University of Michigan Health System
Program and Operations Analysis

Analysis of Pre-Operation Process for
UMHS Surgical Oncology Patients

Final Report Draft

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# Table of Contents

Executive Summary 1

Introduction 3

**Background** 3
- Key Issues 3
- Project Scope 4
- Goals and Objectives 4

**Methodology** 5
- Literature Search and Interviews 5
- Observations 5
- Time Studies Using Time Cards 6
  - Trial Run 6
  - Time Card Process 6
- Benchmarking 7
- Data Analysis and Recommendations 7

**Findings and Conclusions** 7
- Literature Search 8
  - Findings and Conclusions 8
- Interviews 8
  - Findings 8
  - Conclusions 8
- Observations 8
  - Findings 8
  - Conclusions 9
- Reception Wait Times 9
  - Findings 9
  - Conclusions 9
- Exam Room Wait Times 10
  - Findings 10
  - Conclusions 10
- Appointment Length 11
  - Findings 11
  - Conclusions 11
- Vitals 12
  - Findings 12
  - Conclusions 12
- History & Physical (H&P) 12
  - Findings 12
  - Conclusions 13
- Teaching Session 13
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Findings</td>
<td>13</td>
</tr>
<tr>
<td>Conclusions</td>
<td>14</td>
</tr>
<tr>
<td>Appointment Sequence</td>
<td>14</td>
</tr>
<tr>
<td>Findings</td>
<td>14</td>
</tr>
<tr>
<td>Conclusions</td>
<td>15</td>
</tr>
<tr>
<td>Add-on H&amp;P</td>
<td>15</td>
</tr>
<tr>
<td>Findings</td>
<td>15</td>
</tr>
<tr>
<td>Conclusions</td>
<td>15</td>
</tr>
<tr>
<td>Benchmarking</td>
<td>15</td>
</tr>
<tr>
<td>Findings</td>
<td>15</td>
</tr>
<tr>
<td>Conclusions</td>
<td>15</td>
</tr>
<tr>
<td>Recommendations</td>
<td>16</td>
</tr>
<tr>
<td>Create Appointment Coordinator Position</td>
<td>16</td>
</tr>
<tr>
<td>Standardize H&amp;P Appointment Process</td>
<td>17</td>
</tr>
<tr>
<td>Further Investigate Add-on H&amp;P</td>
<td>17</td>
</tr>
<tr>
<td>Separate Check-in and Check-out Reception Desks</td>
<td>17</td>
</tr>
<tr>
<td>Action Plan</td>
<td>18</td>
</tr>
<tr>
<td>Appointment Coordinator</td>
<td>18</td>
</tr>
<tr>
<td>Standardization Plan the Appointment Process</td>
<td>18</td>
</tr>
<tr>
<td>Separate Check-in and Check-out Reception Desks</td>
<td>18</td>
</tr>
<tr>
<td>Appendix</td>
<td></td>
</tr>
<tr>
<td>Appendix A</td>
<td>19</td>
</tr>
<tr>
<td>Flowchart of Surgical Oncology Patient Process</td>
<td></td>
</tr>
<tr>
<td>Appendix B</td>
<td>20</td>
</tr>
<tr>
<td>Time Card</td>
<td></td>
</tr>
<tr>
<td>Appendix C</td>
<td>21</td>
</tr>
<tr>
<td>Graphical Data Analysis of Wait Times</td>
<td></td>
</tr>
<tr>
<td>Appendix D</td>
<td>29</td>
</tr>
<tr>
<td>Graphical Data Analysis of H&amp;P Process</td>
<td></td>
</tr>
<tr>
<td>Appendix E</td>
<td>35</td>
</tr>
<tr>
<td>Swim Flowchart of Appointment Process</td>
<td></td>
</tr>
<tr>
<td>Appendix F</td>
<td>36</td>
</tr>
<tr>
<td>Value Stream Map of H&amp;P Appointment Process</td>
<td></td>
</tr>
</tbody>
</table>
Executive Summary

The Surgical Oncology Clinic at the University of Michigan Cancer Center, Team 5 located in Reception E, is experiencing extended appointment times for its History & Physical (H&P) appointments. Therefore, the Clinic asked our team to determine where the bottlenecks are occurring within the appointment process, and which of these bottlenecks are causing the delays. Our team has studied and analyzed the H&P appointment process and developed conclusions and recommendations for improvement.

Goals and Objectives

The goal of this project was to determine why the surgical oncology clinic is experiencing backups in wait rooms and excessive patient wait times. Our team has completed the following objectives:
- Conducted literature search to determine past methods used to improve patient flow
- Observed H&P, workups, and wait room processes (including check in and check out)
- Interviewed clinic employees involved in the process
- Started data collection using a time card on patient appointment times
- Completed time card data collection
- Identified significant delays that cause bottlenecks in process such as: overlaps, slow downs, time gaps, and unnecessary work done during patient appointments
- Created a value stream map of the clinic appointment process

With this information, we have developed recommendations to:
- Decrease patient wait times
- Increase efficiency in patient appointments
- Improve patient and employee experience in the Oncology Clinic

Methodology

To understand and determine the bottlenecks in the H&P process, our team used the following methods:
- Conducted a Online Literature Search
- Interviewed PAs, MAs, NPs, RNs, and clerical staff (9)
- Observed and Recorded Data for Reception Area (97 samples)
- Observed and Recorded Data for H&P Appointments (61 samples)
- Conducted Time Studies Using of H&P process Time Cards (87 samples from October 16 to November 10, 2006)
- Benchmarked Against the Anesthesiology Clinic and General Medicine Clinic
- Created a Swim Flowchart diagramming the H&P Appointment Process
- Created a Flowchart and Value Stream Map of the Patient Flow

