University of Michigan Health System

Program and Operations Analysis

Improving Patient Throughput in the Emergency Department

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Executive Summary

Introduction

The efficiency of patient throughput in the Emergency Department (ED) of U-M Hospital is dependent on physician productivity and capacity limitations. The primary goal of this project was to find potential areas of improvement for patient throughput in the ED, specifically involving Attending Physician, Resident Physician, and Physician Assistant (PA) efficiency. Our project team studied and observed the bottlenecks, which caused a backlog of patients waiting for service in the Main Department of the ED. Our principal focus was on how the efforts of the Physicians could be enhanced to decrease the amount of time a patient spends in the ED. Physician productivity notably depended on available rooms in the ED. For more specific results, beeper and patient flow studies were carried out in neighboring departments of the Main ED. Through data collection and analysis, the team produced statistics describing the tasks performed by Attendings, Residents, and PAs. We evaluated the distribution of workload within the ED amongst Physicians to determine potential causes for bottlenecks. We also performed benchmarking to gather suggestions from other Medical Centers on improving patient throughput in the ED.

Expected Impact

In conducting this study, we hoped to identify bottlenecks in the ED that slow the system down and develop suggestions to reduce these constraints. We intended on gaining a better understanding of the necessary physician workload and what options exist for increasing room availability. From our recommendations, we aimed to find potential ways to increase patient throughput and Physician efficiency in treating patients, with possibly the delegation of Physician activities which would aid in throughput.

Background

The University of Michigan Emergency Department is a Level 1 trauma center that sees approximately 70,000 patients per year. The ED consists of four treatment areas: the Main ED, where the majority of patients are seen; Children’s Emergency Services (CES), for pediatric patients; Minor Emergency Care Area, for minor conditions; and Michigan Emergency Department Patient Assessment and Treatment Hub, for extended observation. This project focused on the Main ED. It has been reported that currently a typical Physician sees between 1.3 and 1.5 patients per hour. This number is currently not high enough for all working physicians to collectively accommodate all patients in need of care during peak operating hours.

Methodology

We performed this project in three phases: observation and shadowing, data collection, and data analysis. The following is a summary of the methodologies in each category used throughout the project:
Shadowing and Interviewing
- *Directly observed Physicians*. Five shadowing sessions of individual Physicians were performed, each lasting at least two hours. We also interviewed Physicians about their daily tasks and possible improvements on the system.

Data Collection
- *Administered a beeper study on Physicians*. Attending Physicians, Resident Physicians, and Physician Assistants in the Main ED, MEDPATH, CES, and MECA tracked their daily tasks at random time intervals. Both studies were conducted for 9 days each.
- *Conducted a patient flow log sheet study*. A single log sheet accompanied the patient from triage until discharge, and each activity involving the patient and an ED faculty member was documented.
- *Performed a benchmarking on hospitals across the country*. We interviewed other medical centers to look at Physician workloads and how Residents were assigned patients.

Data Analysis
- *Input beeper study and patient flow log sheet data into Access Database*. We produced statistics and corresponding graphs analyzing the tasks performed (at specific times of day) by the Attendings, Residents, and PAs. We also analyzed the number of patients assigned to the Physicians when performing such tasks.

Findings

Overall, Physicians spend the majority of their time doing activities categorized under patient care reviewing patient records. Attendings spent 32% of their time performing patient care, with Residents and PAs performing patient care 38% and 36% of the time, respectively. In addition Physicians were also asked to record how many patients they were currently carrying and whether or not they could handle another patient. PAs reported that they could handle another patient at least 80% of the time. Residents felt they could handle another patient at least 50% of the time, except for early morning hours. Finally, Attendings follow a similar trend to that of Residents. It was also found that as the number of patients carried by a Physician increased, the Physician's perceived ability to handle an additional patient decreased.

From our *benchmarking efforts*, we able to correspond with the following Medical Centers:
- Oregon Health and Science University
- Brigham and Women's Hospital
- Medical College of Wisconsin
- Massachusetts General Hospital
- University of Illinois at Chicago
- University of New Mexico
- Medical College of Georgia
- UCLA Medical Center
- University of Nebraska Medical Center
- Yale-New Haven Medical Center
- Penn State University
Most of the Emergency Departments we interviewed around the country are similar in their approach of assigning patients to residents. Two medical centers reported that they are currently using an electronic tracking system in place of a white board. Two centers also reported to be using a teams approach in the ED. Like the UMHS, most will admit a better, more accountable approach is needed, yet respondents tend to revert to the “traditional, we’ve always done it this way” approach. Institutions that had implemented electronic tracking systems in place of antiquated white board systems overwhelmingly reported higher satisfaction and the perception of increased efficiency.

