ESTABLISHING A MORE EFFICIENT EMERGENCY DEPARTMENT THROUGHPUT: ONE HOSPITAL'S EXPERIENCE

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Abstract

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Overcrowding in the emergency department has become a national crisis. Facilities have been challenged to devise new strategies to deal with the influx of patients who are seeking medical treatment in the emergency department. The purpose of this paper is to present how one hospital formed a process improvement team to restructure patient flow and change the culture of the emergency department in order to improve patient throughput. Kadlec Regional Medical Center, a 270-bed, level 3 trauma center located in Richland, Washington was experiencing an average growth in volume of over 9% per year between 2003 and 2009. The number of patients who left without being seen by a provider and the wait times to see a provider increased along with the overall length of stay. A change in the way patients were managed from triage and registration, along with a new method to assigning patients into treatment rooms not only improved the efficiency of the department, but also improved patient and staff satisfaction.

Keywords: throughput, patient flow, overcrowding, emergency
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Kadlec Regional Medical Center Emergency Department Metrics........................................10
Preparation of manuscripts

Manuscripts must be typed, double-spaced. Research and clinical articles are limited to 15 pages. Length restrictions for all manuscripts apply to text plus references, tables, and illustrations. All lines on the manuscripts must be numbered.

Title Page

The title page must include the title, full name(s) of author(s), academic degrees, position, institution, city, state, and ENA chapter name, if a member.

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Standard abbreviations are to be used consistently throughout the article. Spell out unusual or coined abbreviations at first mention, followed in parentheses by the abbreviation.

References

References are to be the original sources of information in most instances. Number references sequentially in order of their mention in the text, and type the reference list double-spaced at the end of the text. Bibliographies will not be published.
Establishing a More Efficient Emergency Department Throughput:

One Hospital’s Experience

Overcrowding in the nation’s emergency departments has become a significant problem. Following the enactment of the Emergency Medical Treatment and Active Labor Act (EMTALA) in 1986, emergency departments were mandated to ensure emergency health care for all (Newton, Keims, Cunningham, Hayward, & Stanley, 2008; Tzeciak & Rivers, 2003). With a 24-hour a day open door policy and the convenience and guarantee of access to comprehensive medical care, the numbers of individuals accessing the emergency department (ED) has risen drastically nationwide, resulting in emergency department overcrowding. Additional factors that have contributed to overcrowding include inappropriate use of the ED, lack of primary care providers, lack of physical space, insufficient staffing, the need to temporarily care for patients who require inpatient care, prolonged treatment to avoid admitting patients, and an increase in the complexity and acuity of patients (Cowan & Trzeciak, 2005; Moskop, Sklar, Geiderman, Schears, & Bookman, 2009; Trzeciak & Rivers 2003; Twanmoh & Cunningham, 2006).

In 2006, there were an estimated 119.2 million ED visits nationwide, up 32% from the 90.3 million visits in 1996 (Pitts, Niska, Xu, & Burt, 2008). In 2005, approximately one-fifth of the U.S. population visited an ED one or more times within the previous twelve months. This equates to 40.5 visits per 100 persons or 227 visits every minute (Pitts, Niska, Xu, & Burt, 2008). The sheer volume of people presenting with acute and chronic illnesses and injuries to the ED presents a problem in itself. As patient volumes continue to rise, the negative impact experienced by overcrowding not only leads to long waits, prolonged pain and suffering, patient dissatisfaction, and staff
frustration and exhaustion, but can result in detrimental effects such as delay in treatment, decreased quality of care, and undesirable clinical outcomes (Derlet, 2002; Derlet & Richards, 2000; Moskop, Sklar, Geiderman, Schears, & Bookman, 2009).

Given this situation, hospital EDs around the nation are being challenged to address the issue of overcrowding and devise strategies to improve patient flow, generally referred to as “throughput.” The Emergency Nurses Association (ENA) issued a Position Statement addressing throughput. To reduce overcrowding, EDs must “…examine issues of input, throughput, and output in order to optimize patient flow throughout the hospital system…and implement best practices for addressing hospital and ED crowding on a systems-wide level” (ENA, 2010, ¶1). The Institute for Healthcare Improvement also addressed the issue of patient flow citing “unnecessary delays can contribute to poor medical outcomes, frustrated and unhappy patients, increased cost from waste and rework, increased harm, and a lower quality of work life for staff” (Institute for Healthcare Improvement, 2009, ¶1).

