

University Hospital Preoperative Patient Flow & Work Flow Analysis

Final Report

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Executive Summary

Introduction

Many patients in the University Health System (UHS) arrive in the Preoperative (Pre-Op) unit without complete Surgical History & Physical (H & P) forms, consent forms, and Pre-Op medication or testing orders. Missing patient information causes delays in the surgical process and creates extra work for those involved. There is also concern that the lack of interaction between Pre-Op nurses, surgical services, and anesthesiologists is contributing to longer process times and deficiencies in the flow of patient information.

The purpose of this final report is to describe the methods used to observe these areas of concern and to present the quantified findings. The report also includes the team's analysis and conclusions of the findings as well as recommendations to improve process times and communication between Pre-Op Nursing, Surgical Services, and Anesthesiology.

Project Goals and Objectives

The goal of this project was to develop the value stream for the Pre-Op process, which includes:

- Determining the impact of missing information on the process time
- Determining the communication triggers between Pre-Op Nursing, Anesthesia, and the surgical services
- Determining the patient flow and work flow when all patient information is complete versus the flow and rework when patient information is incomplete

From developing the value stream, the team established:

- Factors contributing to incomplete patient information
- How frequently delays are occurring
- The impact of delays

Methodology

The team collected data by following patients through the entire Pre-Op process, starting with arrival at the bed, and ending when exiting into the OR. The team also recorded whether the patient's H & P, consent form, and medication and test orders were present when the patient arrived in Pre-Op. In addition, the Pre-Op clerk assisted in recording occurrences of missing information, and times when the services were contacted to complete patient information. Data was collected for 48 patients being operated on by Urology, Orthopedics, Plastic surgery, and General gastrointestinal surgery.

Findings

- Unobserved staff perceptions
 - The Pre-Op clerk will page the surgical service to complete patient information if necessary.
 - Surgeons leave medication and test orders at the patient's bedside after the nurse assessment is complete.
 - Unnecessary test orders cause delays.
- Frequency of missing information

- 81% of observed patients were missing at least one piece of information.
- Urology patients were missing at least one piece of information in 100% of the observed cases.
- Impact of missing information
 - No correlation between missing information and time spent in Pre-Op.
 - Patients without complete information generally spent *less* total time in Pre-Op, but required more time from the clerks, nurses, surgeons, and anesthesiologists.
 - No correlation was found between missing information and late surgery starts.
- Patient and Work Flow
 - No difference was found in patient flow or work flow when all information was present versus not present.
 - Examples were found of patients with incomplete information spending the same amount of time in Pre-Op as patients with complete information.
- Additional observations
 - Approximately 24% of patients arrive into Pre-Op late.
 - Patients that arrive late into the Pre-Op spent 28 minutes less than patients that arrived on time.
 - 77% of surgeries started after their scheduled start time.

Conclusions

- Impact of Missing Information
 - Missing information impacts employees by requiring extra time to locate missing information, and rework may be necessary.
 - Workload increases when information is missing, but does not correlate with longer total time in Pre-Op.
- Patient and Work Flow – Complete Versus Incomplete Information
 - Surgeons are not alerted of missing information, so they always visit the patient's bedside, and any incomplete information is completed during one of those visits.
- Additional observations
 - Late Pre-Op arrival patients spend less time in the Pre-Op process, due to the staff awaiting their arrival and the patient being seen more quickly.
 - Late surgery starts compound throughout the day.

Recommendations

- Standardize data entry process across all services
 - Consistent use of Centricity and naming conventions for forms
 - Use electronic forms whenever possible
 - Information will be easier to find, and wasted time will be decreased.
- Educate services about negative effects of missing information
 - Missing information increases service visit time with patients in Pre-Op.
 - Persuade process flow improvement.
- Encourage services to consolidate and standardize patient visits
 - Minimize patient visit time by consolidating multiple visits.
 - Services should arrive earlier to eliminate chance of last minute complications.
 - Service time will decrease, and the patient will receive better quality service.

Introduction

Many patients in the University Health System (UHS) arrive in the Preoperative (Pre-Op) unit without complete information for their surgery. A specific area of concern is incomplete or absent Surgical History & Physical (H & P) forms, consent forms, and Pre-Op medication or testing orders. Missing patient information causes delays in the surgical process and creates extra work for those involved. Another area of concern is the interaction between Pre-Op nurses, anesthesiologists, and the surgical services and the coordination of triggers between them. Therefore, the Manager of the Pre-Op and Post-Anesthesia Care Unit (PACU) requested the student team observe the process, collect data, and create a value stream of the pre-op process to determine how missing patient information and a lack of interaction between entities affects the Pre-Op process. This report details the findings and conclusions made by the project team.