Through these methods, we expected to find tangible delays that occurred in the H&P process. Through the time study data, we conducted a statistical analysis to determine the average wait times and average component lengths of patient H&P appointments. This information helped our team to formulate conclusions and develop recommendations to improve the H&P process.
Findings and Conclusions

Based on our data analysis and Surgical Oncology Clinic observations, our team has several key findings:
- A patient spends over one hour waiting in between parts of the appointment
- Over 85% of appointments last over the scheduled one hour appointment time
- Clinic employees are focused on their own task and are not always aware of the importance of the entire appointment flow

From these findings, we were able make several conclusions:
- A patient spends the most significant time in waiting between appointment components, which is the largest bottleneck in the process
- The lengths of the components are not the cause of significant delays in the H&P process
- Add-on H&Ps cause delays in the appointment process because Clinic employees do not have the necessary patient information due to the nature of the unplanned appointment

Recommendations

Create Appointment Coordinator Position
We recommend creating the position of Appointment Coordinator to reduce the amount of time spent finding medical information about the patient during the appointment. The Appointment Coordinator would be responsible for finding the patient’s medical history and the necessary information from the patient’s medical records. This information would then need to be given to the involved clinic employees before the actual appointment to ensure that the NPs, RNs, or PAs have complete understanding of the patient’s current state of health.

Standardize H&P Appointment Process
Our team recommends standardizing the appointment process from start to finish. Ideally, with a standard procedure that each clinic employee has to follow, the patient will no longer have to wait between appointment components. The appointment length would be reduced by 40 minutes because the employee for the next part will be ready to meet with the patient with all the information needed to successfully prepare the patient for surgery. Possible standardization methods include appointment sequence protocol and eliminating add-on H&Ps. However, because our data was very limited, we recommend further investigating the option of adding on an H&P to the end of a patient’s appointment to determine the impact on the Clinic’s appointment schedule.

Separate Check-in and Check-out Desks
To better serve the patients when they are checking in and checking out of the H&P appointment, our team recommends that a separate desk should be available for patient check-in and check-out. Also, clerks should be distributed so that two clerks are assigned to the check-out desk and one clerk is assigned to the check-in desk because the check-out process requires more time as the patient needs to schedule their next appointments.
Introduction

Currently in the Surgical Oncology Clinic at the University of Michigan Cancer Center, patients are experiencing long wait times and inefficient appointments. The various stages in the pre-operation process – consisting of a history and physical (H&P), physician meeting, and teaching session – make it difficult for the Clinic employees to identify the causes of these long wait times. To address this problem, our hospital special projects team was asked to analyze these processes. The project purpose was to identify the bottlenecks that slow down these processes and develop recommendations to improve patient visits in the surgical oncology clinic by decreasing patient wait times. The purpose of this final report is to present our project methods, findings, conclusions, and recommendations.

Background

Every week, 30 to 40 oncology surgeries occur in the cancer center. Each of these surgery patients must go to the oncology clinic for a pre-operation H&P, physician meeting, and teaching session. The high traffic flow in the clinic creates backups that result in long waits and extended appointments for patients.

Patients’ appointments involve an initial meeting with their physician and then a second meeting for their workup and H&P. According to the clinic Nurse Practitioner, H&P appointments are usually scheduled for an hour but often take an hour and half to two hours. Also, although patients are required two pre-operation appointments, these appointments are often combined last minute to be more convenient for the patient. These factors, amongst others, are creating bottlenecks in the process, and generating stress on patients and employees at the clinic. To better explain the flow of patients in the Surgical Oncology clinic, we created a flowchart documenting the patient’s movements through the process as seen from our observations. The flowchart is located in Appendix A.

Key Issues

Several key issues affect the History and Physical (H&P) process, and as a result impact the overall process of patient visits. While a scheduled appointment considers the time needed for an NP, RN, or PA to obtain the information needed for an H&P, other factors need to be taken into account. Because of the nature of the illness, patients can be very emotional, and the employees in this clinic need to be sensitive to that fact. Helping an emotional patient may require the staff to spend additional time with that patient, leaving another patient with an appointment waiting.

Another issue that affects the process is the option physicians have for adding an H&P after they see a patient. While H&Ps are done during visits specifically scheduled for H&Ps, physicians can add an H&P to the end of a patient’s visit if the physician wishes to do so. When a physician adds an H&P, a Nurse Practitioner (NP), Registered Nurse (RN), or Physician Assistant (PA) must make time to complete this extra work. Along with causing more unexpected work for the NP, RN, or PA, an add-on H&P may also cause longer wait times for other patients with appointments, since the employee’s time must now be dedicated to the add-on H&P.
A third issue affecting a patient’s H&P process is the time needed to educate the patient about his or her surgery and/or treatment process. Along with obtaining information for the actual H&P, an informational teaching session is conducted during each patient’s visit by an NP, RN, or PA. The teaching session is the time when the patient receives information such as where to go on the day of surgery, whether he or she can eat before surgery, and side effects he or she can expect to see or feel. However, while each employee covers the same material in the teaching session, different employees may teach it in different ways. The variation in teaching time needed to present the information may cause a variation in the total H&P time. For example, if an NP takes less time to do the teaching session than an RN, then the team would recommend that the Surgical Oncology Clinic look into these differences to determine how to reduce the time the RNs take.

Project Scope

The scope of this project focused on the process in the University of Michigan’s Cancer Center’s Surgical Oncology Clinic’s H&P patient visits. While our team reviewed the entire patient visit process up to the physician encounter, we focused on the H&P process. We examined wait times from arrival to check-in, as well as from check-in to being seen by an MA, of all patients. However, once the patient is in an exam room, our team only studied patients scheduled for H&Ps. Because H&Ps are sometimes added on at the request of a physician after seeing a patient, our team collected information on appointments of that nature as well.

