboration and an interdisciplinary team approach, leaders and staff developed and implemented a rapid assessment zone that reduced multiple throughput metrics.
**Key words:** Throughput; Crowding; Emergency department; Rapid assessment zone

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**Introduction**

ED crowding and boarding, the practice of holding patients in the emergency department until an in-hospital bed is available, has been associated with increased in-hospital mortality and delays in care. ED crowding also results in patients leaving without being seen (LWBS) by a provider, which increases the risk of adverse events in high-risk populations that need treatment and also contributes to lost revenue. For these reasons, LWBS rates represent a key ED performance metric.

Nationally, LWBS rates vary substantially between hospitals; however, one key predictor of ED LWBS rates is the time from when patients check in until they are seen by a provider, also known as “arrival to provider” time. Efforts to reduce “arrival to provider” time often realign ED resources, including placing a provider (physician or advanced practice provider) in triage and cohorting inpatient overflow patients (“ED boarders”) in one area. In addition, rapid assessment zones (RAZs) have been proposed as a way to shift ED providers, nurses, and technicians to the front end of the emergency department to expedite assessment and treatment. Early assessment includes identification of patients who do not require physical bed space, thereby conserving ED bed space and other resources for higher-acuity patients. RAZs also can incorporate evidence-based, nurse-initiated orders and facilitate treatment and discharge of low acuity patients from the waiting room. In 2019, our hospital noted increased LWBS rates. As part of a quality improvement project, we implemented a RAZ with a vertical care model and examined its impact on ED LWBS rates, arrival to provider times, and ED discharge length of stay (DLOS). Although the project focused on the implementation of ED-specific initiatives, we also examined the impact on length of stay (LOS) for admitted patients and LOS for all ED patients.

**Methods**

**DESIGN AND SETTING**

We performed a single-site quality improvement initiative examining the impact of a RAZ on commonly measured ED operational metrics before and after intervention. The ED Medical Director was approached by hospital leadership and asked to reduce LWBS rates, which were as high as approximately 8% in certain months of the preimplementation measurement period, compared with the hospital’s internal goal of a LWBS rate of < 2%. The ED sees roughly 40,000 patients annually. Before the creation of the RAZ, the ED had 23 treatment rooms, with 8 additional treatment spaces in the front of the department that were formerly used as a “Fast Track” treatment area. These 8 spaces were incorporated into the triage area during the creation of the RAZ (Figure 1). This work was approved by the Allegheny Health Network Institutional Review Board.

**OVERVIEW OF RAZ**

In response to ED crowding and suboptimal performance metrics (eg, LWBS of approximately 8%), we assembled a multidisciplinary throughput team composed of US Acute Care Solutions (USACS) clinical leaders from the Clinical Resource Group, ED leaders, providers, emergency nurses, and support staff to redesign front-end flow and serve as process champions. The ED providers at Mercy Health-Fairfield Hospital are employed by USACS, and the Clinical Resource Group is an internal USACS quality improvement and implementation team who provides quality and process improvement services to hospital partners at no additional cost to the organization. Our focus was to create a rapid assessment and vertical care model to best use the existing footprint of the emergency department, expedite initial provider and nurse triage assessments, determine patient placement into the appropriate care area, and expedite testing, thereby decreasing the LWBS rates and decreasing the DLOS.

The RAZ was created using an existing 8-bay treatment zone in the front end of the emergency department to be used from 7 AM to 10 PM daily (Figure 1). This 8-bay area was formerly the department’s “Fast Track” area, which during the COVID-19 pandemic was largely unused space. Staff resources were shifted to the front end to operate the RAZ with triage nurse(s), an ED technician, and a phlebotomist. Before the process change, there was 1 triage nurse at all times, and as staff expanded during the day, there were 2 triage nurses from 11 AM to 11 PM, 1 technician assigned to triage, and 1 phlebotomist for the department. Triage patient flow prior to process change was linear. Patients were quick registered by a member of the registration team and brought into one triage room by the triage nurse for assessment by the triage nurse who then entered preapproved protocol orders before sending patients back to the waiting room. Patients were called to a blood draw area for testing to be initiated.
by the triage tech or phlebotomist when they were available. Following this obtaining of specimens, patients were sent back to the waiting room, where staff from imaging would pick up and return patients if imaging studies were ordered.