Goals and Objectives

The goal of this project was to develop the value stream for the Pre-Op process, which includes:

- Determining the patient flow and work flow when all patient information is complete versus the flow and rework when patient information is incomplete
- Determining the impact of missing information on the process time
- Determining the communication triggers between Pre-Op Nursing, Anesthesia, and the surgical services

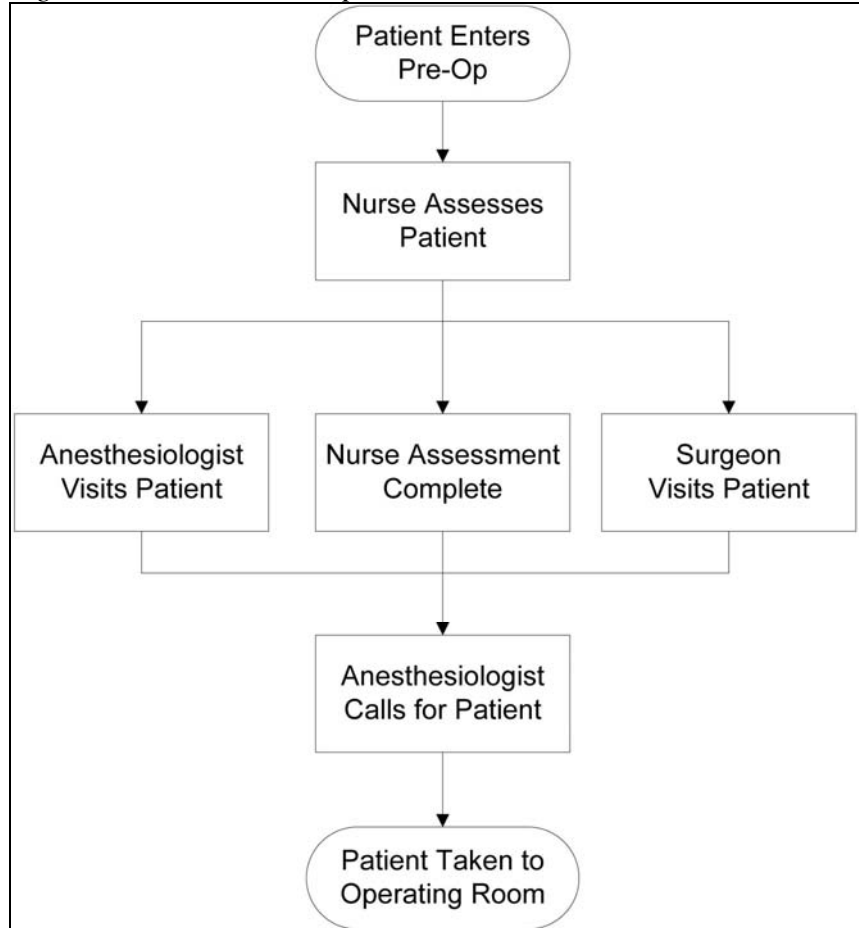
From developing the value stream, the team established:

- Factors contributing to incomplete patient information
- How frequently delays are occurring
- The impact of delays

Background

The flowchart in Figure 1 depicts a high-level description of the Pre-Op process as observed by the project team during observational and pilot testing periods.

Figure 1 – General Pre-Op Process Flowchart



As displayed in Figure 1, the Pre-Op process includes the following events:

- Before the patient arrives, the Pre-Op clerk organizes existing patient documents and flags what information is missing or incomplete.
Potential variation: The clerk typically assumes that the surgical services are aware of the need to complete missing information and therefore makes no effort to contact them. On some occasions, depending on the service and surgeon, the clerk doesn't assume services are aware of missing information. In these situations the clerk sends a page to inform the service that patient information is incomplete.
- The Pre-Op charge nurse assigns the patient to a Pre-Op bed and delivers all patient documents to the bedside.
- The patient enters the UH Pre-Op unit after being notified by the Pre-Op waiting room (if not an In-Patient) and changes into a hospital gown at the bedside, if necessary.
Potential variation: In-Patients will be brought directly to their Pre-Op bed from their previous location in the hospital system, and are not brought into the Pre-Op waiting room process.
- The Pre-Op nurse performs the Nurse Assessment.

Potential variation: If med or test orders are required, the nurse may also draw blood, start an IV, shave the surgical site, etc. in addition to the standard nurse assessment. Also, if information is missing, the nurse may look for it in Centricity instead of waiting for the service to complete it.

- A representative from the service visits the patient to complete any incomplete or missing information and discuss the surgical procedure.

Potential variation: The process of the service completing the missing information and adequately assessing the patient often requires multiple visits by both residents and attending surgeons.

- A representative from anesthesiology visits the patient to discuss the anesthesia plan for the surgery and begin potential pre-surgery anesthesia procedures.

Potential variation: The anesthesiology process varies greatly between patients depending on the surgical and pre-surgical anesthesia plan, how the patient reacts to the procedures, or if any meds or tests are required before procedures can begin. This process often requires multiple visits from anesthesiology representatives.

- Anesthesiologist calls for patient to be brought into the OR.

Potential variation: Sometimes in the case of pre-surgical anesthesia procedures, the anesthesiologist is already with the patient in Pre-Op immediately prior to entering the OR. Therefore the need to call the patient into the OR is eliminated.

- Patient exits the Pre-Op unit and is taken to the OR.

Methodology

To analyze the patient flow and work flow, the team examined the Pre-Op processes for Urology, Orthopedic, Plastic, and General Surgery Gastro-Intestinal (SGI) services. The primary parties involved in this project include registered nurses, resident and attending anesthesiologists and surgeons, clerks, and administrative staff.

