Study of the General Surgery Pre-Operative Clinic

April 27, 1999

IOE 481 Hospital Systems
Richard J. Coffey, Ph.D.

Prepared by:
Leigh Althoff
Mike Lee
Barney Westbury

Coordinator: Liz Othman
RECOMMENDATIONS

Increase Communication between Cardiology and other departments ........................................................................... 14

Increase Communication between Nurses and Residents ............................................................................................... 15

Increase Communication between nurses and check-in ......................................................................................................... 15

Increase Communication between check-in and Patients .................................................................................................... 15

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Executive Summary

The purpose of this study was to examine the patient flow of the General Surgery Pre-Operative visit, including the History & Physical clinic and any department that a patient may visit. The goal was to identify any problems and discrepancies when analyzing data for waiting and service times. In order to achieve this, it was imperative to understand the entire process from start to finish. Therefore, a detailed flow chart had to be created and data had to be collected.

For three consecutive Tuesdays, one team member documented the start and finish times of every contact a patient experienced with a provider, while another collected patient-estimated times for the other departments (EKG, Bloodwork, etc.). From these data sheets, Excel spreadsheets were constructed to extensively analyze the data for any trends. These spreadsheets were also able to extract many wait times and service times for any provider.

The following list summarizes some results or conclusions found in due course of the data analysis:

1. The RNs have to follow the progress of the Residents to determine whether or not to do teaching before or after the history & physical.
2. The RNs render service on more than one occasion per patient (usually before and after the service of the Resident).
3. The amount patients in process, total length of stay, and the waiting times peak at the times of 10 AM, 12 PM, and 2:30 PM, as a result of the scheduling system.
4. The Residents seem to fatigue throughout the day very slightly as indicated by their increasing service times.

Based on the results and conclusions mentioned above, the following recommendations could be made to help alleviate the waiting time for the patients:

1. To increase the communication between Cardiology and other departments.
2. To increase the communication between the RNs and Residents.
3. To increase the communication between the RNs and the clerical staff at the check-in counter.
4. To increase the communication between the clerical staff at the check-in counter and patients.
5. Do not try to schedule three different patients at each hour interval in the early AM hours.
6. Obtain a portable EKG Unit to be used for pre-op patients and others.
Background

In the University of Michigan Health System, doctors see patients and determine whether or not they need surgery. However, before any operation can begin, certain tests must be conducted on the patients to ensure that they are healthy and stable enough to undergo the operation. Therefore, once surgery has been recommended, the patient must go through a pre-operative visit at a designated clinic.

During this visit, a history & physical is conducted, along with tests in other areas of the hospital. Such tests may include blood-work, EKG, anesthesiology and x-rays, depending on the age and condition of the patient. The hospital staff has guidelines to determine what specific tests must be conducted on each patient prior to surgery.

Dr. Burney and his colleagues run a pre-op clinic for general surgery on Tuesdays. Through anecdotes and verbal patient feedback, it is clear that the patients feel the entire pre-op process is very hectic and frustrating.

Introduction

Project Purpose

The purpose of this project was to analyze the flow of patients through the General Surgery Pre-Operative Clinic within the University of Michigan Health System. Dr. Burney was concerned with the patients' frustrations that this system created because of the significant wait time and lengths of stay that the average patient experiences. Therefore, this project was initiated to reveal possible causes of these unnecessary waiting times within the system.

This report identifies the current patient flow of the visit and suggests how to address the excessive waiting times of patients. All recommendations pertain to this pre-operative clinic, and no other area of the hospital.

Project Goals/Objectives

The goal of this project was to recognize existing problems within the process and to identify potential opportunities to improve them. The recommendations aim to alleviate wait times and maximize the efficiency of each step that the patients encounter throughout the entire process. Communication and scheduling dilemmas need to be addressed in order to achieve these goals.

Scope

The scope of this project was limited to the data collection of the entire pre-op process. Implementation of any change to the existing situation may be initiated as a result of this report, but will not be commenced by the team. This project simply gathered quantitative...
data, recognized existing problems and suggested general solutions. With the support of numerical data, discrepancies within the pre-op process can be more effectively identified.

