Emergency Department – Medical Admission Faculty Handoff Study and Recommendations

Final Report

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# TABLE OF CONTENTS

Executive Summary

1.0 Introduction 1

2.0 Background 1

2.1 Key Issues 3

2.2 Goals and Objectives 3

2.3 Project Scope 3

2.3.1 ED Perspective 3

2.3.2 General Medicine Service Perspective 4

3.0 Methods 4

3.1 Data Collection 4

3.1.1 ED Process - Data Collection 5

3.1.2 General Medicine Process – Data Collection 5

3.2 Data Analysis 6

3.2.1 Observation Data Analysis 6

3.2.2 Centricity Data Analysis 6

3.2.3 Survey Data Analysis 6

4.0 Findings and Conclusions 6

4.1 Emergency Department Perspective 7

4.1.1 Observation Data Findings: Causes of Process Delays 7

4.1.2 Centricity Data Findings 10

4.1.3 Survey Findings 11

4.2 General Medicine Perspective 13

4.2.1 Observation Findings 13
4.2.2 Surveys

4.3 The Admission and Bed Coordinator Center

5.0 Recommendations

6.0 Expected Impact

7.0 Open Action Items

Appendix

A. Data Collection Form

B. ED Provider Survey Questions

C. General Medicine Provider Survey Questions

D. Admission and Bed Coordinator Questions

E. Stratification of Centricity Data
LIST OF FIGURES AND TABLES

Table 1: Summary of Data Collection Methods

Figure 1: Process Map of the patient handoff process with and without the STAR Consult

Figure 2.1: Process Map for the Current Handoff Procedure

Figure 2.2: Process Map of the patient handoff process with and without the STAR Consult

Figure 4.1: Current State Value Stream Map (Observation data, n = 30)

Figure 4.2: Observed Process Times (ED Observation data, n = 30)

Figure 4.3: Status page to service contact (ED Observation data, n = 27)

Figure 4.4: Service contact to initial service response (ED Observation data, n = 28)

Figure 4.5: Bucketing of Common Delays in the ED (ED Observation, n = 27)

Figure 4.6: Percent breakdown of # of Call back Cycles in a Handoff (ED Observation, n = 30)

Figure 4.7: Average process time by # of Call back Cycles in a Handoff (ED Observation, n = 30)

Figure 4.8: Average Process Time by inpatient Medicine Service (Centricity, 1/1/2011 – 11/30/2011, n = 8023)

Figure 4.9: Box plot of Total Process Time by Experience Level of ED Provider (Centricity data, 1/1/2011 – 11/30/2011, n = 8023)

Figure 4.10: ED Provider Ranking of Priorities (Survey, n = 62)

Figure 4.11: ED Provider Confidences in Inpatient vs. Observation Status Determination (Survey, n = 62)

Figure 4.12: ED Provider Confidences in Inpatient Medicine Service Determination (Survey, n = 62)

Figure 4.13: ED provider Role in the ED (Survey, n = 62)

Figure 4.14: Process Time from Gen. Med. Perspective (Observation, n = 28)

Figure 4.15: Gen. Med. Observations from the ED Perspective (Observation, n = 12)

Figure 4.16: General Medicine Patient Information Free Responses (Observation, n = 48)

Figure 5.1: Comparison of Current process to Predicted Process (Observation, n = 30)
EXECUTIVE SUMMARY

The Emergency Department (ED) at the University of Michigan Hospital observed delays in the patient handoff process between the Emergency Department (ED) and inpatient Medicine Services. The patient handoff process occurs when an ED provider decides a patient must stay at the hospital for further care and should be admitted as “inpatient” status to a Medicine Service or as “observation” status to the Adult Medicine Observation Unit (AMOU). To reduce the process time of this handoff the Medical Admissions Stream Team (MAST) completed a study in early 2011. As a result of their study, the MAST team made one major change to the process by removing a step in which each ED provider consulted with the STAR (a General Medicine Resident rotating through the ED) before deciding the admission path of each patient. After implementing this change, however, the total process time was not reduced. Thus, this project was initiated to analyze and evaluate the “new” current state of the process. Specifically, the ED and inpatient Medicine Service providers asked the IOE 481 project team to lead a study to determine the effect of removing the STAR consultation step as well as new barriers leading to delays in the process. Based on the analysis performed, the team assessed the current process, identified the root causes of delays, and provided actionable recommendations to improve the handoff process.

Background

The total process lead-time for the original process was estimated to be 80.0 minutes from a sample size of 12 patient observations. Removing the STAR consultation was expected to decrease the process lead-time to 41.6 minutes, calculated using a sample size of 10 patient observations. Thus the following key issues drove this project:

- Patients in the ED are experiencing excessive wait times when being handed off to inpatient Medicine Service providers
- ED providers are experiencing long wait times for responses from inpatient Medicine Service teams

Figure 1: Process Map of the patient handoff process with and without the STAR Consult

Methods

The team completed this project in three primary phases, data collection, data analysis, and recommendations. Data was collected from two perspectives, ED and General Medicine, using three sources: observations, Centricity, and surveys. The details of this data collection can be seen in Table 1. Observations consisted of identifying the actions the Medical Providers performed between each of the events while times studies were completed to record the times each of these events occurred. Using electronically recorded data in Centricity, the team was able to validate and verify the observation samples by checking each of the process times against the electronic time stamp, and was able to complete stratifications that required larger sample sizes such as day of week, and time of day. The ED provider survey was created to collect information on common delays, critique current system, and
confidence in status and service selection. The General Medicine survey was created to collect information on what is generally researched for each patient as well as suggestions to improve the process and the Admissions and Bed Coordination Center (ABCC) survey was created to collect information on common delays from the ABCC perspective.