Implementation of the RAZ process created a front-end team composed of the triage nurse(s) and triage technician and stationed the ED phlebotomist primarily in the RAZ area where the bulk of testing occurred. From 7 AM to 11 AM, there was 1 triage/RAZ nurse using 4 RAZ bays. Depending on RAZ volume, 2 or 3 triage/RAZ nurses functioned in this area between 11 AM to 11 PM. The triage nurse role was redefined to fit the new process, with the RAZ nurses sharing the responsibility of performing the triage assessment and initiation of orders with the technician and phlebotomist. RAZ patient flow begins with quick registration; then, patients are called by an available RAZ team member to any of the open RAZ bays. Any available

FIGURE 1
Layout of the rapid assessment zone and patient flow—ED front-end diagram. RAZ, rapid assessment zone; ED, emergency department; EKG, electrocardiogram.
provider (physician or advanced practice provider) could see a RAZ patient, with the provider performing the RAZ assessment being the provider of record for the entire ED visit. The RAZ process includes initial nursing triage assessment, provider assessment, order entry, phlebotomy, obtaining any other ordered specimens, medication administration, treatments, and full registration. One of the RAZ bays was dedicated to performing urgent electrocardiograms.

During the initial assessment, the provider and triage nurse would collaborate on which patients were appropriate to remain in the RAZ process and which patients would be placed in a bed in the main emergency department. After RAZ tasks (e.g., blood draws) were completed, the patient was moved either back to the waiting area or to a bed in the main emergency department (Figures 2 and 3). The imaging departments picked up RAZ patients for testing from the waiting area and returned patients to the same area after testing. The goal was to have patients seen with workups started within 20 minutes of arrival to the emergency department. When there was a delay of greater than 20 minutes for provider assessment, a member of the front-end
team called the providers to identify a reason for the delay, and if no provider was available, one of the RAZ nurses entered protocol orders to keep RAZ flow moving. When a provider became available, the provider and the RAZ team worked to cycle patients back into the RAZ area from the waiting area for their provider assessment and enter any additional orders. In this model, critically ill walk-in or ambulance patients were directly assigned a bed in the main emergency department. Noncritical walk-in or ambulance patients were registered and proceeded through the RAZ process.

Before implementation of the RAZ process, the throughput team developed provider and emergency nursing staff education that included team role responsibilities, appropriate patient types for vertical care, vertical care orders, emphasis on concurrent provider and nurse assessment and decision making, and focus on a short RAZ LOS. In addition, staff training included elements of patient
and family education, with scripting of key words to explain the new process (Figure 3). It was essential that staff be able to articulate the benefits of the process changes to patients and their loved ones, promoting a positive patient experience. Education was conducted at staff meetings, shift huddles, and in real time on shift using the RAZ flow diagrams and scripting samples (Figure 4; Supplementary Appendix 1). A timeline of the implementation can be seen in Figure 5. During initial implementation, a member from the USACS Clinical Resource Group, a group of clinicians with over 10 years of experience in improving ED operations, was on site to support ED leadership and staff. This team member was available alongside ED leaders to help answer questions in real time and observe challenges and successes while ensuring consistency.

METHODS OF MEASUREMENT

We used data from the 6 months before and 6 months after RAZ implementation. Visit characteristics, including LWBS, arrival to provider time, and DLOS were abstracted by trained billing specialists. Briefly, the emergency department is staffed by a national group that is responsible for its own billing and coding. ED records are reviewed by billing and coding specialists who extract data from the health.
records including visit characteristics (eg, disposition). All specialists undergo ongoing training, auditing, and external evaluation to ensure consistency. In addition, they are required to have or acquire relevant billing and coding certification(s). In addition to being used for billing and coding, the abstracted data are saved to a database, allowing for additional analyses that have been successfully used previously.13

OUTCOMES

Our primary outcome was percentage of patient visits with LWBS dispositions, defined as patients who presented to the emergency department and were registered for treatment but subsequently left before being evaluated by an ED provider.

Our secondary outcomes included arrival to provider time, defined as the length of time (in minutes) from patient arrival to initial provider evaluation; DLOS, defined as the length of time (in minutes) from patient arrival to the time the patient leaves the department upon discharge; and LOS for all ED patients and LOS for admitted ED patients (in minutes), defined as the time from ED arrival until admission.

ANALYSIS

All ED visits during the measurement period were considered for analysis. Visits where the disposition was not recorded were excluded. Time intervals less than 0 minutes or greater than the 99% percentile of times were considered spurious and interpreted as missing.14 We summarized characteristics of ED visits using descriptive statistics. Pre- and post-RAZ implementation metrics were compared using parametric or nonparametric methods when appropriate. Normality of the data was determined by using the Shapiro-Wilk test. All analyses were completed with Stata (v. 12, College Station, TX).