**Recommendations**

Our project team recommends looking into decreasing the amount of time Physicians spend working with patient records. We recommend delegating activities from Attendings and Residents to other faculty members, such as PAs, during busiest the times. This is due to the fact that PAs continuously had the highest perceived ability to handle another patient. We also recommend implementing a system that regulates how many patients are assigned to Physicians, and that this number should be 4. In addition, test results returns were thought of by Physicians as an extreme holdup, and they conveyed the importance of increasing test return rates. We advise further investigation into the process of how test results are performed and returned, and how Physicians are notified.
Introduction

The Emergency Department (ED) of U-M Hospital wants to increase patient throughput by identifying and eliminating the bottlenecks that cause patient backups. Patient throughput efficiency in the ED is dependent on their physician productivity and capacity limitations. The primary goal of this project was to find potential areas that could improve patient throughput in the ED by increasing Attending Physician, Resident, and Physician Assistant (PA) efficiency. Our project team studied and observed the bottlenecks that caused a back-up of patients waiting for service in the Main Department of the ED. Our primary focus was on the tasks performed by Physicians and to decrease the amount of time a patient spent in the ED. For explicit results, beeper and patient flow studies were carried out in the Main ED and its neighboring departments to identify the distribution of workload during specified time intervals. Through analysis, the team produced statistics, which are discussed in detail in Findings, for the tasks performed by Attendings, Residents, and PAs. We evaluated the distribution of workload amongst the ED staff to determine potential causes for bottlenecks and if specific duties could be delegated to alternative staff members. To gain the perspective of Physicians, we shadowed them for extended periods of time. We also performed benchmarking to gather suggestions from other Medical Centers on improving patient throughput in the ED.

Project Scope

This project is a detailed account of our analysis of the current Physician workload as it relates to patient throughput in the Emergency Department at the University of Michigan Hospital, our evaluation of alternative methods, and our recommendations for improving patient throughput. Jennifer Holmes, UMH Emergency Department Director of Operations, and Dr. Jeff Desmond, UMH Emergency Department Service Chief of Adult Emergency Medicine, asked us to evaluate patient throughput and provide recommendations.

Project Purpose

The purpose of this project is to conduct a series of studies focusing on physician workflow, patient flow options, and work distribution strategies. Once a patient gets assigned to a room in the ED, too often they spend the majority of their time waiting, as oppose to receiving treatment. This slows down the patient throughput system, leaving the ED frequently in short supply of open rooms for patients. At peak hours, patients spend hours waiting in the ED for lab results, physicians/ED staff members, and available rooms. This is where the primary bottlenecks are initiated. After examining the current situation and other options, we generated figures (using Microsoft Access) for Physicians’ activities and organized observation/shadowing results, from which we generated recommendations for improving patient throughput.
Background

The University of Michigan Emergency Department is a Level 1 trauma center that sees approximately 70,000 patients per year. The ED consists of four treatment areas: the Main ED, where the majority of patients are seen; Children’s Emergency Services, for pediatric patients; Minor Emergency Care Area, for minor conditions; and Michigan Emergency Department Patient Assessment and Treatment Hub, for extended observation. This project focused on the Main ED. In the Main ED, Attending Physicians, Resident Physicians, and Physician Assistants treat patients. Two Attending physicians are on duty 8 hours per day, each leading a team of resident physicians. Core resident staffing consists of one senior Emergency Medicine Resident 24/7, and one senior Internal Medicine Resident 24/7. In addition 2nd year residents are available 8 hours a day, and a pediatric resident is working in the Main ED when CES is not open (01:00-11:00). There are also a variable number of interns working each day and a 4th year Emergency Medicine Resident is present during the day, practicing in a junior supervisory role. It has been reported that currently a typical Physician sees between 1.3 and 1.5 patients per hour. This number is currently not high enough for all working physicians to collectively accommodate all patients in need of care during peak operating hours.

Methodology

We performed this project in three phases: observation and shadowing, data collection, and data analysis. The following is a summary of the methodologies used throughout the project:

Observation and Shadowing

- Observed rooms in ED.
- Shadowed individual Physicians in ED, each session lasting at least two hours.
- Interviewed staff members in ED about their daily tasks and possible improvements for current patient flow system.