### Table 1: Summary of Data Collection Methods

<table>
<thead>
<tr>
<th>Data Collection Period:</th>
<th>ED Perspective</th>
<th>General Medicine</th>
<th>ABCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 – 7:00 PM M-F</td>
<td>Observations</td>
<td>Surveys</td>
<td>Observations</td>
</tr>
<tr>
<td>Jan - Nov 2011</td>
<td>30</td>
<td>62</td>
<td>28</td>
</tr>
<tr>
<td>Nov. 23 - 30, 2011</td>
<td>8023</td>
<td></td>
<td>48</td>
</tr>
<tr>
<td>1:00 – 7:00 PM M-F</td>
<td>20</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

**Data Stratified by:**
- Sub-process steps
- Common delays
- # call back cycles
- Day of week
- Time of day
- Level of experience provider
- Inpatient Medicine Service
- Priority of ED Provider's responsibilities
- Confidence in Patient status and Medicine Service determination
- Process Time from ED Perspective
- Gen. Med. provider suggestions
- Common Delays

**ED Perspective Findings**

After analyzing this data the team found the total average handoff process time from the sample of 30 observations was 100 minutes. Of the 100 minutes, only 8.5 minutes involve actual processing time, while the other 91.5 minutes were comprised of wait time. The three longest average wait times were identified to be:

1. Bed Slip to Med Status Page = 22 minutes
2. Arrival of Med Status Page to contacting inpatient Medicine Service = 30 minutes
3. Service Contact to Medicine Service Response (Phone Conversation) = 39 minutes

The average total process time was validated with the data from Centricity (average total time = 97.5 minutes) and was therefore found to be a statistically significant and accurate representation of the process.

**Delay from Status page to service contact**

Examining this delay revealed the primary reason for delay was ED providers attending to and visiting other patients when the status page arrives. If the ED providers receive the status determination immediately after submitting the bed slip or when they are not caring for another patient they are able to page the inpatient service right away or within 0 to 10 minutes; however, if they started to visit another patient or have become occupied with another responsibility it often takes over 50 minutes before they have time to send the status page.
Delay from Service Contact to Service Response:
The second sub-process of service contact to initial service response was also stratified. Of the 30 samples 43% had a wait time greater than 30 minutes, with 2 samples having a wait time of over 60 minutes.
The root causes observed for these wait times consisted of three primary situations:
   1. The inpatient Medicine Service providers received the page while occupied by other responsibilities
   2. General Medicine Pager being handed off between attending and resident teams
   3. Inpatient Medicine Services researching the patient before calling the ED provider

Most Common ED perspective Delays:
In addition to examining the delays caused within the various sub-processes the team also completed a root cause analysis of the types of delays of the 30 samples. The 2 most common delays found were a discrepancy of admitting service (30%) and caring for multiple patients (23%). Additionally the team found that when a service is not determined correctly on the first admission attempt there are typically several call cycles. Having multiple call cycles results in a 15 minute increase in total process time.
   - 1 Call Cycle (n = 22) Total average process time = 92 minutes
   - 2 or more Call Cycles (n = 8) Total average process time = 107 minutes

General Medicine Perspective Findings
For the General Medicine Perspective the process time is defined as the number of minutes between the time the service contact page is received from the ED provider and the time that the patient is accepted by the General Medicine provider. The majority of the process times were less than 15 minutes. These process times opposite of what was shown from the ED observations, where the majority of the process times were 36 minutes or greater. This difference in process times may be a result of the General Medicine provider feeling the urgency to process the service contact page because they were being observed (the Hawthorn Affect). The most common causes of delays found were researching a patient from a previous page when another page was received (n = 4) and being on the phone for something that was not related to the admit process or for a previous page for another patient (n= 7).

Recommendations:
Based on the above findings the team developed four primary recommendations to improve the ED to Inpatient Medicine handoff process.
   1. Allow the ED provider to set the status of the patient to observation or inpatient.
   2. Develop an algorithm or strict criteria for determining which inpatient Medicine Service to admit inpatient status patients.
   3. Create an electronically generated patient medical information summary through the new capabilities of the Epic software implementation.
   4. Implement a standard call back time for inpatient Medicine Services to respond to ED providers that will be included and taught within the resident’s orientation training.
In conclusion with each of the 4 above recommendations the team believes the total process time can be reduced by 57 minutes; going from a previous total process time of 100 minutes to a new total process time of 40 minutes. Note that 16% of the observations were less than 40 minutes with the current process, however, due to the lack of a standard process and specified time frames many extreme outliers affected the average total process time.
1.0 INTRODUCTION

According to a report by the Medicine Admission Stream Team (MAST) in July of 2011 “greater than 55% of Medicine patients spend a minimum of 6 hours in the Emergency Department, with 20% or more experiencing wait times exceeding 10 hours… and 30% experience Service Changes within the first 2 hours of arrival.” Due to these long wait times, the MAST team has attempted to streamline the ED admissions process and therefore decrease the time patients spend waiting for care.

The data collected in the study mentioned above exposed delays in the admissions process and specifically, in the patient handoff process between the ED and inpatient Medicine Service providers. The lead-time for this handoff was determined to be greater than 80 minutes. The patient handoff process occurs when an ED provider determines a patient must remain at the hospital for additional care and therefore must be admitted to either an inpatient Medicine Service or to the Adult Medicine Observation Unit (AMOU). During the study in July of 2011, the MAST made one change to the process by removing a step. Previously, each ED provider consulted with the STAR (a General Medicine Resident placed in the ED) before deciding the admission path of the patient. The MAST study resulted in the removal of this step. After implementing this change, however, the total process time was not reduced.