Improving patient flow involves efficiency in three distinct areas: patient input, throughput, and output. Input involves the period of time from when patients first present to the ED during the registration process, and culminating prior to receiving any treatment. Throughput involves the period of time when patients are actively assessed, evaluated, and treated by ED staff. Output involves patient discharge from the ED, whether they are admitted as inpatients to the institution, transferred to another facility, or returned to the community. Various institutions are now beginning to address these issues in order to improve efficiency and patient flow through their respective EDs.
Kadlec Regional Medical Center located in Richland, Washington is a 270-bed, Level 3 trauma center with more than 60,000 ED visits in 2010. In the fall of 2002, a 20-bed ED with a separate 6-bed Fast Track was constructed. Since 2003, the number of patients being seen in the ED increased 46%, those who left without being seen increased from 0.25% in 2003 to 1.10% in 2009, and the amount of time patients waited to see a provider averaged 34 minutes in 2009. While the overall length of stay (LOS) for patients was just under 200 minutes, this time has increased over the prior 5 years. Both the ED medical director and nursing management team were faced with devising more efficient ways to accommodate the growing volumes while focusing on decreasing the rate at which patients left the facility without being seen by a provider.

With the support of administration, the leadership team along with a newly developed process improvement (PI) team set out to identify areas of improvement and to devise strategies to improve patient flow. The PI team was composed of ED physicians, nurse practitioners (NP), physician assistants (PA), registered nurses (RN), and ED technicians (EDT). Ultimately the leadership and PI team implemented a series of changes which resulted in improved efficiency as evidenced by a decreased in the number of patients who left prior to treatment and a decrease in the time for a patient to be seen by a provider. These changes not only improved patient flow in the ED, but also improved patient and staff satisfaction. The following sections outline changes which were implemented to achieve these outcomes.

**Problem Identification**

The leadership and PI team understood that metrics such as the left without being seen rate, wait times to see a provider, and LOS were directly correlated to one another
and improvement in one area would positively affect the other. Data were presented to the group identifying target issues which had a direct impact on these specific metrics.

Three areas of delays quickly became evident. First, the time for a provider to assess, treat and discharge a patient from one of the 6 Fast Track rooms ranged anywhere from 30 minutes to over 2 hours. No true criteria existed for which patients were assigned to the Fast Track rooms. Patients were assigned based on nurse or provider subjectivity and, to some extent, on an acuity level score of 4 or 5 on the 5 level Emergency Severity Index (ESI), see Appendix. Secondly, patients seen in the main ED with an ESI acuity level of 3 or 4 frequently experienced prolonged LOS due to other more emergent patients. Lastly, patients who required admission waited for room placement in the ED preventing new patients to be treated in a timely manner.

Implementing the Plan

Following the emergency medical services (EMS) triaging philosophy of Simple Triage and Rapid Assessment – START (Jenkins et al., 2008), the leadership and PI team developed a color-coded system to mimic that of the rapid triaging system commonly utilized by pre-hospital services. In a mass casualty incident, patients would be triaged and given a specific color category: red patients were life-threatening and required immediate care; yellow patients could have care delayed one to two hours; green patients were classified as non-urgent and could have care delayed for many hours; and black patients represented patients who had or would soon expire and would not require care (Community Emergency Response Team, 1999).

With a goal of moving patients through the ED in a more efficient manner, a color triaging theory was adopted. The team modified the definition of EMS color triage to
support an improved patient flow system. Rather than defining how long treatment could be delayed in each triage category, the colors represented a treatment area with a desired LOS for patients in each color category. Three separate zones were created and the respective LOS goals were as follows: green zone patients had a desired LOS of 60 minutes or less; yellow zone patients had a LOS of 120 minutes or less; and red zone patients had a LOS of 185 minutes or less. All patients would be given an ESI acuity level in addition to a zone color which was solely utilized to establish the location where a patient would receive treatment.