For this study, the emphasis was based on the times that the RN and resident MD spent with each patient, along with the wait times between these contacts. Any other testing or treatment outside the clinic (EKG, Anesthesiology, etc.) only required arrival and departure times to be collected. Although some patients have contact with the Staff MD, it does not affect more than 5% of the patients, and therefore will not be included in the extensive analysis.

**Approach and Methodology**

The first step of the project was to decide what type of data needed to be collected and analyzed. After observing the process, a flow chart was generated, displaying each step involved in the pre-op visit. (see Appendix B. Flow Charts) This indicated what means and standard deviations needed to be calculated, and which procedures needed to be included in the overall analysis.

**Old Approach:**

The first approach to data collection utilized only a single sheet to be filled out by the patient (see Appendix A. Data Collection Forms). Each patient was asked to fill in every provider, the service that was being performed, and the start time and finish time of each provider’s service. It also required the patient to carry the sheet around to each required department (depending on which test needed to be done), and fill out the start and finish times. The departments included Bloodwork, Cardiology (EKG), Anesthesiology, and Radiology (X-Ray). The clerical staff was responsible for filling in check-in, check-out, and appointment times for each of the patients. This data sheet required that one member of the team was present at all times in order to instruct patients.

After an investigation of the acquired data, it was determined that accuracy was not being ensured. Some of the subjects were Post-op patients, which are not included in this study. In addition, the patients were confused with the data collection form, which resulted in data forms that had been incorrectly filled out and information that could not be interpreted. Therefore, the approach had to be adjusted to alleviate these problems.

**New Approach:**

The final approach required that two new data collection forms be created (see Appendix A. Data Collection Forms). These had been printed up on different color card stock to make them easily distinguishable from the ordinary paperwork. The new process also demanded that two team members be present at all times. One member completed the first form (orange), after greeting the Pre-op patients after check-in. This orange form requested information pertaining to the external departments to the history & physical clinic, including arrival and departure times. Another team member was positioned just
outside of the examination rooms, and noted the start and finish times of all providers for each patient. This was documented on the green form, and ensured that accurate data was collected.

After a patient checked out of the clinic, the first team member once again approached the subjects and inquired as to whether they were done with their visit, or if they were being sent to another area of the hospital. If they needed to have another test done, they were given back the orange form and asked to fill out the start and finish times of the corresponding departments that they visited. This methodology provided much better results and was therefore utilized for three consecutive Tuesdays, producing a 42 subject sample size. With this newly acquired data, analysis of the system was able to commence.

Current system

The overall pre-op visit includes the general surgery clinic for the history & physical, along with certain tests in different departments of the hospital, dependent on each patient. Each patient is scheduled through the computer scheduling system, which indicates if the patient needs an EKG, Lab, or X-ray. Patients are instructed to come to the hospital earlier than their Pre-op appointment time, depending on what tests need to be done. After all necessary previous tests, the patient checks in at the clinic and is instructed to wait until a nurse calls his or her name. When the nurse summons the patient, the patient is escorted to one of three examination rooms, and instructed to get into the proper dress. Each patient waits in the examination room until a nurse or resident is ready for them. Depending on the availability of the resident MD, two things can happen: nurse will initiate teaching or the resident MD will start the history & physical. After both teaching and H&P are complete, the patient is instructed to receive further tests, or go home. (see Appendix B. Flow Charts)

Results and Conclusions:

Clinic Performance

Results: The following tables show some relevant statistics of the performance of the clinic.

<table>
<thead>
<tr>
<th>Date</th>
<th># of patients scheduled</th>
<th># cancels / no-shows</th>
<th># of add-ons</th>
<th># of Anesthesia cancellations</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-Mar-99</td>
<td>12</td>
<td>6</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>16-Mar-99</td>
<td>15</td>
<td>1</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>23-Mar-99</td>
<td>13</td>
<td>0</td>
<td>2</td>
<td>15</td>
</tr>
</tbody>
</table>

*adverse weather; RN called some patients and conducted teaching over the phone
**the resident was late (2 showed up)
Length of Stay:

Results: The following table displays the total length of stay in the departments outside the clinic. These times were recalled estimates of each of the patients.