Providers in both the ED and inpatient Medicine Services wanted to know the root causes behind these long wait times and therefore asked the IOE 481 project team to lead a study from both perspectives (ED and inpatient Medicine Services) of the patient handoff process. The project team was asked to determine the effect of removing the STAR consult as well as barriers leading to delays in the process. Based on the analysis performed, the team provided an assessment of the previous changes, identified the root causes of delays, and provided actionable recommendations to improve the handoff process. This report presents the methods, analysis, data, findings, conclusions and recommendations completed by the IOE 481 project team.

2.0 BACKGROUND

The patient handoff process begins when an ED provider decides a patient in the Emergency Department needs to stay in the hospital for further care. The Admissions and Bed Coordination Center (ABCC) determines whether a patient meets inpatient criteria. Once this decision is made the ED provider contacts the appropriate inpatient Medicine Service provider to admit the patient for care. This patient handoff process, as described by the ED and inpatient Medicine Service providers, is listed below and illustrated in the process map in Figure 1. Note: several steps in the process map have multiple iterations.

1. After the ED provider has decided a patient is to stay at the hospital, they send a bed slip request to the Admissions and Bed Coordination Center (ABCC).
2. The Admissions and Bed Coordinator (ABC) evaluates the patient’s conditions by referring to Interqual, a reference guidebook for declaring a patient as an inpatient or observation patient.
3. When the patient meets the inpatient criteria to be admitted into the hospital inpatient, the ABC sends a patient status page to the ED provider. No consistent process is followed for the status page; the status page may be sent by pager or by phone.
4. The ED provider receives the status page and determines the appropriate inpatient Medicine Service provider to admit the patient based on the patient’s condition.

5. Once the appropriate inpatient Medicine Service provider has been identified, the ED provider sends an admittance service request page to the respective inpatient Medicine Service provider using the online hospital paging software and waits for a response.

6. The inpatient Medicine Service provider receives and responds to the ED provider.

7. The inpatient Medicine Service provider accepts or declines the patient. A patient can be declined if the inpatient Medicine Service provider does not have space or if the patient does not seem an appropriate fit for the particular inpatient Medicine Services provider. If the patient is declined, the ED provider finds another inpatient Medicine Service and sends another admittance service request page.

8. When the inpatient Medicine Service provider accepts the patient, the EDMP inputs the handoff into another medical web application, called Centricity.

![Figure 2.1: Process Map for the Current Handoff Procedure](image)

The step that MAST removed from the above process (consultation with the STAR resident) occurred between the EDMP’s receipt of the patient status page and the admission request sent to the inpatient Medicine Service provider (steps 4 and 5 above). This consultation step consisted of the EDMP consulting with the STAR resident in order to determine the appropriate inpatient Medicine Service provider for the patient. The total process lead-time for the original process was estimated to be 80.0 minutes from a sample size of 12 patient observations. Removing the STAR consultation was expected to decrease the process lead-time to 41.6 minutes (calculated using a sample size of 10 patient observations). However, there was not a significant change in the actual process lead-time, as reported...
by MAST as well as ED providers. As a result, the purpose of this project is to identify why this change did not decrease the lead-time and to identify areas of potential process improvement.

![Figure 2.2: Process Map of the patient handoff process with and without the STAR Consult](image)

2.1 Key Issues
The following key issues drove this project:
- Patients in the ED are experiencing excessive wait times when being handed off to inpatient Medicine Service providers
- ED providers are experiencing excessive wait times for responses from inpatient Medicine Service teams

2.2 Goals and Objectives
The following goals and objectives were set by the IOE 481 project team at the start of the project:
1. To determine if the removal of the STAR resident consultation as implemented by the MAST team was effective
2. To determine the root causes in the delays of the ED to inpatient Medicine Service provider handoff process
3. To develop recommendations to improve the flow of the patient handoff process and reduce overall handoff process time
4. To standardize the work of ED and Inpatient Medicine Service (General Medicine only) providers

2.3 Project Scope
The process being studied includes two perspectives one from the ED provider and the other form the General Medicine Service provider.

2.3.1 ED Perspective
The project scope for the ED perspective included all steps of the patient handoff process starting when the ED provider submits a bed slip for a patient and ending when the final patient handoff was entered into Centricity. After submitting the bed slip to the ABCC the ED provider receives a page indicating that the patient has been classified as either “meeting inpatient criteria” or as “observation status”. The project scope will only include patients declared as “meeting inpatient criteria” and will not include any of the “observation status” patients. All patients admitted in the Main ED (maize and blue patients) and Med Path are in scope. Patients in MECA are not in scope. In addition, if a patient begins as an observation status patient and is rejected from observation, they will be considered in scope, since they would then be considered a patient “meeting inpatient criteria”. All patients “meeting inpatient criteria” in the Main ED and Med Path regardless of assigned inpatient Medicine Service are in scope.
2.3.2 General Medicine Service Perspective
The project scope for the General Medicine Perspective included only the General Medicine service process. The inpatient Medicine Service process begins when the General Medicine provider receives a page from the ED provider and returns the page with either a phone call or an in-person visit to the ED. The process ends when the General Medicine provider decides to accept/decline the patient and the ED provider enters the final handoff into Centricity. When the team is observing the General Medicine provider, patients that are assigned to any other inpatient Medicine Service other than General Medicine will not be considered in scope.