Establishing Zones

The existing six bed Fast Track was located in a separate section of the ED set apart from the main twenty rooms of the unit and changing the name to green zone would be all that was required. The main section of the unit housed twenty rooms and could easily be renamed the red zone, although a yellow zone beds would need to be carved out of these twenty rooms.

The team initially designated six rooms in the back of the main department as the yellow zone. When this was implemented, staff found it difficult not to utilize the yellow zone for higher acuity patients when the rooms had low occupancy or when a more emergent patient required treatment. Because of the lack of physical boundaries between the yellow and red zones, the rooms began as the yellow zone in the morning, but as volumes increased, the number of yellow beds decreased. This situation again resulted in prolonged LOS for middle acuity patients.

To remedy this, the PI team requested the usage of additional hospital space. A newly constructed 36-bed Clinical Decision Unit (CDU) adjacent to the ED rarely
operated at full capacity. With statistics to support an expansion, the leadership team requested and was granted 8 additional beds bringing the total to 34 ED beds. Data regarding patient acuity, arrival times, and LOS, were utilized to assist in establishing operating hours for each of the zones. The 6 bed green zone would open for 12 hours beginning at 11:00 a.m.; the 8 bed yellow zone would be operational from 9:00 a.m. to 2:00 a.m.; and the 20 bed red zone would be operational 24 hours a day.

**Staffing the Zones**

With the addition of patient treatment rooms, staffing needed to be addressed. The ED was staffed with RNs, EDTs, and health unit coordinators (HUC), all working 12-hour shifts. Staff schedules were based on patient arrival times resulting in staggered shift times throughout the day to support the core day and night shift staff. An increase in 4.2 FTEs was approved for additional RNs to accommodate the increase in total patient rooms. This increase in RN FTEs brought the total to 15 nurses at peak operating times, with a core of 8 nurses during lower census hours. Restructuring the EDTs schedules and a reduction of 2.1 FTEs due to unfilled positions resulted in a core of 2 day and night shift EDTs with 4 additional EDTs staggered throughout the day. The HUC schedule remained unchanged with one HUC working on day shift and one HUC on night shift.

Providers in the ED consisted of NPs and PAs in Fast Track and physicians in the main ED. Patients were seen in order of acuity in the main ED in conjunction with patient wait times as indicated on an electronic tracking board. This method was not ideal as it led to inconsistencies in the order patients were seen, often resulted in an imbalance in the number of patients each physician had, and resulted in physicians having patients scattered in all areas of the main unit.
With the division of the unit into zones, provider assignments, similar to that of nurses and EDTs, were discussed with many positive aspects. Assignments would decrease the chance of patients not being seen in a timely manner, ensure a more balanced number of patients for each provider, and allow for a more team approach to patient care.

The green and yellow zone would not require room assignments since they were staffed with only one provider on at any given time. The red zone, however, with twenty beds and two physicians on at a time would require room assignments. With a nurse’s station in the front and the back of the red zone, the unit was simply divided in half to allow for a physician in each area. The front 10 rooms would remain the red zone and the back 10 rooms would become the blue zone with both zones being held to the same 185 minute LOS criteria.

**Changing the Culture**

After establishing the new zones, changing the way how patients were historically processed through the ED was addressed. This would involve not only physical changes in processes, but more importantly a culture change for staff.

**Triage**

The first point of contact for patients entering into the ED was an RN. Unless the patient presented with an emergent condition, the patient would be directed to one of the two triage booths where a nurse would obtain a full triage assessment including vital signs, chief complaint, medical and surgical history, medications, allergies, immunization status and social history. This process could take anywhere from 10 to 20 minutes per patient depending upon the time of day and the number of triage nurses present. After
completion of the triage process, the patient was either directed to the waiting room or placed in an available room as directed by the charge nurse.

Triage inefficiencies were easily recognized. All ED patients, except those who arrived via EMS, were instantly entered into a queue. Triage had become a place rather than a process and all patients were set up for a wait the moment they entered into the ED. This was frustrating for not only the patients, but for the providers who had available treatment rooms in their zones. With the new LOS criteria for the zones, having a patient wait to be triaged only added time to the patient’s overall LOS.