<table>
<thead>
<tr>
<th>Other Departments</th>
<th>Bloodwork</th>
<th>Cardiology</th>
<th>Anesthesiology</th>
<th>Radiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of patients that visit</td>
<td>53.00%</td>
<td>50.00%</td>
<td>33.00%</td>
<td>8.00%</td>
</tr>
<tr>
<td>Average length of stay (min)</td>
<td>10.5</td>
<td>29</td>
<td>36</td>
<td>34</td>
</tr>
<tr>
<td>ST Dev (min)</td>
<td>9.3</td>
<td>17</td>
<td>14</td>
<td>39</td>
</tr>
</tbody>
</table>

Conclusion: Cardiology and Anesthesiology have relatively small variance. It is also interesting to see that of the 42 patients that were scheduled for anesthesiology, only 33% actually went.

Service time

Results: Figures 1 & 2 show the distributions of RN and Resident time spent with each patient. Because the Staff MD and any other care providers constituted such a small proportion of our data, they have been excluded from these figures. Figure 1 displays the distribution of the RN service times. These service times are a summation of all the times a nurse was in contact with each patient. It appears to be quite normal and stable with a mean of 13 min. and standard deviation of 6 min. Figure 2 is the distribution of resident service time. There is a significantly small deviation for the mean of 20 min. Apparently the residents are quite systematic and consistent with their H&Ps.

RN Service Time
mean=12.59, st dev=6.32

Figure 1
Conclusions: The nurses have to work around the progress of the resident. If the resident is busy, the nurse may initiate teaching. If the resident is ready for a patient and interrupts teaching, a nurse may continue the rest of the teaching later. Otherwise, the nurse can do all the teaching after the H&P. Thus, there is much more variation in the times.

Wait Time

Results: Figures 3 & 4 display the overall wait times for registered nurses and resident MD’s. These times were calculated by subtracting the time that any provider left the examination room from the time that a RN or resident MD entered the room, respectively. The RN distribution is somewhat bimodal, with relative maximums located at 4 and 10 min. Figure 4 shows an exponential distribution, which shows that 80% of the wait times are between 2.5 and 17.5 min.
Conclusions: This simply shows that the RNs are making more than one trip into the examination room, each separated by a service by the resident MD. Therefore, the first wait time may be much longer compared to the wait after the resident has performed a service. The wait time for the resident on the other hand is not bimodal because there is usually only one visit by the resident per patient, which is very normally distributed.

Patients in Process

Results: For each week, the number of patients in process at any given time was determined (see Appendix C. Relevant Calculated Statistics). These numbers were calculated by subtracting the number of patients who had checked out from the number of patients who had started service per time period. Figure 5 is a total of the three weeks. It shows the number of patients in process throughout the day, with peaks at 10AM, 12PM, and 2:30 PM. There is a similar trend in the individual three weeks, which is evident in Figure 5.
Conclusions: This could be due to the appointment scheduling system. The system tries to fill all three of the examination rooms before 9:00 am. Thus, the process is at its max at 10AM, because they are in process for 54 minutes. This same scheduling technique happens again after lunch, which could explain the peak at 2:30 PM.

**Total Length of Stay**

Results: Figure 6 shows the length of stay experienced by patients within the H&P clinic according to their appointment time. It seems to be distributed with peaks at 10:00am and again at 1:30pm. The stays range from 1 hr. to 2 hrs. with a mean of 1 hr. and 33 min.

![Clinic Length of Stay vs. Appointment Time](image)

Conclusions: Clinic length of stay is correlated with how many patients are in process. (Figure 5) As the number of in-process patients increases, the total length of stay increases as well. This explains the similarity in shape of Figure 5 and Figure 6. Again, length of stay could be very dependent on the scheduling system.

**Resident Service Time vs. Appointment Time**

Figures 7 & 8 are the Resident and RN service times throughout the entire day. These numbers are an average of all the service times the provider spends with each patient according to their appointment time. The RN service time seems to be unaffected by the time of day. There is a slight increase of resident service times as appointment times increases, but it is rather small. The peak times for resident service times are at 9:00am, 11:30am and 1:30pm.
**Nurse Service Time vs. Appointment Time**

Figure 7

**Resident Service Time, vs. Appointment Time**

Figure 8

**Conclusions:** Notice that the peak resident service times (9:00am, 11:30am, 1:30pm) are about an hour before the times for the peak amount of patients in the system (10:00am, 12:00pm, 2:30pm). This suggests that the resident begins to take longer, then about one hour later, the number of patients in process builds to its peak. As service times increase, more patients are in process and therefore total length of stay increases.