3.0 METHODS
The team completed this project in three primary phases, data collection, data analysis, and recommendations. Data was collected from three sources: observations, Centricity, and surveys, and from two perspectives the ED and General Medicine.

3.1 Data Collection
The data collection phase was comprised of time studies and observations from both ED and General Medicine perspectives. Data was collected by the entire team with each team member averaging 2 observation periods of 2–4 hours (4–8 hours of observation per team member per week) for 5.5 weeks, from October 14th to November 23rd, allowing the team to gain an in depth understanding of the process. Several observations were completed in parallel with team members observing a single patient from both perspectives of the process. Due to scheduling issues, however, it was not possible to continue data collection in parallel, and a majority of the samples were taken from only one perspective at a time, i.e. observing separate patients from the perspective of the ED provider or General Medicine provider only.

Data from both perspectives was collected during the peak handoff times between 1:00 PM – 7:00 PM. The collection time range was determined to maximize the number of observations the team could record in the available time. Some observations were completed outside of the time range to determine if the handoff frequency affects the overall processing time. The team observed and recorded the time at the start of the following events:

ED Process
- Bed slip requested
- Medical status page arrival
- Admitting service contact
- Admitting service response
- Centricity Handoff entered

General Medicine Process
- Medical status page arrival
- Admitting service contact
- Admitting service response

Observations consisted of identifying and recording the actions and times the Medical Providers performed each of the process steps. The flowchart for the process that the team is observing can again
be seen in Figure 1 above. The observations allowed the team to identify each delay, the reason for the delays, and the root cause of the delays in the handoff process. The times collected and the comments given by the provider about the process were recorded by the team on the data recording form (see Appendix A).

3.1.1 ED Process - Data Collection

The following describes the data collection process of observations and time studies taken from the ED perspective. A time study of both the total process, as well as several sub-process times was used to gauge at what step in the process delays were most frequently occurring. The specific sub processes the team analyzed include:

1. The time from when the ED provider requests a bed slip to the time the ABCC declares the patients status as inpatient or observation.
2. The time from when the ED provider pages the specific inpatient Medicine Service to the time the inpatient Medicine Service provider responds.

The first sub-process time is recorded electronically in Centricity, however the 2nd sub-process is not electronically recorded at all, and therefore required manual observation and data collection by the IOE 481 project team members. While performing these time studies the team also recorded non-quantitative observations allowing them to identify the root causes of the process delays. This again required a team member to be physically present through each of the data sample collections. While observing each team member also informally interviewed each of the ED providers asking a list of questions, see Appendix A, to help highlight and discover the root causes of the delays. The team collected exactly 30 complete and in-scope samples from the ED process, as well as 6 additional process samples that were classified as surgery patients, which follow a different, much more direct handoff process. In addition to the manually collected data the team also analyzed the total process time (lead-time) from all patients admitted through the ED for the months of October and November. Using this electronically recorded data in Centricity the team was also able to validate and verify each of the 30 manually taken samples, checking each of the process times with the electronic time stamps. In addition to the manual data collection by the team and the electronically recorded data in Centricity the team also created and administered a survey to all ED providers. The ED providers survey was created in Qualtrix and included 9 brief questions see Appendix B.

3.1.2 General Medicine Process – Data Collection

For the General Medicine perspective of the process both observations and time-studies were also conducted. A total of 28 samples were collected. The time-study conducted from this perspective was completely dependent on manual recording and observation, as neither the time an ED provider sends the admitting service a page nor the time the admitting service provider responds to the ED provider are electronically recorded. Thus, the data collected from this perspective could not be validated nor verified by Centricity or a like program. As with the ED perspective, a brief survey was also created and distributed to the General Medicine providers. The survey again was created in Qualtrix and can be seen in Appendix C.
3.2 Data Analysis

3.2.1 Observation Data Analysis

The data collected by the team was compiled into a database organized by the unique patient identifier number (CPI). During observations the team recorded the information on the collection form, which can be seen in Appendix A and the entries were later added to the database. After all data was collected the team performed a statistical analysis of the processing times for the total process and each sub-process. A second database sheet was used to organize the comments and root causes for the delays for each CPI. The team grouped similar root causes and tallied the number of times each root cause occurred and noted where the root cause occurred in the process.

3.2.2 Centricity Data Analysis

The data extracted from Centricity was used to analyze the process lead-times when stratified by day of week, time of day, level of experience of ED provider, and by inpatient Medicine Service. This allowed the team to determine if one attribute had a statistically significant higher process time than another. The team was able to stratify the Centricity data in this way because of a much larger sample size of 8023 samples recorded over the months of October and November of 2011, versus only the 30 samples taken over 5.5 weeks.

3.2.3 Survey Data Analysis

The data collected from the survey responses for all three surveys were used to have a better understanding of the perspectives of the ED providers, General Medicine providers and the Admission and Bed Coordinators. The surveys responses also helped the team collect ideas for improvement to the handoff process. The team analyzed the number of each answer choice for the multiple choices and looked at the common rank orders for the ranking questions. The free response comments were grouped by similar context and counted.

4.0 FINDINGS AND CONCLUSIONS

Through analysis of the three sources of data collected from observations, Centricity, and the surveys, the team has discovered and drawn the following findings and conclusions.

As depicted in Figure 2, the total average handoff process time from the sample of 30 observations was 100 minutes. Of the 100 minutes, only 8.5 minutes involve actual processing time, while the other 91.5 minutes were comprised of wait time. The three longest average wait times were identified to be:

4. Bed Slip to Med Status Page = 22 minutes
5. Arrival of Med Status Page to contacting inpatient Medicine Service = 30 minutes
6. Service Contact to Medicine Service Response (Phone Conversation) = 39 minutes
Figure 2 shows the complete ED to inpatient Medicine Service Handoff, including the processing times as well as the wait times for each of the observable steps.