A streamlined triage process was adopted with capture of information needed to accurately establish an ESI acuity level and place the patient in the correct zone. Documentation included: triage time, acuity level, chief complaint, vital signs including pain scale and an actual weight. With this information documented, accurate placement to a treatment zone could be made.

The practice of placing patients in the waiting room until a room was assigned by the charge nurse was also revised. Because the charge nurse was not always readily available to make a bed assignment, patients were faced with another unnecessary wait. The role of assigning patients to beds became a function of the primary triage nurse which decreased the amount of time patients waited to be placed in a treatment room.

Registration

Bedside registration was already established in the ED to collect registration and insurance information from patients once they were placed in a treatment room. Orders placed through the computerized order entry system could not be facilitated until the registration process was completed. This process would often delay laboratory and
diagnostic studies and delay medication administration. During higher volume times, this was especially frustrating to all staff as the registrars found it difficult to discuss registration and insurance information along with the required Medicare/Medicaid questions required with every new patient in the department in a timely manner.

A quick registration process was implemented which was EMTALA compliant, and only required obtaining the patient’s name and date of birth. Additional registrars were allotted for this process and placed in triage with the nurses. Information would be obtained when the patient initially checked into the ED which allowed for the bedside registrar to return to the patient’s bedside later in the visit to attain all remaining information after examination and initial treatment were started.

**Hardwiring the Process**

Understanding the importance of a standard work flow in order to create an efficient patient flow system, the PI team focused on educating the staff to the new culture and standardizing the processes. Education began with the charge nurse group as their understanding, support and their ability to manage patient flow was crucial to the success of the process. Mandatory meetings followed for all remaining staff members including all providers. The hardwired process was written in a manual for reference and laminated pocket cards with key points were provided for all staff.

**Measuring Success**

Patient satisfaction scores were obtained by Professional Research Consultants and showed improvement after the initiation of the new process. By the end of 2010, the perceived quality of nursing care increased from 56% to 96%; quality of provider care
increased from 71% to 93%; overall teamwork between providers, nurses and staff rose from 65% to 90%; and overall quality of care increased from 77% to 95%.

Department metrics also revealed successes with the implementation of the new process. The average time for patients to be seen by a provider in 2010 decreased 61% when compared to the average of the previous five years; the percentage of the patients who left prior to treatment decreased from 1.10% in 2009 to 0.66% in 2010; and the overall LOS decreased by 20 minutes from 2009 to 2010. Table 1 lists the metrics from 2003 through the implementation of the new patient flow process in 2010.

Table 1

<table>
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<tr>
<th>Kadlec Regional Medical Center Emergency Department Metrics</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
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<tbody>
<tr>
<td>Total Volume</td>
<td>32,633</td>
<td>34,729</td>
<td>39,781</td>
<td>43,032</td>
<td>46,965</td>
<td>50,723</td>
<td>58,367</td>
<td>60,264</td>
</tr>
<tr>
<td>Door to Provider Time in Minutes</td>
<td>*</td>
<td>*</td>
<td>36</td>
<td>30</td>
<td>43</td>
<td>32</td>
<td>34</td>
<td>14</td>
</tr>
<tr>
<td>Left Without Being Seen Percentage</td>
<td>0.25%</td>
<td>0.27%</td>
<td>0.32%</td>
<td>0.24%</td>
<td>0.47%</td>
<td>0.74%</td>
<td>1.10%</td>
<td>0.66%</td>
</tr>
<tr>
<td>Overall LOS in Minutes</td>
<td>252</td>
<td>196</td>
<td>177</td>
<td>177</td>
<td>187</td>
<td>197</td>
<td>195</td>
<td>175</td>
</tr>
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*Data not collected in these years
The final positive outcome measurement was staff satisfaction. While a quantitative measurement of staff satisfaction does not exist, a qualitative measure as evidenced by low turnover, compliance to the process, and verbal expression by staff indicated an improvement in satisfaction. Staff became engaged in the process and continually offered feedback for improvement, additional changes to benefit efficiency, and increased involvement in the PI team.