This project required our team to look at the big picture of the process while excluding information about the time taken while the physician is in the room. If the H&P and teaching session were done before the physician saw the patient, then the gathering of data for this project ended when the physician went into the exam room. If the patient was seen by a physician before the H&P and teaching session were done, then our team gathered data from the time the physician left the room to the time the patient checked out at the reception desk. Also excluded from the scope of this project was identifying the reason for variation in the time needed for an H&P and the variation in the time needed for the teaching session given by an RN or NP. While variation in these two tasks was noted, our team was not looking into specific reasoning for this variation. This decision was made in part to respect patients’ privacy; to determine the reason for variation in teaching session or H&P times, a team member would have needed to be in the room when the session was conducted, which may have been uncomfortable for a patient.

Goals and Objectives

The goal of this project was to determine why the Surgical Oncology Clinic is experiencing backups in wait rooms and excessive patient wait times. Our team has completed the following objectives:
- Conducted literature search to determine past methods used to improve patient flow
- Observed H&P, workups, and wait room processes (including check in and check out)
- Interviewed clinic employees involved in the process
- Completed data collection using a time card
- Identified significant delays that cause bottlenecks in process such as: overlaps, slow downs, time gaps, and unnecessary work done during patient appointments
- Created a value stream map of the clinic appointment process

With this information, we have developed recommendations to:
- Decrease patient wait times
- Increase efficiency in patient appointments
- Improve patient and employee experience in the Oncology Clinic

**Methodology**

To form conclusions and develop recommendations, our team conducted a literature search, interviewed Surgical Oncology Clinic employees, observed the current process and wait times, conducted a time study using time cards, and benchmarked against two other clinics in the University of Michigan Hospital System.

**Literature Search and Interviews**

Our team conducted a literature search to examine methodologies used in similar past projects, such as projects that include clinic patient flow processes. The team studied the reports and compared and contrasted our approach to the approach of past projects. We were also able to use information from an article found on the internet, “Strategies for Better Patient Flow and Cycle Time,” by Leigh Ann Backer (June 2002, Vol. 9, No. 6 Family Practice Management, http://www.aafp.org/fpm/20020600/45stra.html).

Our team approached the project by interviewing the employees involved, specifically two RNs, two NPs, one PA, one MA, one receptionist, and one surgical scheduler to determine their thoughts on the current process and problems they could identify.

**Observations**

Our team observed the reception area at the Surgical Oncology Clinic on September 26 and 28, as well as October 2, 2006. We recorded the time needed for each step of a patient’s appointment. By determining where the wait times occur in the process, and how long (on average) these wait times last, we determined where the delays are occurring and whether they are causing bottlenecks. When observing the clinic reception area, our team recorded the wait time from arrival to check-in, the wait time after check-in to when the vitals are taken, and the wait time from when the vitals are through being taken to when the patient is taken back to an exam room. Our team observed 98 patients’ wait times in the reception area.

Our team also observed the H&P process as a whole twice – once on October 3, 2006 and once on October 4, 2006. We followed individual patients through their entire appointments and recorded times for the following steps in the appointment:
- Wait times from the reception area
- Wait time patients experience in the exam room before being seen
- Time needed to complete the H&P
- Wait time between the H&P and the teaching session
- Time needed to complete the teaching session
- Time needed to check out

Our team observed the entire H&P process on only two occasions because each H&P appointment usually took over two hours. Therefore, time cards were used as an alternate method of recording the time needed for the various steps in the H&P process.

**Time Studies Using Time Cards**

After these initial observations and interviews, our team asked the UMHS Surgical Oncology clinic employees involved in the H&P appointments to document the time from start to finish of the H&P and teaching session. We created time cards for the employees to record the duration of each stage in the patient’s H&P appointment. This time card required people involved in the H&P to identify themselves and record the amount of time they spend with a patient. The information from the time card helped determine which processes continually slow down patient appointments.

**Trial Run**

Before starting official data collection using the time cards, our team performed a trial run in the clinic to identify any problems and to ensure the official data collection would be valid. During this trial run, the layout and information on the time card were changed multiple times due to our team’s observations and the client’s requests. Such changes included adding the place for employees to indicate their title and separating the time data into start and finish times. The trial run was conducted from October 9 to October 13, 2006. Official data collection was taken using the time card found in Appendix C.

**Time Card Process**

The time study required the employees to fill out the time card for each component of the patient’s H&P appointment. The time card and a digital clock were located on the doorframe of the exam room for the convenience of the Clinic employees. The time card passed through the process as follows:

- MA records the patient’s identification number and scheduled appointment time
- MA records the start and finish time of taking patient’s weight and height measurements
- MA records the time the patient is taken to the exam room
- MA records the start and finish time of taking patient’s vitals
- MA records the time that he or she leaves the exam room
- Physician records start and finish time of consultation, if applicable
- NP or PA records start and finish time of H&P and number of interruptions
- RN records start and finish time of teaching session and number of interruptions
- RN, NP, or PA records time patient leaves exam room and if appointment was an add-on H&P

The team recorded the data in an Excel spreadsheet to find trends in appointment times. The time study was conducted from October 16 through November 10, 2006. A total of 87 time cards
were received from the Clinic staff members. However, only 61 time cards were completely filled out and used for analysis.

The data from the time cards allowed our team to achieve many of the project’s goals. The time card data collected by the clinic employees was used to determine the time needed to complete an H&P appointment and identify possible problems, such as the differences between scheduled and actual appointment times. From the study, 61 completed time cards were received. From the data taken from our team’s observations and the employees’ time cards, we identified the bottlenecks in the process and developed recommendations for changes to reduce the bottlenecks and improve the efficiency of the patient appointment process.

**Benchmarking**

Our team examined past IOE 481 reports to understand methods used for benchmarking against other hospitals. Benchmarking was used to compare patient flow in the different clinics to determine how to improve the patient flow in the Surgical Oncology Clinic.