The project scope included:

- Tasks or activities that occur while the patient is in the Pre-Op unit
- Services including Urology, Orthopedic, Plastic Surgery, and SGI
- Identification of deficiencies in work and information flow
- Recommended improvements in the process

The project scope excluded:

- Tasks or activities that occur in the operating room or Post-Op
- All services except Urology, Orthopedic, Plastic Surgery, and SGI

This project included three phases: familiarization with the Pre-Op process, data collection, and data analysis.

Step 1: Identified the Preoperative Process and Determined Areas of Focus

The team performed the following tasks to gain background knowledge about the Pre-Op unit:

- Reviewed a previous senior design report, *Analysis of Patient, Information, and Work Flow in the University of Michigan C.S. Mott Children's Hospital Preoperative Area*, obtained from the project coordinator.
- Attended an introduction meeting and walk-through of the Pre-Op unit with the Manager of University Hospital Pre-Op and PACU.
- Conducted impromptu interviews with the Pre-Op unit nurses and staff.

Step 2: Determined Data Collection Process

The team performed the following tasks to determine the most effective means of collecting information and workflow data in the Pre-Op unit:

- Followed patients through the entire Pre-Op Unit, starting with arrival at the bed, and ending when exiting into the OR.
- Constructed a data collection sheet, made up of the specific data collection points discussed with the Pre-Op manager (see Appendix A).
- Performed 6 man-hours of trial data collection, reviewed the ease of use of the data collection sheet, and modified the sheet as necessary.
- Discontinued use of the standard data collection sheet and instead used a dynamic method of recording process details.
- Obtained the clerk's assistance in recording occurrences of missing information and communication with the services.
- Increased communication with staff and nurses by asking for helping identifying staff members to maintain an understanding of observed processes.

Step 3: Performed Data Collection

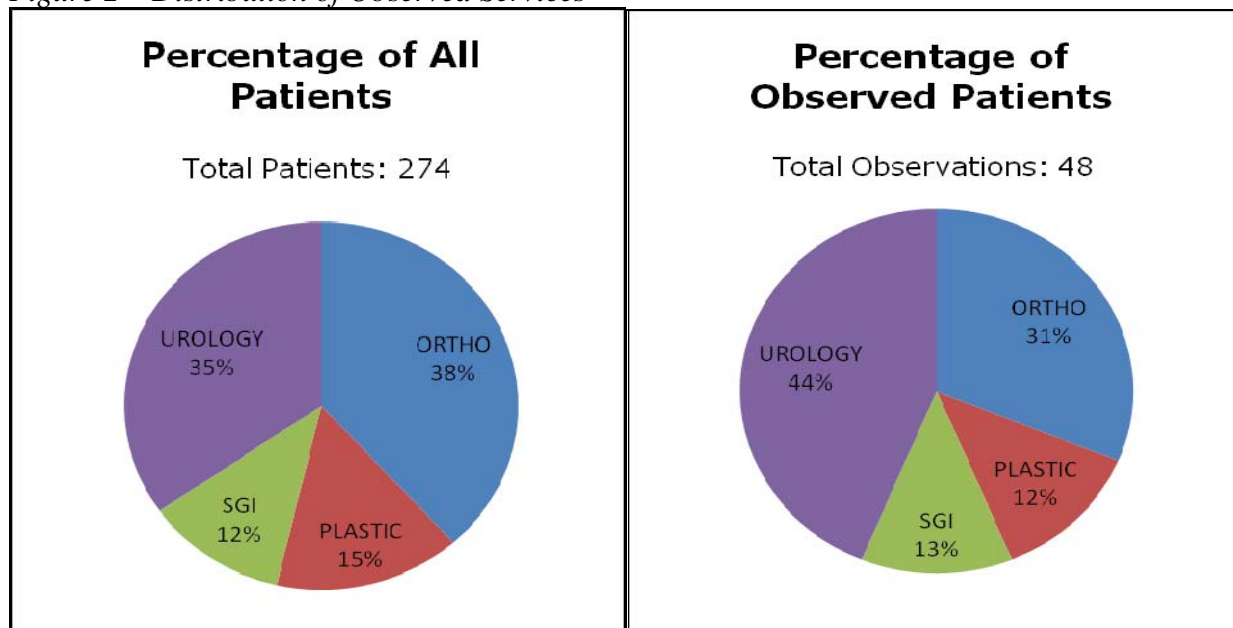
The team and Pre-Op clerks collected data from October 24 to November 21 and observed 34 patients pass through the entire Pre-Op process. The team also collected data regarding missing information for an additional 17 patients to increase the sample size of missing information statistics. Data collection was limited to 1 or 2 entire patients per visit due to long patient times in the system and needing to document simultaneous events as they occurred. In addition to recording missing information, the team observed the interactions between Pre-Op nurses, the services, and anesthesiology.

The team distributed data collection shifts between morning (7 – 12), early afternoon (12 – 2), and late afternoon (2 – 5) to remove any sampling bias. The team performed the following tasks:

- Performed a time study of the Pre-Op process. Data points recorded were patient clothes change time, nurse assessment time, patient wait time, total service visit time, total anesthesiologist visit time, and total time in the system.
- Recorded missing or incomplete H & P forms, patient consent forms, and medical orders when the patient entered the Pre-Op unit.