Results

There were 42,390 initial ED visits during the examined time period. After removing 276 ED visits where no disposition was recorded, there were 42,115 ED visits available for analysis; 20,731 visits before implementation and 21,384 after RAZ implementation (Table 1). The majority of patients in each group were triaged as an Emergency Severity Index 3 and were discharged. All evaluated outcome metrics improved from the 6-month preintervention period to the 6-month postintervention period: LWBS (5.64% vs 2.55%; $\chi^2 = 258.13; P < .01$), median (range) of arrival to provider time (28 [8-83] vs 11 [4-27]; $P < .01$), and median (range) of DLOS (205 [133-304] vs 163 [102-243]; $P < .01$), (Table 2). These results were immediate and sustained during the studied time interval (Figures 6-8). LOS for all patients and LOS for admitted patients also decreased (Table 2; Supplementary Appendix 2).

During initial implementation, there was a higher volume of mid- to lower-acuity patients than anticipated. These mid- to lower-acuity conditions allowed these patients to remain “vertical” instead of requiring a physical bed (“horizontal”) for their care. Vertical care means evaluating and treating patients without the use of a physical emergency department room when one is not necessary and assigning patients to virtual beds in the electronic health record instead of actual treatment rooms.8 Vertical patients
are stable and can sit in a chair to receive treatments and therapies and wait for discharge. This required another emergency nurse to move from the main emergency department to the RAZ beginning at 11 AM and closing a section in the main emergency department for a total of 3 RAZ nurses. This section closure was possible, because the RAZ process successfully identified vertical appropriate patients who formerly were bedded in the main emergency department, thereby conserving the main ED rooms for higher-acuity patients, reducing back-end volume, allowing an emergency nurse to shift to the RAZ where the patient volume exists. This reallocation of nursing resources did not affect the ratios in the main emergency department and did not change the care provided to higher-acuity patients who required critical care, admission, or transfer. This was achieved without hiring additional staff or increasing provider hours.

**Discussion**

ED crowding and throughput are critical issues, as prolonged wait times can jeopardize quality of care and patient safety. In our single-site emergency department, the implementation of a RAZ was associated with improvement in a number of ED metrics including LWBS rates, arrival to provider times, and DLOS. Creating a RAZ and vertical care process for appropriate patients helped to conserve

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**TABLE 1**

Pre- and postintervention visit characteristics and outcomes

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Preintervention</th>
<th>Postintervention</th>
<th>$c^2$ value</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visits</td>
<td>20,731</td>
<td>21,384</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESI level</td>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>233 (1.15)</td>
<td>159 (0.75)</td>
<td>530.26</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>2</td>
<td>5090 (25.13)</td>
<td>3444 (16.33)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10,310 (50.91)</td>
<td>11,814 (56.02)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4431 (21.88)</td>
<td>5491 (26.04)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>187 (0.92)</td>
<td>181 (0.86)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disposition</td>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMA</td>
<td>208 (1)</td>
<td>211 (0.99)</td>
<td>292.44</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Admitted</td>
<td>5473 (26.4)</td>
<td>5374 (25.13)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharged</td>
<td>13,365 (64.47)</td>
<td>14,767 (69.06)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LWBS</td>
<td>1170 (5.64)</td>
<td>545 (2.55)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (eg, died in ED or transferred)</td>
<td>515 (2.48)</td>
<td>486 (2.27)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ESI, Emergency Severity Index; AMA, against medical advice; ED, emergency department; LWBS, left without being seen.

**TABLE 2**

Pre- and postintervention outcomes

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Preintervention</th>
<th>Postintervention</th>
<th>$c^2$ or Kruskal-Wallis value</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LWBS % (95% CI)</td>
<td>5.64</td>
<td>2.55</td>
<td>258.13</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Median arrival to provider (IQR)</td>
<td>5.33-5.97</td>
<td>2.34-2.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median LOS for discharged patients (IQR)</td>
<td>28</td>
<td>4-27</td>
<td>3278.66</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Median LOS for admitted patients (IQR)</td>
<td>133-304</td>
<td>102-243</td>
<td>990.51</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Median LOS for admitted patients (IQR)</td>
<td>395</td>
<td>265-411</td>
<td>629.77</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

ED, emergency department; LOS, length of stay; CI, confidence interval; IQR, interquartile range.
monitored beds in the main emergency department for higher-acuity patients, which was necessary because of ED crowding. This was accomplished without the addition of staff or provider hours. Current staffing resources were used, and daily assignments were changed to redefine staff roles and shift staff to the front end, creating a RAZ and vertical care team. The RAZ model of care has been sustained through daily review of performance metrics, weekly debriefing discussions at the ED throughput team meetings, and ownership of the new process by the local ED team. ED leaders and throughput team members initially served as process champions and coaches on shift to help answer questions and address issues in real time. The team met daily during the first 2 weeks and then moved to weekly debrief discussions to discuss successes, challenges, and metrics and to make systematic alterations to the process when necessary. Consistent communication was sent to the provider and nursing teams weekly to provide status and process updates. As the RAZ process became more hardwired, debrief meetings happened every 2 weeks (Figure 3).