**Resident Wait Time vs. Appointment Time**

**Results:** Another way to examine the performance of the Residents throughout the day is to look at the wait time per patient per appointment time. Figures 9 and 10 show wait times vs. appointment times for the Residents and RNs. A Resident will often take several minutes looking over each patient’s file. They will make calls, research or discuss with other MDs and RNs. During these times the patient is forced to wait. These numbers were an average of the times that a patient waited for the Resident according to appointment time. Peak times seem to be around 10:30, 12:00 and 2:00. It is also interesting to notice that those peaks hit very quickly. There is little build up of wait times. RN wait times seem to be unaffected by the time of appointment. In fact, the trend seems to be a decrease in waiting time as the day continues.
**Conclusions:** Again we see that patients that are scheduled at 10:30AM, 12:00PM and 2:00PM are in for some long waits. These are also the times, as stated before, when the residents service times are at their maximums. It could be inferred that the time the resident spends outside the examination rooms is also affected by fatigue.

**Wait in Waiting Room**

**Results:** The first wait that patients encounter when they visit the history & physical clinic is in the waiting room. Once they have checked in, they are asked to sit and wait until one of the RNs has called their name. Figure 11 displays the waiting times that each individual experiences. This time is calculated from their arrival time to the time that they are taken into an exam room, while appointment time is not considered.
Conclusions: As Figure 11 shows, our data is a normal distribution with a mode of 30 minutes. The mean is up at 38 minutes, simply because of the many higher waiting times of an hour or more. This could be due to the large waiting times that people experience because they are early to their appointment. Regardless of whether the patients are early or late, they will be sitting in the waiting room for half an hour or more, on average.

Wait in Waiting Room from Patients’ Appointment Times

Results: This is basically the time spent in the waiting room, from appointment time to the start of service. Therefore, the 12% of patients who started before their appointments were not included in this figure. The mean is higher than the overall waiting room time, simply because the amount of time that the patients were late is included in this number. It in essence shows the amount of time between an appointment time and the time that a patient starts their service. This distribution has a somewhat normal shape with a relatively low standard deviation, which suggests that the mean of 46 min. is a good estimate of average wait time for those who start their service after the appointment time.
Conclusions: A number of factors explain the surprisingly large lag between start time and check-in. One can see that the average patient that shows up late shows up 28 minutes late. (see Appendix C. Relevant Calculated Statistics) Also, 36% of patients show up late.

RN Service Time (Broken up into each contact)

Results: Figure 13 displays the amount of time that the RN spent with a patient on every trip into the examination rooms. It is simply a breakdown of Figure 13, that could possibly show the duration of the different services that the RN provides, such as teaching. The standard deviation here is pretty high due to the three different peaks at 1 minute, 4 minutes, and 11 minutes.

Conclusions: Teaching is the RN’s number one priority and takes up the largest amount of their service time. The highest peak at one minute was most likely the greeting from the RN and maybe a request to get into the proper dress. The team hypothesized that the peak at 11 minutes could be the amount of time for teaching when it was done in one visit. When the teaching was split up into multiple visits, those service times were then reduced accordingly. These times, in addition to the times spent checking vitals, probably accounted for the peak at 4 minutes.

Recommendations

Increase Communication between Cardiology and other departments

The clinic relies on Cardiology for all it’s EKG testing. The medical assistant who performs all of the EKGs is a woman named Mary. Mary declares that she is the only person doing EKGs on Tuesdays. When she takes her lunch break, patients often have to
wait over 30 min. to get this test. A possible remedy to reduce some time in Cardiology would be to assign a strict window for Mary’s lunch break. This way other departments could know that around lunch times Mary would not be available. Patients would not be told to go to Cardiology at these times, therefore reducing the patient Total length of stay.