Data Collection – Beeper Study

- Conducted beeper study; where Attendings, Residents, and PAs wore pagers and marked their activity on a log sheet when beeper activated (average 4 times/hr).
- To ensure data accuracy, we first surveyed Physicians to determine which tasks generally make up the majority of their day. We then ran a preliminary round of data collection to gain further input into the makeup of the beeper study sheet itself, and to work out any kinks that may occur. To officially kick off the study, we had someone in the ED at the beginning of each shift to distribute beepers and give instructions to all of the Physicians. This process continued for the first two days. We then checked in daily to monitor that the forms were being filled out correctly and that everyone was participating. Poor or extremely extreme data sheets were discarded. The study lasted for nine days in October of 2004.
Data Collection – Patient Flow Study

- Conducted patient flow log sheet study; log sheet was attached to patient’s file and every staff member that saw that patient recorded their activity, (from patient entering ED to their discharge/admission to the hospital).
- The study was monitored in a similar manner as that of the beeper study. A log sheet was attached to the golden rod of every patient at triage. The sheet accompanied that patient until discharge. Instructions were given to the staff at the beginning of the study, and a group member checked daily to see that the sheets were being completed correctly and by all ED staff. Poor and incorrectly completed log sheets were discarded. The study lasted for 9 days in November of 2004.

Data Analysis

- Inputted beeper study data into Access database for analysis using query statements (using Microsoft Access).
- Inputted and analyzed patient flow data in Access database.
- Developed recommendations to increase patient throughput in ED.

Findings

Beeper Study

Figures 1, 2 and 3 display the daily task breakdown for Attendings, Residents, and PAs. The sample sizes are 880, 841, and 611, respectively.

Attending Activity Breakdown

Figure 1: Attending Activity Breakdown
Figure 2: Resident Activity Breakdown

Figure 3: PA Activity Breakdown
In addition to marking the tasks that they completed, Physicians were also asked to note the number of patients they were carrying and whether or not they believed they could handle an additional patient at the time that the beeper went off. Figure 4 shows the breakdown of the Physicians' ability, in their own opinion, to take on one additional patient throughout the day.

Figure 4: Perceived Ability to Handle More Patients
Figures 5, 6 and 7 show Physicians' perceived ability to handle one more patient versus the number of patients they were carrying at the time, over all times of the day.

**ATTENDING: # Current Pts When Could/Could Not Handle Another Pt**

![Graph showing the number of patients carried by attendings vs. ability to take on another patient, categorized by time of the day.]

Figure 5: # of Patients Carried by Attendings vs. Ability to Take on Another Patient
RESIDENT: # Current Pts When Could/Could Not Handle Another Pt

Figure 6: # of Patients Carried by Residents vs. Ability to Take on Another Patient

PA: # Current Pts When Could/Could Not Handle Another Pt

Figure 7: # of Patients Carried by PAs vs. Ability to Take on Another Patient
Patient Flow Study

Figure 8 shows the amount of time it takes a Physician to initially see a patient from the time the Physician was assigned to that patient.

Figure 8: Duration of time between first Physician assignment to patient and patient's first Physician visit

Our team has collected enough data to generate results using query statements in Access, however the turn out was not as we had anticipated. Our sample size consists of 105 beeper study sheets and 226 patient flow sheets. We had intended to receive at least 200 usable beeper study sheets and over 1000 usable patient flow sheets.
Shadowing and Interviewing

Observations

- Attending not working faculty shift spends at least 50% of their time teaching.
- Two separate bed locations are tremendous causes for poor rates of patient throughput.
- Bed Availability is key cause of backup; moving patients upstairs and freeing up beds in ED (rooms with monitoring equipment are in high demand in ED).
- Test results often take over two hours. This was a major holdup to efficient work patterns, according to several Physicians.
- Physicians have to continually check on status of lab results.
- It is the opinion of some Physicians that they spend excessive and unnecessary amounts of time doing patient education; explaining things to patients that could be easily explained by other faculty members.
- Patients often come to ED for a second opinion.

Benchmarking

Respondents included:

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<th>Oregon Health and Science University</th>
<th>Penn State University</th>
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<td>Brigham and Women's Hospital</td>
<td>Medical College of Georgia</td>
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<td>Medical College of Wisconsin</td>
<td>UCLA Medical Center</td>
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<tr>
<td>Massachusetts General Hospital</td>
<td>University of Nebraska Medical Center</td>
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<tr>
<td>University of Illinois at Chicago</td>
<td>Yale-New Haven Medical Center</td>
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<td>University of New Mexico</td>
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E-mail was sent to persons on the University Health System Consortium’s Emergency Department Contact List in order to determine how other institutions assign patients to their residents. Eleven institutions responded.