To understand how to improve the H&P process, our team benchmarked against the Anesthesiology Clinic, Reception G, in the Taubman Center on Tuesday, November 21, 2006. We discussed the current process in the Anesthesiology Clinic with Dr. Patrick Benedict, a Clinical Assistant Professor, to understand why their patient flow is efficient. We also spoke to Jennifer Tomford, who works at the reception desks, who explained how she gathered each patient’s history and tests needed for the upcoming appointments.

We also benchmarked against the General Medicine Clinic, located in Reception B in the Taubman Center on Wednesday, November 28, 2006.

**Data Analysis and Recommendations**

Once the tasks stated above were completed, the team compiled the time card and observation data. This data was analyzed to determine which steps in the H&P process cause significant delays. The team also identified another clinic with a superior patient appointment process to use as a benchmark for the appointment process in the Surgical Oncology Clinic. Finally, after analyzing and benchmarking, the team made recommendations to standardize and streamline the H&P appointment process.

**Findings and Conclusions**

Our team compiled our findings and generated conclusions from the data gathered. Other than interview and observation findings, patient wait times were broken down into reception area and exam room wait times. Also, the H&P appointment process was recorded in four segments: the entire appointment, the vitals component, the H&P component, and the teaching session component. Additional graphical representation from the data gathered can be found in Appendix C (Graphical Data Analysis of Wait Times) and Appendix D (Graphical Data Analysis of Wait Times).
Literature Search

Findings from our literature search were used to identify possible changes to improve the patient flow in the Surgical Oncology Clinic.

Findings and Conclusions from Literature Search
Backer determined that flow mapping, cycle time measurement and recording interruption can help identify bottlenecks in patient flow processes. She further recommended co-location of related staff members such as locating schedulers and clinical teams in the same area. She also stated that standardizing exam rooms is important and locating the exam rooms near the nurse’s station and the weight rooms would increase efficiency during the appointment and reduce the walking distances.

Interviews

The interviews with the Surgical Oncology Clinic provided our team with the staff members’ perspective of the current process and problems they have identified.

Findings from Interviews
After interviewing clinic staff members in various positions, our team noticed that each staff member has a hard time seeing the big picture and identifying problems outside of their own role in the process. Employees are focused primarily on their own tasks, which segments the H&P process. We also noticed that several people interviewed were interested in a staff member that could help the clinic manage its high traffic flow. One of the RNs also noted that having some assistance for the NPs would be helpful in reducing the workload, while another suggested having a DVD or similar teaching aid sent to the patient before the appointment to reduce the time needed for a teaching session during the appointment.

Conclusions from Interviews
Our team concluded from the interviews that wait times are occurring because staff members are unaware of what else needs to be done during the appointment process outside of their own tasks. Without being able to see the whole picture, the staff often overlooks how each component of the process affects the following component.

Observations

Our team observed the Surgical Oncology Clinic to get a first hand understanding of H&P appointment process. Team members followed patients through their appointment, watching as the patient entered the room, recording the length of time they spent in the room, and observing what the hospital staff was doing throughout the appointment.

Findings from Observations
Our team saw patients that were not supposed to be scheduled in the Surgical Oncology Clinic, staff that didn’t have the necessary patient information prior to the appointments, and patients that waited for long periods of time alone in exam rooms. We also noticed interruptions during the patient appointment process. Often times during the H&P or the teaching session hospital
staff would get pulled from their work to attend to other matters. This lengthened patient appointment time, leaving the patient in the room and waiting for the hospital staff.

**Conclusions from Observations**

From our observations, we concluded that patient appointments are taking longer than necessary due to interruptions and lack of time to prepare for patient appointments by hospital staff. The workload demands on the Clinic employees did not afford them time to gather patient information before the appointment, therefore causing the employees to have to find the information during the appointment. Because the employees were forced to juggle the current appointment process and gather patient information, the patients experienced long wait times during the appointment.

**Reception Wait Times**

Our team observed and recorded the wait times of 97 patients as they waited in the reception area before they were taken to the exam room and after coming out of the exam room.

**Findings from Reception Wait Times**

The reception wait times were broken down into five steps: wait time from arrival to registration, time spent at reception desk, wait time from registration to when his/her height and weight are recorded, wait time from after the patient comes back from having his/her height and weight recorded to when he/she is shown to an exam room, and wait time from when patient is done with the appointment to when he/she checks out. The average patient wait times in the reception area are as follows:

<table>
<thead>
<tr>
<th>Wait time for:</th>
<th>Average Wait</th>
<th>Standard Deviation (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrival to registration</td>
<td>1.209 minutes</td>
<td>2.003 minutes</td>
</tr>
<tr>
<td>Time spent at the registration desk</td>
<td>1.395 minutes</td>
<td>1.080 minutes</td>
</tr>
<tr>
<td>Registration to vitals</td>
<td>7.766 minutes</td>
<td>5.852 minutes</td>
</tr>
<tr>
<td>Back from vitals to exam room</td>
<td>15.55 minutes</td>
<td>12.02 minutes</td>
</tr>
<tr>
<td>Checking out time</td>
<td>3.333 minutes</td>
<td>2.820 minutes</td>
</tr>
</tbody>
</table>

However, there is much variation due to the fluctuation in patients needing to schedule future appointments.

**Conclusions from Reception Wait Times**

The wait times that patients experience waiting in line to see the receptionist – both upon arrival to register and upon completion of appointment to check-out – is not a significant wait and is not a significant factor in causing the bottlenecks in the process. However, the wait times patients experience having their height and weight measurements taken and waiting for an exam room are much longer; the average total wait time from after registering to when the patient is shown to an exam room is about 20 minutes. Reducing the amount of time the patient spends waiting in the reception area to be shown to an exam room would reduce the total time of H&P appointments. However, the process would need to continue to run smoothly once the patient is in the exam room.
Exam Room Wait Times

The time cards allowed our team to compile data from 61 H&P appointments and calculate the wait times patients experienced while in the exam room between the various steps of their appointment.