4.1 Emergency Department Perspective

A majority of the handoff process steps take place in the ED and therefore the ED perspective findings are the primary focus of the project.

4.1.1 Observation Data Findings: Causes of Process Delays

Of the 30 samples collected through observation, several outliers of extremely long processes greatly impacted the average. Figure 3 shows a Median process time.
time to be just over 60 minutes, a full 40 minutes less than the average.

Figure 3 also shows the longest sub-process lead times were from the status page to service contact and the service contact to service response.

While the sub-process times shown, were not available in Centricity, and therefore were based completely on observations, the average total process time was validated with the data from centricity (average total time = 97.5 minutes) and was found to be a statistically significant and accurate representation of the process.

After the team identified the sub-processes with the longest wait times, the team further stratified the data in order to determine the root causes behind each of the wait times. Figure 4.3 displays the time between arrival of status page and the time a service is contacted as a histogram. The analysis shows that there is a bimodal distribution of wait times.

As shown in Figure 4.4 a majority of the service contacts took place between 0 and 30 minutes; however, 22% took over 30 minutes. Further examining this delay revealed the primary reason for delay was ED providers attending to and visiting other patients when the status page arrives. If the ED providers receive the status determination immediately after submitting the bed slip or when they are not caring for another patient they are able to page the inpatient service right away or within 0 to 10 minutes; however, if they started to visit another patient already or have become occupied with another responsibility it often takes over 50 minutes before they have time to send the status page.

The second sub-process of service contact to initial service response was also stratified. As shown in Figure 5, 43% of the 30 samples had a wait time greater than 30 minutes, with 2 samples having a wait time of over 60 minutes.

The root causes observed for these wait times consisted of three primary situations:
4. The inpatient Medicine Service providers received the page while occupied by other responsibilities.
5. General Medicine Pager being handed off between attending and resident teams.
6. Inpatient services researching the patient before calling the ED provider.

In addition to examining the delays caused within the various sub-processes the team also completed a root cause analysis of the types of delays. The 2 most common delays as shown in Figure 6 are a discrepancy of admitting service (30%) and caring for multiple patients (23%).

Discrepancy of admitting service can be broken down into 3 situations:

1. The ED provider was unaware that the patient had a previous relationship with a specific service, such as Family Medicine, Heart Failure Cardiology etc.
2. General Medicine is paged, and the Gen. Med. Provider doesn’t feel the patient is appropriate for their care and suggests another service.
3. The patient’s condition changes or additional results come back that makes them a better fit for a different service.

Caring for multiple patients refers to when the ED providers are delayed in completing the next step in the handoff process because they are with another patient. From the dialogues exchanged with the ED providers, the team learned when the ED providers are caring for 8 or more patients they feel they are spread too thin, which results in longer delays throughout the process.

Additionally the team found that when a service is not determined correctly on the first admission attempt there are typically several call cycles. These call cycles result in a longer process time. Figures 7.1 and 7.2 show both the frequency of a process having more than one cycle and the difference in process time when there are 2 or more call cycles. A call cycle is most commonly defined as the contact...
between the ED provider and the inpatient Medicine Provider; however, occasionally it includes the contact of any other consultation that occurs for the handoff or admission of the patient to be completed.

4.1.2 Centricity Data Findings

Total process times were collected from the second data source, Centricity, for 2 primary purposes: to validate the observation data, and to stratify the total process time by factors such as day of week, time of day, and ED providers level of experience. The observation data could not be stratified by these factors due to the small sample size not encompassing all times of day, days of week, and levels of experience.

When stratified by day of week, a sample size of 14146 was taken from (1/1/2011 – 11/10/2011). A box plot of the average total process time was created (see Appendix E). The box plots show how large the variation in average process time is, ranging from process times of over 250 minutes to nearly 0 minutes. Note, the process times of 0 minutes are surgery, stroke, or other extreme patient situations in which the patient is already moved and admitted into the inpatient service before the bed slip is even sent in, making the total process time essentially 0 minutes. The box plots also show a slight decrease in process time on Saturday and Sunday, however; overall there is not a significant difference in process time between the days of the week.

When stratified by time of day, a sample size of 8023, was also taken from (1/1/2011 – 11/10/2011). A box plot of process time broken down by hour of day was generated (see Appendix E). The box plot showed an increase in process time about every 2 hours with spikes at 5 AM and 8 AM. The increase at 5 AM was attributed to the “golden hour”, an hour of time in which the hospital (all other inpatient services excluding the ED) does not admit any patients. Thus any patient arriving in the ED that is not admitted before 6 AM must wait until 7 AM to be admitted, adding about 60 minutes to the average process time. The increase in process time at 8 AM was attributed to the service provider’s morning rounds and meetings as well as the shift change, and everyone starting their day.

![Figure 4.8: Average Process Time by inpatient Medicine Service (Centricity, 1/1/2011 – 11/30/2011, n = 8023)](image_url)
The final stratification of Centricity data was by experience level of ED provider, which was broken down into 2 categories, Attendings and Residents/PAs. The team found that the time from the status page arrival to the time of the handoff entry into Centricity was 15 minutes faster with an Attending than the average process time. This can be attributed to the experience of Attendings allowing them to make faster and more accurate determinations of which inpatient Medicine Service to admit the patient and allowing them to contact the admitting Medicine Service before filing the bed slip. Figure 9 shows that the variation in process time is much less with Attendings as well, which again can be attributed to the same reasoning. Also new residents are placed in the ED every 2 months and learning the handoff process takes time. The variation may also be an effect of new rotations in residents.