As stated in Step 2, the clerks collected missing patient information and service call data for nine days, between November 6 and November 16 (weekends excluded). The clerks collected data regarding missing information and service calls to complete that information for all patients of all services, which were complied by the team regularly each week. The team used data from 274 patients from this clerk data to determine the distribution of services as shown in Figure 2.

Figure 2 – Distribution of Observed Services



Source: IOE 481 Project Team 3 Observations Dates: October 24, 2007 to November 21, 2007 Sample Size: 274 All Patients, 48 Observed Patients

The chart on the left indicates the distribution of services for the 274 patients observed by the clerks. The right chart indicates the distribution of services for the patients observed by the team. These charts were used to ensure that the team's data was representative of the actual distribution of surgeries.

Step 4: Analyzed Data and Developed Process Improvement Recommendations

The team compiled all observed and clerk-logged data, and performed the following tasks:

- Calculated mean and standard deviation times for each step in the Pre-Op process.
- Calculated the frequency of missing or incomplete information upon entering Pre-Op.
- Created swim lane diagrams (Appendix B) to exemplify variation between patients.
- Identified deficiencies in the process and information flows, and specific breakdowns in communication between employees and calculated their effect on the patient.
- Developed an action plan for improving the process at specific points, where applicable (see recommendations section below).

Findings

After collect and compiling data from 48 patients, the team observed the following information.

Overall Variability Between Patients

The steps of the Pre-Op process occur differently for every patient. This variation leads to difficulty identifying a single factor as the general cause for patient delays or late exits from the Pre-Op. Appendix B contains six swim lane diagrams that depict the irregularity of the process:

- All information present – Limited stay in Pre-Op

- Missing information – Limited stay in Pre-Op
- All information present – Extended stay in Pre-Op
- Missing information – Extended stay in Pre-Op
- All information present – Variation in Pre-Op process
- Missing information – Variation in Pre-Op process

These six patient swim lane diagrams were chosen to emphasize the trouble assigning a single factor, specifically missing information, as a general cause for patient delays or late exits. For example, the diagrams show the complexity that can occur when multiple personnel are simultaneously attending to the patient. Also, the swim lane diagrams depict other observed instances that can contribute to delays. Some of these instances captured by the swim lane diagrams are:

- Security needing to be called to handle valuables
- Nurse having to conduct a pregnancy test
- Nurse having difficulty inserting the IV
- Anesthesiologist performing lengthy procedure
- Surgeon having to return to mark the surgical site on the patient
- OR not ready

The overall variability of the Pre-Op process is reflected in the data of the total time spent in Pre-Op. The large standard deviations of the times are indicative of the volatility of the process. The observed data, as well as data from ORMIS can be found in Table 1 below. This table also serves as a form of validation, as the observations are similar.

Table 1 – Total Time Spent in Pre-Op: Observed vs. ORMIS

	Observed Time in Pre-Op (Min)		ORMIS Time in Pre-Op (Min)	
Services	Average	St. Dev	Average	St. Dev
Ortho	99.8	19.8	129.1	90.9
Plastic	91.8	67.7	69	14.9
SGI	68.0	8.9	70.7	18.5
Urology	78.6	36.1	83.7	24.1
All	86.1	35.5	97.2	47.4

Unobserved Initial Staff Perceptions

After the team's initial meeting and walk through of the Pre-Op unit, the staff communicated several perceptions on the current state of numerous Pre-Op events. Several of these perceptions were observed by the team, and therefore could not be confirmed by this report.

Firstly, Pre-Op management expressed that if a patient is missing information, their surgeon is usually called or paged to come to the patient's bedside to complete that information. However, the team observed that in the majority of cases, the clerk did not communicate with the services, assuming that they were aware of the missing or incomplete information. Instead, the first time a representative from the surgical service stopped by the patient's bedside in Pre-Op, they would learn of any incomplete information and complete it at that time.