Most of the responding Emergency Departments around the country are similar in their approach of assigning patients to residents. Like the University, most will admit a better, more accountable approach is needed, yet respondents tend to revert to the “traditional, we’ve always done it this way” approach. In order to increase efficiency in this process, catalysts must be in the form of innovative “out of the box” ideas.

Two responding institutions have implemented electronic tracking systems in place of antiquated white board systems and have reported higher satisfaction and the perception of increased efficiency.
<table>
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<tr>
<th>Institution</th>
<th>Current Process</th>
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<tr>
<td>Oregon Health and Science University</td>
<td>Residents sign up for available patients on an electronic tracking system. It is up to the senior resident and faculty member to ensure residents are doing their share of cases and patient throughput is maintained.</td>
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<tr>
<td>Medical College of Wisconsin</td>
<td>Department is divided into two patient care teams. One team consists of a faculty member, EM3, intern and medical student. A faculty member, EM2 and EM1 comprises the second team. Patients are alternatively assigned to each team. Hence, each team gets every other patient. One of the teams is assigned trauma room coverage.</td>
</tr>
<tr>
<td>Brigham and Women's Hospital/Massachusetts General Hospitals</td>
<td>Patients are brought into a specific side of the ED based on their severity index triage score (acute vs. urgent care). The patient then appears on an electronic patient tracker system and the next available physician signs up. One to two residents work on each side at any given time.</td>
</tr>
<tr>
<td>Penn State University</td>
<td>Residents self-assign as well. Tight geographic limits and a teams approach has been debated but requires a more accurate triage function which is an institutional barrier.</td>
</tr>
<tr>
<td>Medical College of Georgia</td>
<td>Residents are not assigned to geographical areas. Department is divided into a critical and an acute side. Residents may see patients on either side simultaneously.</td>
</tr>
<tr>
<td>Olive View-UCLA Medical Center</td>
<td>Residents self-assign for patients primarily based on seriousness of complaint and secondarily on order of presentation. Residents are not assigned by area.</td>
</tr>
<tr>
<td>University of Nebraska Medical Center</td>
<td>Residents self-regulate their workload by picking up the next chart in the chart rack.</td>
</tr>
<tr>
<td>University of New Mexico</td>
<td>Do no: have an organized way of picking up patients by the residents. Residents self-regulate their workload while faculty members are held responsible for their efficiency. They are presently working on developing a more accountable system.</td>
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<tr>
<td>University of Illinois at Chicago</td>
<td>Has implemented a one-team approach. The entire ED is fair game to the entire team. Two faculty members and one to two senior residents plus or minus an off service resident or intern cover the entire ED.</td>
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Recommendations

Physicians spend a large amount of time performing patient histories and paperwork, anywhere from 15 to 29% of their time. Many of these activities are repeated by Residents and Attendings, such as H & P's. While the group is not qualified to recommend a change of practice, we do recommend looking into the possible reduction or delegation of these activities to other staff members.

According to Figure 4, PAs were the most able to handle an additional patient at any given time. This can be thought of as them having the most time on their hands, compared to Attendings and Residents. Therefore, we recommend looking into delegating some tasks from Attendings and Residents to PAs.

We also recommend implementing a system that assigns a consistent number of patients to a Physician at one time. According to Figures 5, 6, and 7, there appears to be a point where Physicians stopped responding ‘yes’ to the question, ‘Could you handle another patient?’ and started responding ‘no.’ While it is not very definitive, that point looks to be 4. Therefore, while we recognize that it would be difficult to implement and constantly monitor, we recommend that each Physician aim for carrying 4 patients at all times.

In addition, we recommend further investigating the reasons that test result rates are as low as they are. On average, Physicians spend 7% of their time obtaining and reviewing test results. This is a significant activity that is done frequently, so the fraction of time spent waiting for test results will be multiplied and the improvement in Physician efficiency should be noticeable.

Additional recommendations from ED faculty
- Update patient mark-up system.
- Schedule more overlapping shifts between residents to allow for flux to increase patient pick up rate.
- Schedule more nurses on night shift.
- Schedule at least one more resident on night shift.
- More efficient communication needed to alert of open rooms.
- Briarwood facility should permit walk-ins.