Findings from Exam Room Wait Times

The MA shows the patient to the exam room and takes his or her vitals before leaving the exam room. After the MA has left the exam room, the next step in the appointment may either be the H&P or the teaching session. If the H&P came first, then it will be followed by the teaching session. After the teaching session, the patient would then need to wait for his or her paperwork before going to the reception area to check out. The wait times in between the appointment components when an H&P comes before a teaching session are shown below.

<table>
<thead>
<tr>
<th></th>
<th>Average Wait</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>After the MA leaves</td>
<td>15.7 minutes</td>
<td>8.8 minutes</td>
</tr>
<tr>
<td>From H&amp;P to teaching</td>
<td>17.1 minutes</td>
<td>12.5 minutes</td>
</tr>
<tr>
<td>Teaching session to</td>
<td>4.7 minutes</td>
<td>5.5 minutes</td>
</tr>
<tr>
<td>given paperwork</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When the teaching session comes before the H&P, the wait times are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Average Wait</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>After the MA leaves</td>
<td>14.5 minutes</td>
<td>9.3 minutes</td>
</tr>
<tr>
<td>From teaching session to H&amp;P</td>
<td>13.4 minutes</td>
<td>9.2 minutes</td>
</tr>
<tr>
<td>From H&amp;P to given paperwork</td>
<td>9.0 minutes</td>
<td>5.7 minutes</td>
</tr>
</tbody>
</table>

If at any time in the appointment an EKG needs to be done, the average time a patient waits before the MA comes in to do the EKG is 14.37 minutes with a high standard deviation of 12.52 minutes, then waits an average of 7.667 minutes after the EKG before the appointment resumes.

Conclusions from Exam Room Wait Times

If the H&P follows immediately after the MA is done taking the patient’s vitals, then the total time the patient waits in the exam room during the appointment is an average of 37.416 minutes. If the teaching session follows immediately after the MA is done taking the patient’s vitals, then the patient waits an average of 36.903 minutes in the exam room over the entire appointment. The time study has shown that the order of the various steps in the appointment does not make a significant difference as the wait time between an H&P and teaching session and the wait time between a teaching session and an H&P is the same, shown in the Pareto chart in Figure 15 in Appendix C. The time study has also shown that the patient spends a total of about 45 minutes waiting in his/her exam room between the various steps of the H&P appointment. Since an H&P appointment is only scheduled for an hour, and the patient spends 45 minutes waiting during the appointment, that only leaves 15 minutes for the vitals, H&P, and teaching session to be done, which is unrealistic. The wait times that incurred while the patient is in the exam room need to be drastically reduced.


**Appointment Length**

Our team analyzed the total time used for the H&P appointment to determine the variation of total time and difference between the scheduled appointment length and the actual appointment length.

**Findings from Appointment Length**

From the 61 appointments analyzed, the average appointment lasted 109.8 minutes with a standard deviation of 37.1 minutes. However, the appointment would only be scheduled to last for 60 minutes. Also considered a bottleneck is the variation in the appointment lengths, as the appointment lengths spanned from 45 minutes to over 180 minutes, shown in Figure 16 in Appendix D.

When comparing the appointment lengths, the times were broken into three divisions: under 70 minutes, between 70 and 120 minutes, and over 120 minutes. The pie chart in Figure 17 in Appendix D shows that more than half of the appointments, 85%, lasted longer than the scheduled time of one hour, as seen in Figure 1 below.

![Pie chart showing appointment length distribution](image)

**Figure 1: Appointment Length- Sample Size 61**

**Conclusions from Appointment Length**

An H&P appointment is scheduled to take only one hour, and the data showed that an average appointment was taking, on average, over 45 minutes longer than the scheduled time. The variation in the appointment lengths creates many issues about the standardization, and efficiency of the current process.
The results from the pie chart raised concerns regarding patient satisfaction in terms expected length of appointment. To understand the reasons for these long appointment lengths, a Pareto chart was generated to expose which components created these delays in appointment times. Figure 18 in Appendix D shows that the teaching session is taking the most time during the entire appointment, with the H&P length closely following. The times of the medical assistant taking the vitals, getting an EKG, and of the physician are insignificant to the total time of the appointment.

**Vitals**

From the 61 appointments analyzed, our team identified whether the time needed for the medical assistant to record the patient’s vitals was a factor in the bottlenecks of the H&P appointment process.

**Findings from Vitals**
The tasks of the medical assistant (MA) include getting the weight and height of the patient, taking the patient into the assigned exam room, taking the vitals of the patient, and getting an EKG if necessary. The mean time of this process from the 58 appointments is 5.8 minutes and a standard deviation of 2.0 minutes. As seen in Figure 19 in Appendix D, the medical assistants did not produce much variation in completing their tasks.

An MA can conduct an EKG any time during the appointment. When an EKG is taken, the mean total appointment length is increased to 123.5 minutes with a standard deviation of 35.8 minutes. The mean time of doing an EKG is 6.3 with a standard deviation of 2.6 minutes. However, there is much variation is taking an EKG, as seen in Figure 20 in Appendix D.

**Conclusions from Vitals**
After observing the process, the team found that the process of taking the patient’s vitals is standardized, and the main cause for variation is when the medical assistant has to take an EKG of the patient, which delays the appointment slightly.

**History & Physical (H&P)**

Our team compared the time needed for an H&P when conducted by a Nurse Practitioner (NP) and when conducted by a Physician Assistant (PA). Many tasks need to be completed during an H&P, including obtaining the patient’s medical/surgical history; getting information on the medication that the patient is taking and any allergies that the patient has; understanding the patient’s family and social history; taking a physical exam; and receiving consent for surgery from the patient.