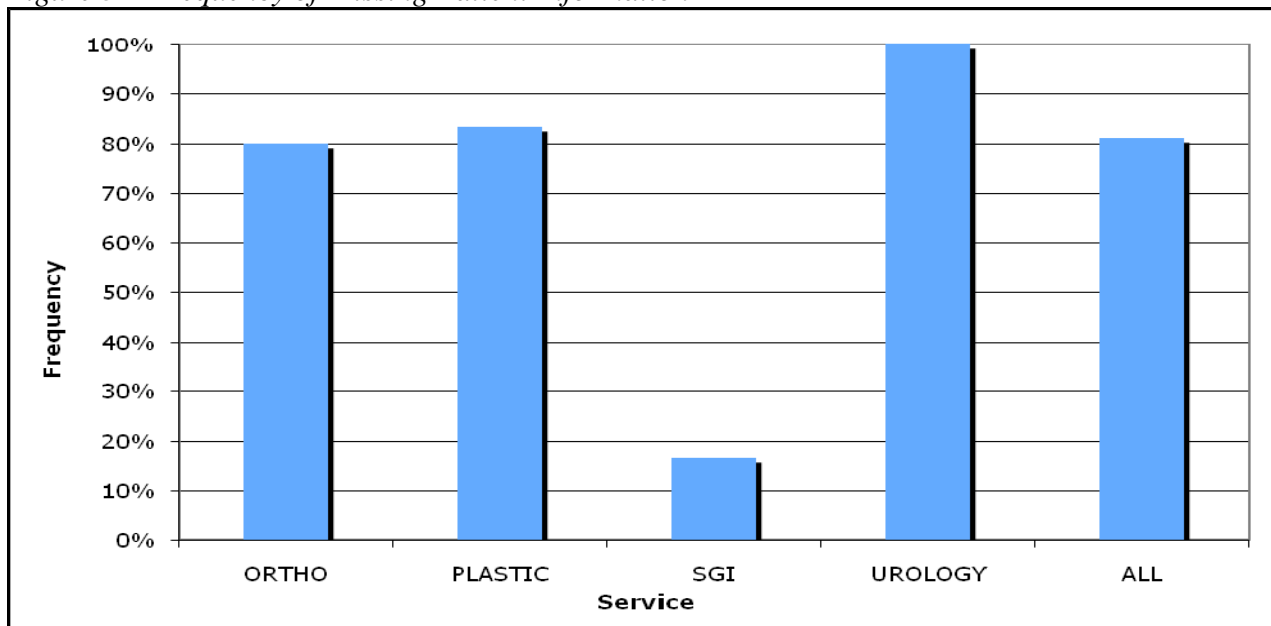
Also, the staff stated that there is a problem with surgeons leaving medication orders or test orders at the patient's bed after the nurse has completed the assessment. As a result, these late orders are often overlooked, which can delay the surgery. The team did not observe any late orders for any of the 34 complete patient observations.

Finally, the Pre-Op staff was concerned that unnecessary test orders may cause delays. An unnecessary test order is an order that was completed but later determined not to be necessary. There were no unnecessary test orders observed by the team during data collection.

Frequency of Missing Information

As seen in Figure 3, most of the observed services had at least an 80% occurrence of patients entering Pre-Op with at least one piece of missing or incomplete information, with the exception of SGI. Urology had the most frequent missing information, occurring in 100% of the observations. Overall, the average of all services was 81% of patients having at least one piece of missing or incomplete information.

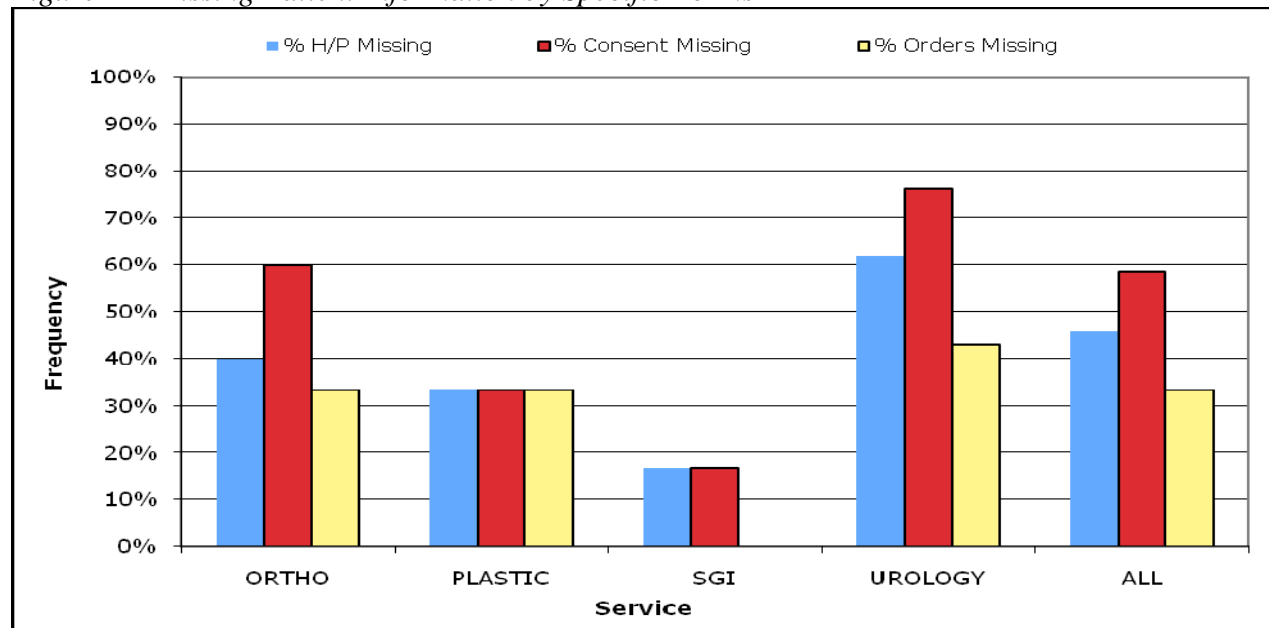
Figure 3 – Frequency of Missing Patient Information



Source: IOE 481 Project Team 3 Observations Dates: October 24, 2007 to November 21, 2007 Sample Size: 15 Ortho, 6 Plastic, 6 SGI, 21 Urology, 48 Total

Figure 4 further stratifies the above information by indicating the frequency of each piece of missing information for each service. The patients' consent form was the most common piece of missing information, while medication and test orders were the least frequent.