4.1.3 Survey Findings

The ED provider survey was created to collect information on common delays, to assess the confidence in the status and service determinations of the providers and to critique the current handoff process. The survey received 62 responses from all experience levels of ED providers (Residents, PAs and Attendings).

In order to understand the extreme disproportion of wait-time to processing time the team assessed the priority the ED providers place on the handoff process, and did so by asking the ED providers to rank a set list of tasks. This assessment was accomplished with question 2 (See Appendix B) of the survey. Figure 10 shows the weighted averages given to each task. Due to the wording of the question and the fact that this survey was administered as part of the study of the Observation or Inpatient handoff, the team believes these responses may have been skewed. When asked how much of a priority the handoff process was
considered in informal dialogues throughout the observations, many of the ED providers explained they felt discharging a patient was the highest priority, because discharging a patient would open up a bed and allow for another patient to receive care.

Questions 6 and 7 from the survey (See Appendix B), each evaluate the confidence an ED provider has in making two determinations in the process. Figure 11.1 shows the findings from assessing the ED providers’ confidence in the determination of inpatient vs. observation status. Figure 11.2 shows the confidence in determining which inpatient Medicine Service to admit the patient. Each decision has roughly the same distribution, implying that most likely an ED provider feels the same level of confidence in each determination. The breakdown of survey question 9 (See Appendix B) asking what the ED providers role in the emergency department was has a similar distribution to that of the confidence levels. In Figure 12, roughly 45% of the responses came from Attending physicians and 35% were from Residents. While there is not a way to verify if the level of experience of provider directly correlates with the confidence of these decisions, due to the way the survey questions were written, it is interesting to see the similar distributions.

To collect an open ended critique of the current process the survey included a free response question (questions 8, See Appendix B), that allowed the ED provider to write any suggestions they had to improve the process. Of the 62 responses, 15 suggested change in the process for determining the status of the patient. Specifically the changes suggested:

- More timely call back from the ABCC (6 of the 15 responses)
- Do not allow the ABCC to call the ED provider with questions as it disrupts patient care (8 of the 15 responses) and
- Make ED providers aware of the criteria the ABCC follows
In addition to these suggestions another response suggested the ED implement strict criteria for who admits who. Another common response was to standardize the time in which an inpatient Medicine Service is supposed to call back. One provider suggested making it a goal for inpatient Medicine Service providers to return a call or page (saying you're #3 in line, will call in __min). The ED providers noted that within 10 minutes would be nice so that they know the Medicine Service providers received the initial page and the ED providers can estimate how much they can do in the meantime. Most responses on this topic suggested a 10 minute window of time; however, a few did say they were not sure if a 10 minute window was feasible and that even 15 to 20 minutes would be an improvement.

4.2 General Medicine Perspective

While the scope of the project included observations of the General Medicine perspective of the process, this perspective became much less of a focus as the project progressed.

4.2.1 Observation Findings

The process times of the 28 samples that were collected from the observations and time-studies were analyzed. The process time is defined as the number of minutes between the time the service contact page is received from the ED provider and the time that the patient is accepted by the General Medicine provider. Figure 13 shows the number of samples for eight ranges of process times. The majority of the process times were less than 15 minutes. These process times are the opposite of what was shown from the General Medicine samples from the ED observations in Figure 14, where the majority of the process times are 36 minutes or greater. This difference of the process times may be a result of the General Medicine provider feeling the urgency to process the service contact page because they were being observed.

The common delays in the process were also analyzed from the General Medicine perspective samples. The two most common causes of delays were researching a patient from a previous page when another page was received and on the phone for something that was not related to the admit process. These delays had a number of 4 samples each. The third most common delay occurred when the General Medicine provider received a service contact page while on the phone for a previous service contact page. This delay occurred in three of the samples. Other delays that were not as common but were still noted are missing patient info or CPI number in the service contact page or the ED provider was not available when the General Medicine provider called to discuss a patient to be admitted.
4.2.2 Surveys

The General Medicine survey was created to learn about what information is generally researched for each patient and collect suggestions to improve the overall handoff process. The responses on what information is needed to decide whether to accept or decline a patient were compiled in the categories shown in Figure 15. Out of the 62 responses, 40% of the respondents said that the patient’s current state and diagnosis was needed, 25% said that the medical history was needed. The team learned during observations, that the majority of the information needed is researched by the General Medicine provider before the phone call is made to the ED provider. This shows that there is a disconnection between the information that is proved by the ED provider and the information that is needed from the General Medicine providers.

The survey included a free response question (questions 3, See Appendix C), that allowed the General Medicine providers to give suggestions to improve the process. There were 38 responses from the 48 respondents that completed the survey. Seven of the responses suggested improvement in the information provided by the ED provider by having a standard amount of information on the patient sent to the General Medicine provider.

![Figure 4.16: General Medicine Patient Information Free Responses (Observation, n = 48)](image)

4.3 The Admission and Bed Coordinator Center

The ABCC survey was created to collect information on what the common delays appear to be from their perspective and whether the completeness of the Bed Slip that the ED providers fill out affects the decision to determine if a patient is observation or inpatient status. This survey also included a free response question (questions 2, See Appendix D), that allowed the coordinators to give feedback on the most common causes of delays. There are 13 responses from the 20 respondents that completed the survey. Six of the responses claimed that the most common cause of delay was not having the proper information on the patient status, lab results and treatment to make a decision. The lack of patient information results in the coordinator calling the ED provider to get the missing information. This step of retrieving information causes delay in the hand off process.
5.0 RECOMMENDATIONS

Based on the above findings the team developed four primary recommendations to improve the ED to Inpatient Medicine handoff process.