**Findings from H&P**
An H&P can be conducted by either an NP or a PA. Of the data gathered, 24 H&P sessions were conducted by an NP, and 29 H&P sessions were conducted by a PA. The statistical data for the H&P is as follows:
Conducted by Mean H&P Session Length Standard Deviation
NP 29.9 minutes 16.7 minutes
PA 24.0 minutes 8.5 minutes

We were also able to determine the average total appointment time length, which was 123.18 minutes when the H&P was conducted by an NP and 93.8 minutes when the H&P was conducted by a PA. The difference in times between the NPs and PAs can be seen in the swim flowchart in Appendix E.

**Conclusions from H&P**
The reasons for the variation when the NP conducts the H&P were because of interruptions and the physical health of the patient. When a patient was in good health and did not have a long or complicated medical history, the process went much quicker than when patients were much older and had many complications. Not as much variation was seen in the times of the PA because the PAs are rarely interrupted during their session as the PAs were dedicated to conducting H&Ps only, whereas the NPs are responsible for many other tasks as well.

**Teaching Session**

Normally, an NP and a registered nurse (RN) can conduct a teaching session, which includes going through the logistics of the surgery, informing the patient about which medication to take before and after the surgery, symptoms that could occur, and resources at the hospital that are available to the patients.

**Findings from Teaching Session**

From the appointments that were analyzed, only RNs recorded that they had conducted the teaching session, so our team focused only on the 48 appointments done by registered nurses. The average time predicted was 20-30 minutes, and the mean time for the teaching session found from the time studies was 27.1 minutes with a standard deviation of 10.0 minutes. Our team also found much variation in the teaching session, as seen in Figure 2.
Conclusions from Teaching Session
The variation in the length of teaching sessions is due to the number of questions that the patient may have about his or her surgery. Also, the RNs have multiple responsibilities and tasks to accomplish, which can mean interruptions during the teaching session. Other Clinic employees may interrupt the RN to ask a question about another patient, or the RN may have to leave the exam room to answer a page; these interruptions are another reason for the variation in teaching sessions.

Appointment Sequence
After our team analyzed each component of the H&P appointment, we decided to study how one component affected each other and the entire appointment time. We investigated if the appointment length would change if the H&P or the teaching session was done before the other. Currently, there is no protocol for a specific order; the process is done based on the availability of the NPs and RNs.

Findings from Appointment Sequence
Currently, the H&P session can be done either before or after the teaching session since there is no standardization for the appointment sequence. We were able to collect data from 41 appointments where the H&P session was conducted before the teaching session and 35 appointments where the H&P session was conducted after the teaching session; the data showed the following:

<table>
<thead>
<tr>
<th></th>
<th>H&amp;P before Teaching</th>
<th>H&amp;P after Teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Appointment Time</td>
<td>108.8 minutes</td>
<td>113.7 minutes</td>
</tr>
</tbody>
</table>
Standard Deviation: 34.5 minutes 40.9 minutes
Mean H&P Session Time: 29.1 minutes 26.2 minutes
Mean Teaching Session Time: 29.4 minutes 29.2 minutes

Conclusions from Appointment Sequence
When the H&P followed the teaching session, the H&P appointment time was approximately ten minutes longer and had more variation. However, a possible reason for the difference in appointment lengths was that the H&P session was shorter as patients had the opportunity to ask many or all of their questions about the surgery in the teaching session before getting their physical.

Add-on H&P
The final part of the process that was analyzed was an add-on H&P, where a new patient would see a physician and then would have the H&P conducted right away and not have to schedule another appointment.

Findings from Add-on H&Ps
The unscheduled and unplanned add-on H&Ps created more work and delays in the process. During the time study, there were only four recorded add-on H&P events. The mean appointment length when the H&Ps were added on was 182.8 minutes with a standard deviation of 42.4 minutes, as seen in Figure 26 in Appendix D.

Conclusions from Add-on H&Ps
Our team developed these conclusions based on the very low sample size of add-on H&Ps. It is important to note that the inclusion of the physician visit added to the appointment length in an add-on H&P. However, the H&P and teaching sessions also took longer during an add-on H&P because more time was required to get all the information about the patient, and the employees had to work around the scheduled appointments. The add-on H&Ps also created extra stress on the employees as they rushed to find the necessary patient information.

Benchmarking
Our team felt benchmarking against other clinics to help identify where the bottlenecks are occurring in the Surgical Oncology Clinic’s H&P appointments.

Findings from Benchmarking
The Anesthesiology Clinic treats patients who have high risk problems that could complicate the anesthesia, or are anxious about anesthesia during surgery. This Clinic’s appointment process includes an H&P, but no teaching session. Appointments usually last 20 minutes and are scheduled 30 minutes apart with 3 appointments per time slot on the schedule. Although the Clinic deals with late patients and walk-ins daily, they rarely fall behind schedule or deal with long wait times. The appointments stay on time because every morning from 7:00 am until 9:00 am the clinic scheduler spends two hours putting together patient data for the day’s scheduled appointments. This data includes the patient’s consent, full H&P, and EKG for surgery. The clinic scheduler also finds any information on the patient’s medical history, previous doctor
records, and records from other hospitals. This information is then scanned into Centricity, the hospital’s software for patient data, and sent it to the anesthesiologists and residents working in the Clinic that day. Having these documents available allows everyone working in the clinic to know what needs to be done for each patient before the patients arrive that day.