Figure 4 – Missing Patient Information by Specific Forms



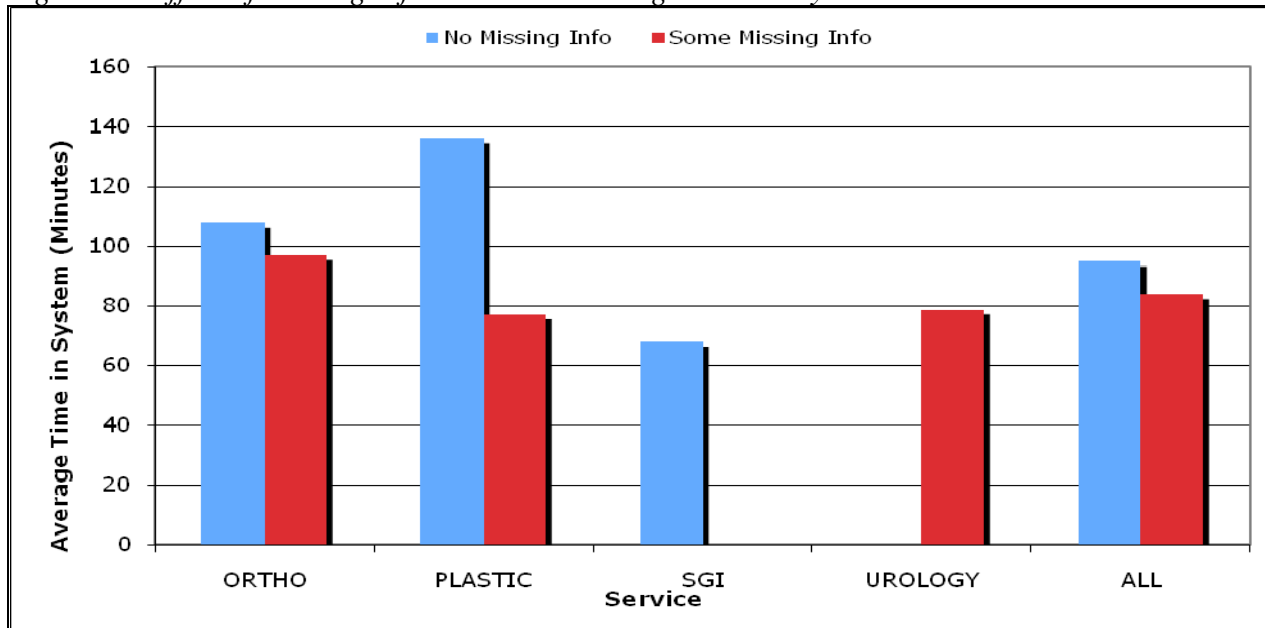
Source: IOE 481 Project Team 3 Observations Dates: October 24, 2007 to November 21, 2007 Sample Size: 15 Ortho, 6 Plastic, 6 SGI, 21 Urology, 48 Total

A possible cause for the high frequency of missing consent forms is that there is no standard trigger in place to alert the surgical service that a new consent form is needed before they arrive that the patient's pre-op bed. Another potential reason is that H & P forms are only valid for 30 days, and there is no trigger in place to alert the surgical staff that the patient needs an updated H & P before they arrive in Pre-Op. An specific, pre-surgery appointment is often required to complete the H & P, and if the patient misses that appointment or it was never scheduled, the patient will arrive in Pre-Op without their H & P. A patient's medication and test orders may be missing because it is not the standard procedure of the service to complete that work ahead of time, or because that the patient's required tests were not anticipated before the day of surgery.

Impact of Missing Information

Through observations, the team was not able to establish a direct correlation between missing information and the average time a patient spends in the Pre-Op unit. Across all of the four services that the team examined, the average patient spent less time in the Pre-Op if they were missing any information. Figure 5 demonstrates this increased time spent in the Pre-Op when no information is missing.

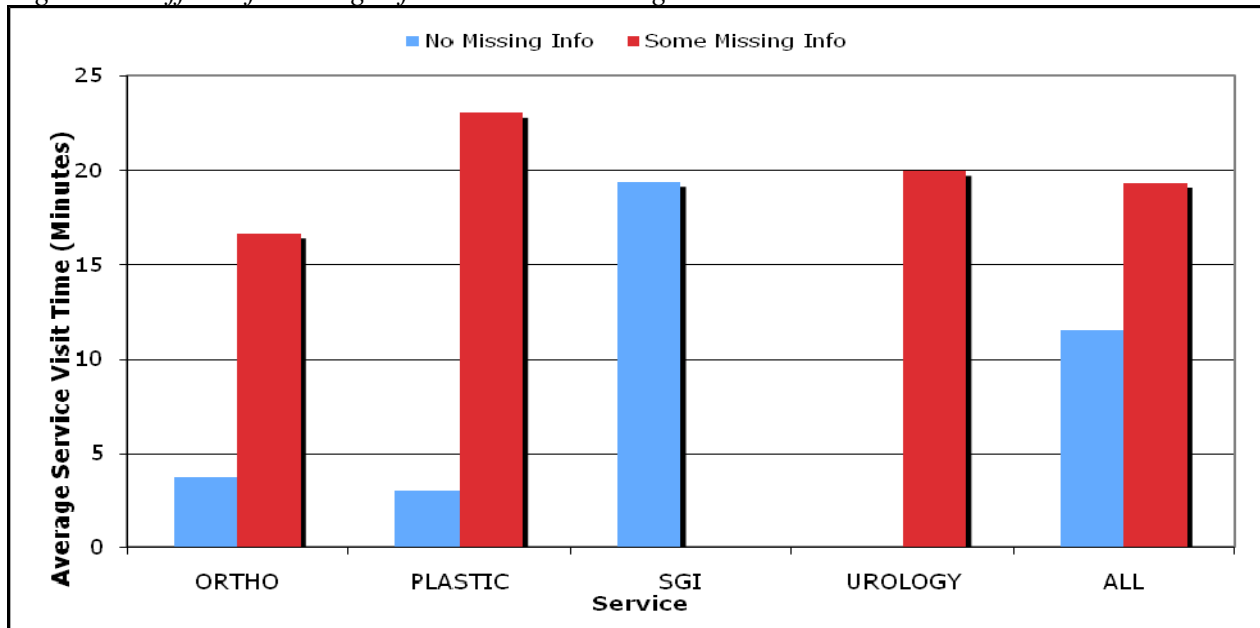
Figure 5 – Effect of Missing Information on Average Time in System