**Subsequent Changes**

Since the initial implementation of the new process, two substantial changes have taken place to further benefit patient flow. First, five additional CDU beds were given to the ED to accommodate the growing volumes. These additional beds were located adjacent to the eight yellow zone beds, bringing the total number of ED beds to 39. To address output issues in the ED, the white zone was created as an area to hold admitted patients waiting for inpatient admission. Admitting providers could evaluate their patients in the white zone which was open for 12 hours during peak times beginning at 1:00 p.m. Stable patients who were being admitted would be moved to the white zone allowing additional treatment beds in the red and blue zone to be utilized for new patients.

The second change impacted the green zone where patients with the lowest acuity often spent time waiting for diagnostic imaging or results of tests to be completed. Patients with low acuities could easily be evaluated in a private room and then sent to wait in a designated area until diagnostics and/or laboratory studies were completed. The patient could then be brought back into a treatment room for any additional treatment and disposition.
The PI team followed this model and reconfigured the waiting room to offer two separate areas. One section would be for incoming patients and a separate area would be occupied by patients who had already been evaluated. Patients were directed to the designated area where they could wait for diagnostic imaging or test results allowing treatment rooms to be available to see additional patients.

In addition, when volumes increased and zones were at capacity, higher acuity patients could also have an initial evaluation in the green zone. Stable patients were evaluated, had tests ordered and initiated, and directed to the designated waiting area until a treatment room was opened in the appropriate zone. Higher acuity patients evaluated in the green zone who were not appropriate to return to the waiting area were first in the queue to be placed in the appropriate zone. This process was also hardwired with specific patient criteria and education provided to all staff members to ensure a standard work flow.

**Lessons Learned**

The PI team was able to achieve a more efficient and effective method to move patients through the ED. Patient and staff satisfaction improved and more importantly a culture of change was established. The planning, development, implementation and evaluation of this process improvement initiative required not only the commitment of the leadership and PI team, but also the buy-in of the entire ED staff.

Two key elements are necessary for success. Administrative support is essential in order to have the autonomy to initiate changes and secondly, involvement of all levels of staff is needed. Staff who work on the unit must be involved in the decision making process. Individuals who are positive and promote change are vital to include on the
team, however it is important to include members who are negative as they will provide the team with differing points of view. This diversity of members promotes camaraderie among the group which is necessary when initiating a new process.

Observations and trials are an important part of developing a new process. It is beneficial to have all team members conduct observations of all aspects of the current process. For the physician who observed the triage process, it was an eye-opening experience as most providers were completely unaware of what took place or why, prior to a patient being placed in a room. Conducting trials of the planned process at different times of the day is also essential. While the process may seem to work on paper, it may not work when actual patients are involved.

All progress was reported to the entire staff via email, weekly updates posted in the staff lounge and in monthly staff meetings. Forms were kept at all nurse’s stations to collect feedback, questions and comments. This was compiled and organized by topic and addressed at each PI meeting and the results reported to staff for review.

Conclusion

The series of changes discussed took place over a 17-month time period. This patient flow improvement process was the result of hard work and dedication of not only the leadership and the PI teams, but of the entire ED staff and the ancillary departments that were affected by the changes. Communication and education were vital for the changes to take place, but more importantly to have continued success. The multidisciplinary PI team has become a vital element of the department and continues to meet regularly. The team focuses on issues dealing with patient flow and strongly encourages involvement of staff and empowers them to be champions of change.
Appendix

Emergency Severity Index Algorithm

requires Immediate life-saving intervention?

no

high risk situation?
or confused/lethargic/disoriented?or severe pain/distress?

yes

how many different resources are needed?

none one many

Resources

- Labs (blood, urine).
- ECG, X-rays.
- CT-MRI-ultrasound-angiography.
- IV fluids (hydration).
- IV or IM or nebulized medications.
- Specialty consultation.
- IV or IM or nebulized medications.

Not Resources

- History & physical (including pelvic).
- Point-of-care testing.
- Saline or heplock.
- PO medications.
- Tetanus immunization.
- Prescription refills.
- Phone call to PCP.
- Simple wound care (dressings, recheck).
- Crutches, splints, slings.

(resources are from US Department of Health & Human Services, 2005)
References