Our team also benchmarked the Surgical Oncology Clinic against the General Medicine Clinic, located on Floor 3 Reception Area B of the Taubman Center in the University of Michigan Hospital. The General Medicine Clinic has a Medical Assistant Specialist who makes phone calls prior to a patient’s appointment to gather necessary information so that all necessary information is available to the physician during the patient’s appointment. This level of organization helps the General Medicine Clinic stay on schedule in regards to patient appointments. We also noticed that the General Medicine Clinic uses a Light System, similar to the one in the Surgical Oncology Clinic, to help keep employees aware of the current status of the appointment: a white light means that the patient is in the room waiting to see the physician, a green light means the physician is in the exam room, a red light means the patient is getting ready to leave or has left the exam room, and a yellow light means that the patient is in the exam room and needs assistance – such as an injection or a teaching session.

Conclusions from Benchmarking
Based on what we observed and discussed in the Anesthesiology Clinic and General Medicine Clinic, we concluded that both Clinics’ appointment processes run more efficiently than the Surgical Oncology Clinic’s appointment process. All three clinics deal with extraneous factors that could cause extreme slow downs in patient appointments. Due to the extra preparation time spent gathering information prior to the patient’s appointment in the Anesthesiology Clinic and the General Medicine Clinic, long wait times and appointments times are rarely an issue. The Light System in the General Medicine Clinic informed Clinic employees of the patient’s progress through the appointment process and minimized the time the patient waited between appointment components.

Recommendations
Our team was informed that it was not a viable option to reduce the number of patient appointments scheduled per day – this restriction means that the time allotted for H&P appointments cannot be extended. Keeping this restriction in mind, our team has developed multiple recommendations to improve the efficiency of H&P appointments based on our findings.

Create Appointment Coordinator Position

The biggest bottlenecks in the process are due to the significant wait times patients experience between the components of the H&P appointment; many of these wait times occur due to unplanned research that staff members must conduct upon realizing they don’t have the needed patient information. Therefore, our team recommends more daily preparation be done before patients’ appointments to reduce these wait times, which can be done by the coordinator. The Appointment Coordinator would gather the patient’s history information and previous test data, including x-rays, blood work, and surgeries. After the information is collected, it would then be
sent to everyone involved in the patient’s appointment. Having relevant patient information ahead of time would reduce the amount of time spent trying to find this information during the patient’s appointment, therefore reducing the patient’s wait time. This preparation would allow H&Ps and teachings to run more efficiently because NPs, MAs, PAs, and RNs would already know what needs to be done for the patient; for example, if Appointment Coordinator knew ahead of time that an EKG was needed, then the MA could perform it immediately after taking the patient’s vitals. This would eliminate the wait time that occurs when the EKG is performed later in the appointment.

**Standardize H&P Appointment Process**

Based on our observations, our team recommends standardizing the H&P appointment process. When the steps of the process are the same for each appointment, the Surgical Oncology Clinic staff will know what has been done and what still needs to be done during the patient’s appointment. The current process requires the patient to wait alone in the exam room between various parts of his or her appointment. If the appointment process were standardized, then staff members involved would know approximately when they would be needed to conduct their part of the appointment; for example, if the H&P was always after the MA takes vitals and before the teaching session, then the RN would know that he/she would be needed for the teaching session for an 11:30am appointment around 12:15pm.

**Further Investigate Add-on H&P**

As the sample size for Add-on H&Ps were very low during the time study, our team had difficulty analyzing and forming concrete conclusions. Therefore, our team recommends investigating the delays that occur when H&Ps are added on to the end of a patient’s appointment. Based on the interviews, an Add-on H&P creates unplanned work and disorganization for the nurses. Also, our data shows that an Add-on H&P unexpectedly increases the patient’s appointment time significantly. Once further investigation of the delays created by an Add-on H&P have been analyzed, the Clinic can determine whether the option of adding an H&P to the end of an appointment should be eliminated.

**Separate Check-in and Check-out Reception Desks**

The most significant wait time in the reception area was the time from when the patient finished his/her appointment to when he/she checked-out at the reception desk. The time needed to complete the check-out is longer than the time to check-in because patients need to schedule future appointments, chemotherapy sessions, or other tests (i.e. blood work or x-rays). Our team therefore recommends that the check-in desk be separate from the check-out desk. Separate desks will expedite the check-in process since the patients will no longer have to wait as patients checking out schedule their next appointments. Also, two clerical staff should be placed at the clerical check-out reception desk to prevent wait times that patients currently experience, and only one receptionist is needed at the check-in desk.
**Action Plan**

The Surgical Oncology Clinic should implement the above recommendations by hiring a Appointment Coordinator, standardizing the H&P appointment process, and separating the check-in and check-out receptions desks.

**Appointment Coordinator**

The Appointment Coordinator would need to have a background in medicine equivalent to that of a Medical Assistant to be able to handle patients who call with questions. The Surgical Oncology Clinic would need to complete a cost analysis to determine the cost benefits of increased productivity. The Clinic sees about 25 H&P patients per week; based on our calculations, if the Appointment Coordinator helped to reduce appointment times by 20 minutes per appointment, then this would save the Surgical Oncology Clinic over eight hours every week. Therefore, the Clinic would be able to see more patients and generate more revenue. Based on the information provided by the Clinic, it would cost $20,000-22,000 per year to create this new position. To determine the cost benefit of this new position, the clinic would need to determine whether the revenue of more appointments outweighs the cost of the position’s salary. However, our team was unable to determine this because the revenue for the H&P appointment is included in the patient’s surgery bill, therefore hard to extract as its own cost. This Appointment Coordinator position could be adjusted to a part-time position if it is seen that the revenue generated does not outweigh the costs. A part-time Appointment Coordinator would only work in the morning to gather and prepare patient medical information for the day’s appointments, which would reduce the annual salary.

**Standardization Plan for H&P Appointments**

To standardize the H&P appointment, the Clinic should create a protocol regarding appointment sequence. The teaching session should either always come before the H&P session or always after the H&P session. Creating a protocol for the appointment sequence will help keep Clinic employees aware of the patient’s progress through the H&P appointment. The Surgical Oncology Clinic should also incorporate the provided light system into the appointment process. The light system would make it clearly visible what step of the appointment the patient is currently in, thereby better communicating to employees what needs to be done next.