*Increase Communication between Nurses and Residents*

For each patient, the nurse gives teaching and the resident MD gives the History and Physical. Nurses and residents are often unsure of where each patient is in the process. Often, when the examination room door is closed, the nurse has no idea if that patient has received the H&P yet. Similarly, the resident does not know if each patient has been taught or not. Nurses and residents have to knock on examination room doors to find out who has been helped. Nurses and residents find themselves waiting around when they could possibly be giving service to the patients. A visual aid to each examination room could reduce some of this uncertainty. An example could be a door hanger (similar to a “Do not Disturb” sign”) with one side that indicated that the resident had completed the H&P, and the other side indicating that it had not been completed. If the hanger indicated that the H&P had been completed, the nurse would be confident that the patient in the room now needs his teaching.

*Increase Communication between nurses and check-in*

There is no system to inform the residents and nurses that there is a patient the waiting room. Nurses periodically travel from the staff room to the waiting room and check if there are any patients waiting. At times such as 8:30 (beginning of the clinic) and 1:00 PM (right after lunch), the number of patients in process is at it’s lowest and the waiting room is relatively empty. This results in unnecessary trips for the nurse. Also a nurse may be unoccupied in the staff room because she thinks that there is no patient waiting. A simple phone call to the staff room, or perhaps a light could signal the nurses and residents that there is a patient in the waiting room could reduce this wasted time.

*Increase Communication between check-in and Patients*

Although this is already implemented, patients should be instructed to come 15 min. early to get their Bloodwork done and 30 minutes for EKG. Cardiology should be avoided during lunchtime if possible.

*Scheduling Alternatives*

As stated before, the clinic tends to peak around 10:00am and 2:30pm. This is due to several factors, one of which is the scheduling system. This system tries to fill up all the examination rooms as soon as possible. For example, a typical schedule would look like:
Apt. time  
8:30 am  
8:30 am  
8:30 am  
9:00 am  
9:00 am  
9:30 am....

From that point on one appointment would be scheduled every half-hour. Thus because each patients spends about 54 minute in service, those patients who had appointments around 10:00 AM, arrive at a system full of patients that had appointments at 8:30 AM. If the “filling” of the examination rooms were decelerated, then those patients that came in at 10:00 AM would not wait as long. For example:

Apt time  
8:30 am  
8:30 am  
9:00 am  
9:00 am  
9:30 am  
9:30 am....

Thus the rooms are filling up slowly, and when any of these patients arrive, they will not necessarily be arriving at a backed up system. The same amount of patients will be served by 9:30 am; thus the productivity of the clinic is not effected.

**Portable EKG Unit**

Close to 50% are sent to Cardiology at some point in the process to get the EKG testing done. One average, they spend 30 min. there. However, the actual test only requires 5 min. and a very small unit that can be wheeled around. Consider having an EKG testing unit assigned to the 3 examination rooms. Either the nurse or the resident could administer the test. This of course would add about 5 min. to the average service time as well as increase the wait time due to waiting for the unit. However the total length of stay would be decreased by close to 25 minutes for 43% of the patients.
Appendix A. Data Collection Forms
Old Data Collection Form

Patient Name: ____________________________
Appointment with: _______________________
Appointment time: _______________________

**General Surgery**

<table>
<thead>
<tr>
<th>Check-In Time</th>
<th>Check-Out Time</th>
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</table>

<table>
<thead>
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<th>Provider</th>
<th>Activity</th>
<th>Start Time</th>
<th>End Time</th>
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<td>Staff MD</td>
<td>Vitals</td>
<td></td>
<td></td>
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<tr>
<td>Resident MD</td>
<td>History</td>
<td></td>
<td></td>
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<tr>
<td>RN</td>
<td>Physical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Assistant</td>
<td>Teaching</td>
<td></td>
<td></td>
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<tr>
<td></td>
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<tr>
<td>Staff MD</td>
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<td>Resident MD</td>
<td>History</td>
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<tr>
<td>RN</td>
<td>Physical</td>
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<tr>
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<td></td>
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<tr>
<td>Staff MD</td>
<td>Vitals</td>
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<tr>
<td>Resident MD</td>
<td>History</td>
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<tr>
<td>RN</td>
<td>Physical</td>
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<tr>
<td>Medical Assistant</td>
<td>Teaching</td>
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<td></td>
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<thead>
<tr>
<th>Bloodwork</th>
<th>Time of Arrival:</th>
<th>Time of Departure:</th>
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<tbody>
<tr>
<td>EKG</td>
<td>Time of Arrival:</td>
<td>Time of Departure:</td>
</tr>
<tr>
<td>Anesthesiology</td>
<td>Time of Arrival:</td>
<td>Time of Departure:</td>
</tr>
<tr>
<td>X-Ray</td>
<td>Time of Arrival:</td>
<td>Time of Departure:</td>
</tr>
</tbody>
</table>
New Data Collection Form #1 (orange)