5. Allow the ED provider to set the status of the patient to observation or inpatient.
6. Develop an algorithm or strict criteria for determining which inpatient Medicine Service to admit inpatient status patients.
7. Create an electronically generated patient medical information summary through the new capabilities of the Epic software implementation.
8. Implement a standard call back time for inpatient Medicine Services to respond to ED providers that will be included and taught within the resident’s orientation training.

The first recommendation was developed from qualitative data gathered from both the dialogues that occurred with the ED providers during observations and from direct suggestions and comments from the ED provider survey responses. The feedback received was that the ED providers often wait for the ABCC (Admissions and Bed Coordination Center) to send out the status page of the patient when the ED providers already know what the status of the patient will be. By shifting this responsibility to the ED provider the team predicts the total process time will be reduced by an average of 40 minutes. As mentioned in the findings 15 of the 62 survey responses made a direct comment regarding this step in the process and the inefficiency and disruption that it causes.

The second recommendation was primarily derived from analyzing the delays that were seen during the observations from the ED perspective. After bucketing all like delays observed, 9 of the 30 observation samples included some sort of discrepancy in deciding which inpatient medicine service to admit the patient. These discrepancies can be grouped into 3 categories,

1. The ED provider was unaware that the patient had a previous history with a specific service such as, Family Medicine or Heart Failure
2. The original service decided upon says they feel the patient is not appropriate for their service
3. The patient condition changes or a new condition is found between contacting the service and when the patient is admitted

Again from both dialogues with the ED providers and through the ED provider’s survey responses suggestions for a sort of algorithm or set of criteria for deciding on inpatient medicine service was strongly encouraged.

The third recommendation stemmed from an observation noted while observing from the General Medicine perspective. Currently when the General Medicine providers receive a page from the ED they take a sheet of computer paper from the printer and hand write all patient information and history they feel is necessary to understand the case and to have a productive conversation with the ED provider. Once they feel sufficiently prepared they call the ED provider to obtain more information and then base their decision on if they will admit or decline the patient from the information they have gathered. This is an extremely inefficient method that could be resolved with the new implementation of the EPIC software systems. The team recommends that a standard electronically generated patient medical information sheet be made accessible to all inpatient medicine services. This form would be a condensed printable page, that would summarize all ED collected medical information and important patient history.
This form can be drafted from the responses submitted by the General Medicine providers in the survey, referring to what information they felt was necessary to make their admission decision. By condensing and summarizing this information the team believes 10-20 minutes could be removed from the process, as this electronic form would eliminate the time required to research the patient and the time required to exchange a verbal report with the ED provider.

The final recommendation is to set a standard call back time from all inpatient Medicine Services. Again this recommendation was strongly supported by the ED provider and ABCC survey responses and from dialogues with the ED providers. Of the 62 ED provider survey responses 11 directly suggested a specified call back time, and many others referred to needing to change this step of the process. Most of these suggestions stated that a 10 minute call back window would be best; however, most providers also commented they did not know if 10 minutes was feasible and therefore if the inpatient Medicine Service provider could at least notify them of how long it will be in 10 minutes that would greatly improve the process as well. As mentioned in the findings one ED provider suggested a queuing system in which the ED provider could get a sense of visibility to the Medicine Service’s process and therefore could better manage their time in the ED.

The findings also strongly support this recommendation. The data collected shows that the average time for an inpatient Medicine Service to respond is 38 minutes, one of the longest contributing sub-process times, and therefore one of the largest areas of opportunity to improve.

6.0 Expected Impact

In conclusion with each of the 4 above recommendations the team believes the total process time can be reduced by 57 minutes; going from a previous total process time of 100 minutes to a new total process time of 40 minutes. Note that 16% of the observations were less than 40 minutes with the current process, however, due to the lack of a standard process and specified time frames many extreme outliers affected the average total process time. Figure 16 below shows a comparison of the current process with the predicated process time after implementing the recommendations.

With the recommendations the time from Bed slip to Med Status page would be reduced from 22 minutes to 2 minutes. With the time savings coming primarily from the fact that the ABCC no longer has to look up and determine the status of the patient and the ED provider will no longer be interrupted with clarification calls or the status page from the ABCC.

The time from status page to service contact will be reduced from 30 minutes to 10 minutes. This time savings will be a direct result of the ED provider being able to notify the Medicine Service as soon as they determine the patient will be inpatient status. Before the ED provider would have
to wait to be notified by the ABCC and if they were told in the middle of caring for another patient it on average would take 30 minutes before they could send the request for admission page.

The time from service contact to service accept would be reduced from 39 minutes to 19 minutes. This reduction in process time would be a direct result of the implementation of the electronic patient information form that would be made accessible to the Medicine Service providers.

The final sub-process time from service response to final handoff in Centricity would not see a change. The team believes this time would remain the same, because the ED providers have many responsibilities in the ED and although they may be able to complete the formal Centricity handoff immediately after hearing if the Medicine Service accepts the patient, the reality is that much of the time they have to care for patients, and complete their other responsibilities within the ED beforehand.

This predicted total process time, while optimistic, is a conservative estimate for how much time could be removed if the given recommendations are implemented.

7.0 Open Action Items

This list of action items are components to the recommendations that the team does not have the expertise to complete but that need to be completed to follow through with the recommendations:

1. Create algorithm or strict criteria to differentiate patient conditions to determine which inpatient Medicine Service the patient should be admitted.