Source: IOE 481 Project Team 3 Observations Dates: October 24, 2007 to November 21, 2007 Sample Size: 11 Ortho, 4 Plastic, 3 SGI, 16 Urology, 34 Total

A more direct effect of missing information can be seen in its impact on the time a patient with missing information ends up spending with service staff. This increased time spent with service staff could be attributed to completing the missing information. As shown in Figure 6, the amount of increased attention required when information is missing depends upon the service. For example, orthopedics and plastic surgery have significantly large increases (over 400%) in the amount of time that service staff spends with the patient when information is missing. However, SGI spends close to the same amount of time with their patients when there is no missing information versus when there is missing information.

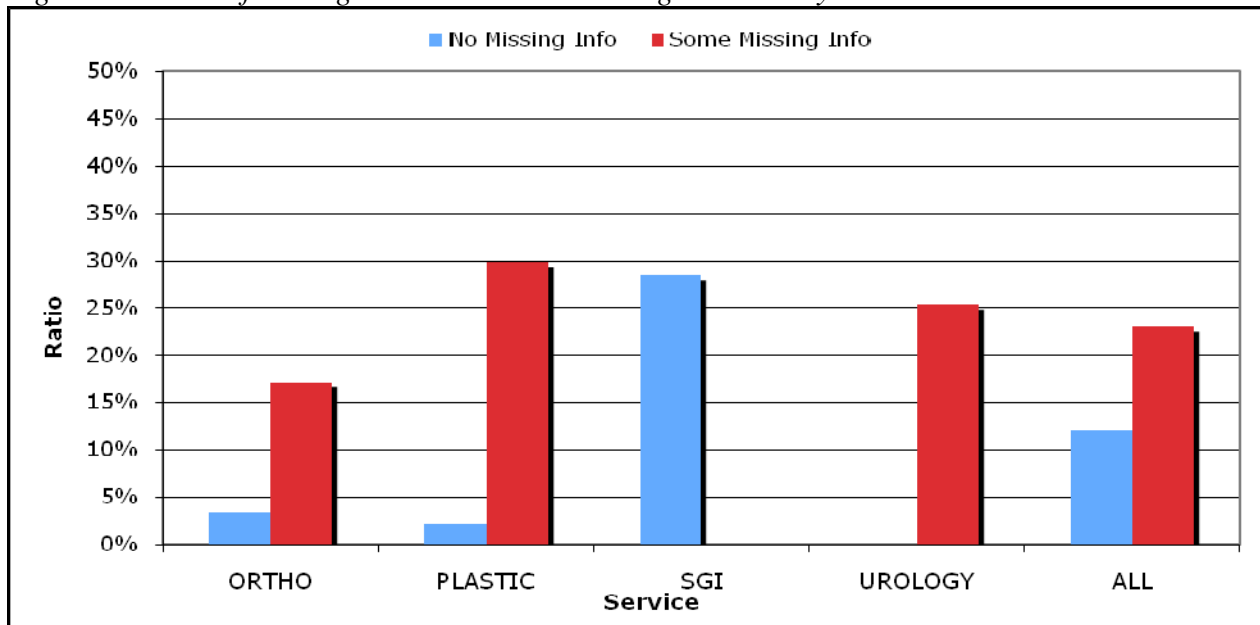
Figure 6 – Effect of Missing Information on Average Service Time



Source: IOE 481 Project Team 3 Observations Dates: October 24, 2007 to November 21, 2007 Sample Size: 11 Ortho, 4 Plastic, 3 SGI, 16 Urology, 34 Total

Patients with missing information were observed to spend less time in the Pre-Op, and more time with staff from their service. This results in patients with missing information spending a greater portion of their visit with their surgical staff, as shown in Figure 7.