General Surgery Pre-Op Clinic

Dear patient,

We are students working with the University of Michigan Hospital. We are collecting information regarding the amount of time you spent with us during your visit today. We would appreciate your help in filling out this form. If you enter one of the departments listed below, simply write down the time that you entered (start time) and the time that you left (end time). Thank you very much for your time and effort!!!

Barney, Mike and Leigh

<table>
<thead>
<tr>
<th>Department</th>
<th>Start Time</th>
<th>End Time</th>
<th>Before H&amp;P</th>
<th>After H&amp;P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bloodwork (Blood-draw)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EKG (Electrocardiogram)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anesthesiology</td>
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</tr>
<tr>
<td>X-Ray</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

***If this form has not been collected during your visit, please call:
Liz Othman
(734) 936 - 2471
New Data Collection Form #2 (green)

*General Surgery Pre-Op Clinic*

Appointment with:  
Appointment time:  
Check-in Time:  
Check-out Time:  

<table>
<thead>
<tr>
<th>Provider</th>
<th>Start Time</th>
<th>End Time</th>
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<tbody>
<tr>
<td>Staff MD</td>
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<tr>
<td>Resident MD</td>
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<tr>
<td>Medical Assistant</td>
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<tr>
<td>Other</td>
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<td>Medical Assistant</td>
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<tr>
<th>Provider</th>
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<tr>
<td>Staff MD</td>
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<tr>
<th>Provider</th>
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<tbody>
<tr>
<td>Staff MD</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*In care of:*
Liz Othman  
Programs & Operations Analysis  
300 North Ingalls N16A14  
(734) 936 - 2471  
Rm #
Appendix B. Flow Charts
Overall Process

Pre-Operative Visit

Weighted average length of stay = 2 hr 13 min.
Check-in Process - Pre-Operative Clinic

Start

Bloodwork Requested? no

EKG Requested? no

X-ray Requested? no

Blue Card? yes

Has it been done yes

Blood Draw

Mean = 10 min.
St. dev. = 9 min.

n=20

Mean = 25 min.
St. dev. = 17 min.

n=18

Mean = 11 min.
St. dev. = 4 min.

n=2

Cardiology

Radiology

Registration

...
History & Physical Clinic - Resident MD and RN Service/Wait Times

A → Check-in → Wait in Wait Room

Mean = 38.6 min.
St. dev. = 21.2
n=42

H&P Done?

no

Teaching Done?

no

Teaching Done?

yes

Wait for Resident MD

Mean = 11.1 min.
St. dev. = 11 min.
n=42

Total Resident MD Service Time

Mean = 20 min.
St. dev. = 6.7 min.
n=42

yes

B

Wait for Nurse

Mean = 9.6 min.
St. dev. = 8.4 min.
n=42

Total RN Service Time

Mean = 13 min.
St. dev. = 6.5 min.
n=42
Post-Check-Out Process - Pre-Operative Visit

**Flowchart Diagram:**

1. **B**
   - **Need EKG?**
     - yes .07 Cardiology
     - no .93
   - no .93
2. **Blood-draw**
   - yes .05
   - no .95
3. **Need Bloodwork?**
   - yes .93
   - no .97
4. **Need an X-Ray?**
   - yes .03 Radiology
   - no .97
5. **Anesthesia**
   - yes .33
   - no .67
6. **Need Anesthesia?**
   - yes .33
   - no .67
7. **End**