ED capacity and crowding contribute significantly to LWBS, and it is important to incorporate methods to keep patients moving through the department and optimize existing space to help expedite safe patient care. Having a
provider assessment with orders initiated early in the visit is a key determining factor to reducing LWBS. Patients experience an overall shorter LOS when cared for in a vertical model. From a patient experience perspective, using key words to inform patients of the process steps, letting them know that they are moving forward in the process, and keeping them routinely informed on their plan of care also influence LWBS.

Our results are consistent with those of other studies looking at the impact of RAZ on ED metrics. Anderson et al examined the impact of a RAZ in a high-volume, academic, urban emergency department and found similar results. Without increasing staffing, they were able to decrease arrival to provider times, DLOS times, and LWBS rates. In addition, studies have shown that bringing additional resources to the triage area and, in appropriate patients, keeping patients “vertical” can help to decrease time in the emergency department. ED leaders may consider a combination of these options when looking to decrease LWBS rates and improve ED throughput.

Although our results are encouraging, they should be considered in context. Improving throughput times in the emergency department requires a team approach. The RAZ and vertical care process is not a simple Provider in Triage model aimed solely at decreasing arrival to provider times but is a throughput model intended to appropriately align ED staff and resources and separate out lower-acuity vertical care patients, which has proven to be effective in decreasing arrival to provider times, DLOS, and LWBS rates.

Hospital leadership should be involved in discovering the root cause of ED crowding and LWBS as optimization of the emergency department involves addressing both front-end and back-end issues (ie, boarding). Multiple studies have examined other aspects associated with ED crowding and specifically focus on boarding as a key contributor. Our findings should be incorporated in the context of other hospital-wide solutions to continually improve ED throughput and maximize the quality and efficiency of care delivered in the emergency department.

Limitations

Our work has several limitations. It was performed at a single community emergency department. How these results translate to other emergency departments (eg, academic facilities, larger annual volumes) is unknown. Individual efficiency variances exist between individual emergency nurses and provider clinicians. Although it was not formally measured in regard to this initiative, we anecdotally noted frequent ED boarding during the project. How RAZ implementation would affect emergency departments without boarding is unknown. We did not adjust for potential underlying differences in patient characteristics. Overall, there were improvements in our studied outcomes; however, it is unclear whether specific populations are affected differently by the RAZ. We also did not specifically account for seasonal volume and acuity variations. Data were reviewed over a 12-month timeframe, 6 months before and 6 months
after the intervention. We did not look at data over several years, and we acknowledge that there could be seasonal differences in patient populations.

Implications for Emergency Nurses

The key to our success was using an interdisciplinary team approach to process design and implementation during all phases of this process improvement initiative. A team approach has been shown to increase team ownership and sustainability of new processes. Leaders can engage staff in the Plan, Do, Check, Act Deming Cycle method of process improvement to improve team engagement during process improvement. Team collaboration on process change and creation of the RAZ resulted in fewer patients LWBS, improved patient throughput, and improved ED performance metrics. Emergency nurses were key participants on the process change design team, providing valuable insights on the details of how to structure RAZ patient flow, organization of the workspace, and staff workflow. During the first 4 weeks of implementation, emergency nurses kept a daily logbook of issues that occurred, which were acted upon each day by ED leadership. Emergency nurses also participated in weekly debrief sessions outlining the challenges and successes of the week and helped to troubleshoot the identified challenges. Leveraging the expertise of emergency nurses in the process design promoted early adoption and staff ownership of the RAZ process. Creation of a vertical care model helped conserve main ED beds for higher-acuity patients, ensuring that there was increased bed availability for critical patients. Implementing a process that dedicates space and staff resources to rapid assessment and initiation of care has changed the culture of this emergency department, creating a sense of urgency to quickly care for all patients, no matter what their acuity level. Assessing patients and initiating diagnostic testing quickly has proven effective in reducing LWBS rates, arrival to provider times, and LOS.

Conclusions

The implementation of a RAZ resulted in immediate and sustained reductions in LWBS. Involving an interdisciplinary team in systematic process design and implementation was crucial to eliciting staff feedback and gaining staff buy-in for these operational changes. Team engagement is key when creating culture change and sustaining long-term process change. This approach may be used by other emergency departments to accelerate patient care and improve ED throughput.

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Author Disclosures

Conflicts of interest: none to report.

Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jen.2022.10.002.

REFERENCES