2. Interview the General Medicine and other inpatient Medicine Service providers to determine exactly what information they would need on the electronically generated patient medical information form.

3. During all Residents orientation or training periods include teaching of the standard call back time for requests for patients from the ED.
Appendix A: Data Collection Form

IOE 481 Med Admit Data Recording Form

Date: ____________  Process Start Time: __________

CPI #: _______________________________

Name: _______________________________

Patient Initials: __________  Obs. Decline? (Y or N)

Attending: __________________  Resident/PA: __________________

Inpatient Service Screened for: __________________________

Admission Bed Slip Request: __________

Time Med Status Page Arrived
(Meets Inpatient Criteria): __________

Time Page is sent to Service Contact: __________

Time of Admit Service Contact
(When Inpatient Service calls back): __________

Time of each contact (if multiple): __________

# of contact Cycles between ED and Inpatient Service Provider: _______

Inpatient Provider Method of Communication (Phone/ Pager/ In Person)

Process End Time (Handoff in Centricity): __________

Delays, Issues, Root Causes:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Common Questions to ask while observing:

How did you learn the handoff process?

What are the next steps in the process?

Are the steps you follow the same each time?

If waiting for something else to be completed:

   Lab Results: From Whom?

   Insurance?

   Other and why?

If patient declined from Observation:

   Why?

What are common exceptions you see in the handoff process?

What are the common causes for delay you see in the handoff process?

How do you prioritize the handoff process with your other responsibilities?

   What takes precedence over sending a page/or taking a call?

How do you decide when to page the inpatient Medicine Service?
Appendix B: ED Provider Survey Questions

1. When considering the interval from the time of ABCC status page to handoff to the inpatient team (Internal Medicine or Family Medicine), please rank the following in order of most common to least common cause of delay. (Place items in order by dragging them into order with #1 being most common)
   a. I am unsure to which Medicine service to admit the patient
   b. Initial service paged does not accept the patient, requiring additional pages.
   c. I have competing priorities that prevent me from being able to call the inpatient service
   d. Waiting for the Medicine service to return my page.

2. Considering the competing demands during an ED shift, please rank these patient care priorities after receiving the ABCC status page. (Place items in order by dragging - 1 being most important, 5 being the least important).
   a. Observation or inpatient handoff (paging service and providing handoff)
   b. Non-urgent patient care
   c. Discharging patient to go home
   d. Paging a consultant
   e. Looking up test results
   f. Dictating ED record
   g. Seeing a new patient

3. When do you usually start the patient handoff process of contacting the inpatient service?
   Immediately after status page from the ABCC
   1. Whenever I can get to it
   2. When I have at least 2-3 to process
   3. Before I take a break or at the end of my shift
   4. When I have some down time

4. When you submit a bed request for a patient, what percent of the time are you very sure that the patient will be Inpatient status?
   a. 0-25%
   b. 25-50%
   c. 50-75%
   d. 75-100%

5. When you submit a bed request for a patient, what percent of the time are you very sure that the patient will be Observation status?
   a. 0-25%
   b. 25-50%
   c. 50-75%
   d. 75-100%

6. What percent of the time does your assessment of the patient status (observation vs. inpatient) match that of ABCC?
   a. 0-25%
   b. 25-50%
   c. 50-75%
   d. 75-100%

7. What percent of the time do you estimate the initial inpatient Medicine service paged is the service that admits the patient?
a. 0-25%
b. 25-50%
c. 50-75%
d. 75-100%

8. What suggestions do you have to improve the ED to inpatient medicine handoff process and why?

9. What is your role in the Emergency Department?
   1. Attending physician
   2. Emergency Medicine Resident
   3. Internal Medicine Resident
   4. Other than IM off Service Resident
   5. Physician Assistant
Appendix C: General Medicine Provider Survey Questions

1. When considering the interval from the time when the admit page from the Emergency Department is received to the time the patient is accepted, please rank the following in order of most common to least common cause of delay. (Place items in order by dragging them into order with #1 being most common)
   a. Lack of information of patient’s current condition
   b. Lack of information of patient’s health history
   c. Lack of information of patient’s treatment during the current stay
   d. ED medical provider not available
   e. Current work
   f. Discrepancy on the service the patient should be admitted to (General Medicine vs. other inpatient service)

2. What key information about a patient do you need to make a decision on whether to accept to decline?

3. What suggestions do you have to improve the ED to inpatient medicine hand-off process and why?
Appendix D: Admissions and Bed Coordinator (ABC) Survey Questions

1. Please rank the following causes of delay in the process of determining a patient’s status with #1 being the most common cause
   a. Insurance
   b. Lack of information of patient’s current condition
   c. Lack of information of patient’s health history
   d. Lack of information about why the patient requires admission
   e. Lack of information of patient’s treatment during the current stay

2. What suggestions do you have to improve the ED to inpatient medicine handoff process and why?

3. Do you feel that the ED Providers wait to send several bed slips at once?
   a. Yes
   b. No

4. If so when do you feel is the peak times of day this occurs?
   a. Morning
   b. Afternoon
   c. Evening
   d. Overnight
   e. At the end of provider’s shift
   f. At the beginning of provider’s shifts
Appendix E: Stratification of Centricity Data

Box Plot of Total Process time Stratified by Day of Week (Centricity data, 1/1/2011 – 11/10 2011, n = 14146)

Box Plot of Total Process Time Stratified by Time of Day (Centricity data 1/1/2011 – 11/10/2011, n = 14146)