**Statistics:**
- **Cardiology**
  - Mean = 17 min.
  - St. dev. = 14 min.
  - n=3
- **Blood-draw**
  - Mean = 14 min.
  - St. dev. = 14 min.
  - n=2
- **Radiology**
  - Mean = 1 hr. 20 min.
  - St. dev. = 0 min.
  - n=1
- **Anesthesia**
  - Mean = 35 min.
  - St. dev. = 14 min.
  - n=14
Appendix C. Relevant Calculated Statistics
### Relevant Calculated Statistics

<table>
<thead>
<tr>
<th>Description</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total weighted length of stay in Pre-Op Visit</td>
<td>2:13:00</td>
<td></td>
</tr>
<tr>
<td>Total length of stay in H&amp;P clinic</td>
<td>1:32:55</td>
<td>0:28:04</td>
</tr>
<tr>
<td>Total service time in H&amp;P clinic</td>
<td>0:33:44</td>
<td>0:10:21</td>
</tr>
<tr>
<td>Total wait time in H&amp;P clinic</td>
<td>0:59:04</td>
<td>0:27:30</td>
</tr>
<tr>
<td>Total RN service time in H&amp;P clinic</td>
<td>0:12:59</td>
<td>0:06:32</td>
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<tr>
<td>Total RN wait time in H&amp;P clinic</td>
<td>0:09:41</td>
<td>0:08:22</td>
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<tr>
<td>Total Resident MD service time in H&amp;P clinic</td>
<td>0:19:58</td>
<td>0:06:40</td>
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<tr>
<td>Total Resident MD wait time in H&amp;P clinic</td>
<td>0:11:07</td>
<td>0:10:59</td>
</tr>
<tr>
<td>Wait in waiting room</td>
<td>0:38:16</td>
<td>0:20:54</td>
</tr>
<tr>
<td>Total length of stay in Bloodwork</td>
<td>0:10:34</td>
<td>0:09:19</td>
</tr>
<tr>
<td>% of patients that go to Bloodwork before</td>
<td>48.00%</td>
<td></td>
</tr>
<tr>
<td>% of patients that go to Bloodwork after</td>
<td>5.00%</td>
<td></td>
</tr>
<tr>
<td>% of patients that go to Bloodwork Total</td>
<td>53.00%</td>
<td></td>
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<tr>
<td>Total length of stay in Cardiology (EKG)</td>
<td>0:29:06</td>
<td>0:16:43</td>
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<tr>
<td>% of patients that go to Cardiology (EKG) before</td>
<td>43.00%</td>
<td></td>
</tr>
<tr>
<td>% of patients that go to Cardiology (EKG) after</td>
<td>7.00%</td>
<td></td>
</tr>
<tr>
<td>% of patients that go to Cardiology (EKG) Total</td>
<td>50.00%</td>
<td></td>
</tr>
<tr>
<td>Total length of stay in Anesthesiology</td>
<td>0:35:47</td>
<td>0:14:06</td>
</tr>
<tr>
<td>% of patients that go to Anesthesiology before</td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td>% of patients that go to Anesthesiology after</td>
<td>33.00%</td>
<td></td>
</tr>
<tr>
<td>% of patients that go to Anesthesiology Total</td>
<td>33.00%</td>
<td></td>
</tr>
<tr>
<td>Total length of stay in Radiology</td>
<td>0:34:00</td>
<td>0:39:00</td>
</tr>
<tr>
<td>% of patients that go to Radiology (X-Ray) before</td>
<td>5.00%</td>
<td></td>
</tr>
<tr>
<td>% of patients that go to Radiology (X-Ray) after</td>
<td>3.00%</td>
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</tr>
<tr>
<td>% of patients that go to Radiology (X-Ray) Total</td>
<td>8.00%</td>
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<tr>
<td>How early patients are, if they are early</td>
<td>Mean 0:20:12</td>
<td>Stdev 0:19:04</td>
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<tr>
<td>% of patients that are early</td>
<td>61.90%</td>
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</tr>
<tr>
<td>How late patients are, if they are late (excluding outlier of 4 hours)</td>
<td>Mean 0:29:00</td>
<td>Stdev 0:19:45</td>
</tr>
<tr>
<td>% of patients that are late</td>
<td>38.10%</td>
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<tr>
<td>% of patients that start early</td>
<td>11.90%</td>
<td></td>
</tr>
<tr>
<td>% of patients that start late</td>
<td>88.10%</td>
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</tbody>
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