**Separate Check-in and Check-out Reception Desks**

To reduce wait times in line at the reception desk, the Surgical Oncology Clinic should have separate Check-in and Check-out desks. This recommendation does not require more staff, and therefore can be immediately incorporated into the Clinic’s reception area.
Appendix A: Flowchart of Surgical Oncology Patient Process
## Appendix B: Time Card

<table>
<thead>
<tr>
<th>DATE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
</tr>
</tbody>
</table>

### MA - Initial Patient Information
- Takes patient’s weight and height
- Takes patient into exam room
- Takes patient’s vitals
- Takes an EKG
- MA finishes and leaves room

### Comments:

### Physician Visit
- MD added on H&P

### Comments:

### H&P - NP or PA (Please circle your job title)
- H&P
- Number of interruptions/total time

### Comments:

### Teaching Session - NP or RN (Please circle your job title)
- Teaching session
- Number of interruptions/total time

### Comments:

### Patient leaves Exam Room to check out

- Check if it is an add-on H&P
Appendix C: Graphical Data Analysis of Wait Times

Figure 1: Histogram of Time Waiting between Arrival and Checking In

![Histogram (with Normal Curve) of Arrival to Check-In](image)

- Mean: 1.209
- StDev: 2.003
- N: 91

Figure 2: Histogram of Time spent at Registration Desk

![Histogram (with Normal Curve) of Check-In until Registered](image)

- Mean: 1.395
- StDev: 1.080
- N: 81
Figure 3: Scatter plot of Wait Time between End of Appointment and Check-out

Figure 4: Histogram of Waiting Time between Registering and Getting Vitals Done
Figure 5: Histogram of Waiting Time between Vitals and Being Taken into Exam Room

![Histogram (with Normal Curve) of Between Vitals & Appt. Start](image)

- **Mean**: 15.55
- **StDev**: 12.02
- **N**: 22

Figure 6: Histogram of Average Reception Area Wait Times

![Average Reception Wait Times](image)

- **Arrival to Check-In**
- **Registered until Vitals**
- **Between Vitals & Appointment Start**
- **End of Appt. until Check-Out**
Figure 7: Histogram of Wait Time between MA Leaving and Start of H&P

Figure 8: Scatter plot of Wait Time between End of H&P and Start of Teaching Session
Figure 9: Histograms of Wait Time between Teaching Session and Check out

Figure 10: Histogram of Wait Time between MA Leaving and Start of Teaching Session
Figure 11: Histogram of Wait Time between End of Teaching Session and Start of H&P

Figure 12: Histogram of Wait Time between End of H&P and Check out
Figure 13: Scatter plot of Wait Time before Taking an EKG

Figure 14: Histogram of Wait Time after EKG and Before Start of Appointment
Figure 15: Pareto Chart of Wait Time Components

<table>
<thead>
<tr>
<th>Components of Appointment</th>
<th>Count</th>
<th>Percent</th>
<th>Cum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching to H&amp;P</td>
<td>41.6</td>
<td>18.5</td>
<td>18.5</td>
</tr>
<tr>
<td>H&amp;P to Teaching</td>
<td>129.9</td>
<td>18.2</td>
<td>36.7</td>
</tr>
<tr>
<td>MA to H&amp;P</td>
<td>199.1</td>
<td>17.4</td>
<td>54.1</td>
</tr>
<tr>
<td>Teaching to Office (O)</td>
<td>9.1</td>
<td>9.4</td>
<td>71.4</td>
</tr>
<tr>
<td>H&amp;P to O</td>
<td>7.7</td>
<td>7.9</td>
<td>80.8</td>
</tr>
<tr>
<td>Office (O) to Teaching</td>
<td>21.2</td>
<td>7.3</td>
<td>88.7</td>
</tr>
<tr>
<td>H&amp;P to Teaching</td>
<td>7.2</td>
<td>4.1</td>
<td>95.9</td>
</tr>
<tr>
<td>Teaching to H&amp;P</td>
<td>16.3</td>
<td>4.1</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Appendix D: Graphical Data Analysis of H&P Process

Figure 16: Scatter plot of Appointment Length

Figure 17: Pie Chart of Appointment Times
Figure 18: Pareto Chart of H&P Process Components

![Pareto Chart of Components](image)

- **Defect Count**:
  - Teaching: 1841
  - H&P: 1692
  - MA: 420
  - EKG: 207
  - Other: 46

- **Percent**:
  - Teaching: 43.8%
  - H&P: 40.2%
  - MA: 10.0%
  - EKG: 4.9%
  - Other: 1.1%

- **Cum %**:
  - Teaching: 43.8%
  - H&P: 84.0%
  - MA: 94.0%
  - EKG: 98.9%
  - Other: 100.0%

Figure 19: Scatter plot of Process Time of Medical Assistant (MA)

![Individual Value Plot of Total MA Time](image)
Figure 20: Scatter plot of Process Time in Taking an EKG

![Individual Value Plot of EKG Time](image)

Figure 21: Scatter plot of Process Time of an H&P done by a Nurse Practitioner (NP)

![Individual Value Plot of H&P Time (min)](image)
Figure 22 Histogram of Process Time of an H&P Done by a Physician Assistant (PA)

Figure 23: Scatter plot of Process Time of Teaching Session Done by a Registered Nurse (RN)
Figure 24: Histogram of Total Appointment Length when H&P is done before Teaching Session

Figure 25: Histogram of Total Appointment Length when Teaching Session is done before H&P
Figure 26: Total Time when H&P is Added On to End of Appointment
Appendix E: Swim Flowchart for Appointment Process

Appointment Process when PA conducts H&P

Appointment Process when NP conducts H&P
Appendix F: Value Stream Map of H&P Appointment Process