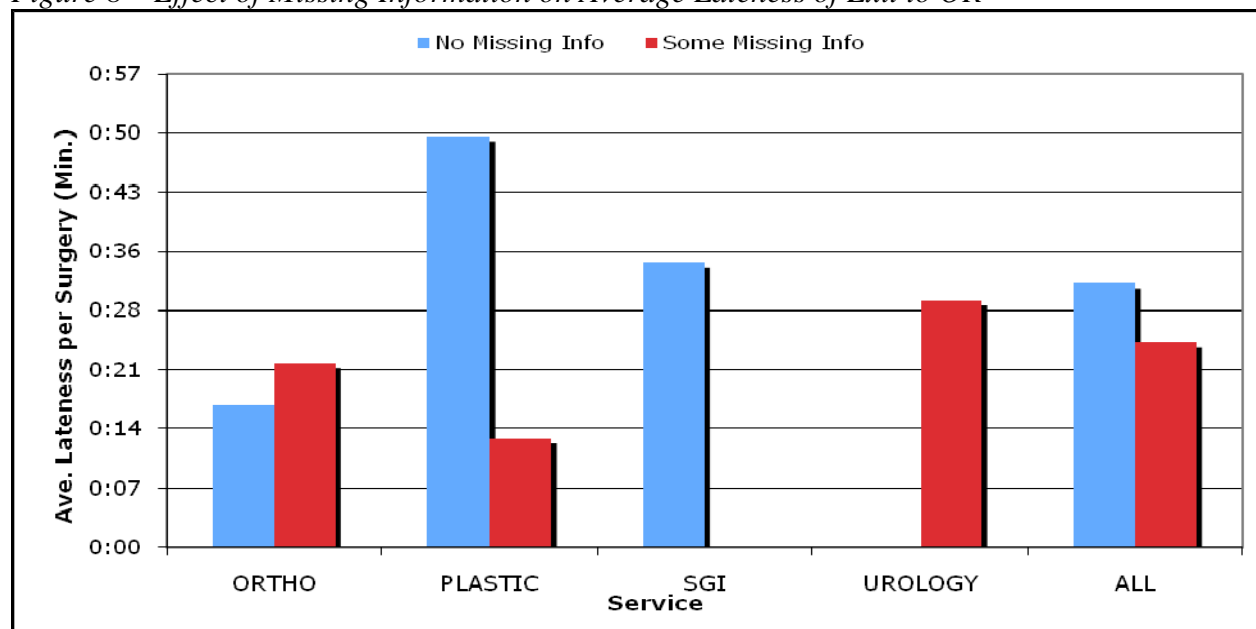
Figure 7 – Ratio of Average Service Time to Average Time in System



Source: IOE 481 Project Team 3 Observations Dates: October 24, 2007 to November 21, 2007 Sample Size: 11 Ortho, 4 Plastic, 3 SGI, 16 Urology, 34 Total

Ultimately, there is no direct correlation between late surgery start times and whether the patient had missing information, which is depicted in Figure 8.

Figure 8 – Effect of Missing Information on Average Lateness of Exit to OR



Source: IOE 481 Project Team 3 Observations Dates: October 24, 2007 to November 21, 2007 Sample Size: 10 Ortho, 4 Plastic, 3 SGI, 16 Urology, 31 Total

Missing information can impact the Pre-Op process in different ways as well. For example, if a medication order was missing, and the patient requires a new medicine due to complications, the late administration of this medication can cause a delay in the process. Another example is that the anesthesia procedures can not be started unless the consent is completed. Anesthesia is not alerted ahead of time that the consent form is missing, so when the anesthesiologist arrives to perform the procedure, they are not able to begin. Therefore, missing information can increase the chance of a delay in the process, especially when the problem is discovered later in the patient's Pre-Op visit. Furthermore, according to the team's project coordinator, anesthesiology has no specific trigger to know when the patient is ready for their services. They typically assume that the nurse assessment and any incomplete forms will be completed about half hour after the patient is admitted into the Pre-Op, and schedule their visits accordingly. Since the average nurse assessment time observed by the team was 21 minutes, it is implied that the patient would almost always experience wait time in cases where there is no delay caused missing information.

Information that is required on the patient forms also has an impact on rework required. Similar information is required on the nursing assessment form, H&P, and consent form, which leads to overlapping information between forms. Also, staff asks similar questions when they visit with the patient. These questions can become redundant, as each staff member asks questions, and multiple people from each staff class (nurse, surgeon, and anesthesiologist) may be present. However, ultimately, this redundancy serves as a safety net to reduce the chance of mistake and ensure quality.

Patient and Work Flow – Complete Versus Incomplete Information

After analyzing the collected data, the team determined that there is no discernable difference in patient or work flow whether or not all information is present. Regardless of missing information, members of the surgical team are at the patient's bedside at various times in the process for consultations, explanations of procedures, and last minute questions. If there happens to be any incomplete information, it is simply attended to during one of those visits. It was difficult to observe exactly when a surgeon was completing missing information because it is usually not actively acknowledged. The observed surgeons were not alerted when information was missing or incomplete, so they are accustomed to completing this information at the patient's bedside at the last minute.

According to Figure 5 above, missing information generally results in a shorter average time spent in Pre-Op. For the average of the four services, patients with missing information spent approximately 10 to 15 minutes less in the Pre-Op area than patients with complete information. However, the swim lane diagrams in Appendix B show examples where patients with all information present and patients with missing information both spent nearly the same amount of time in Pre-Op, which was more than two hours. While the data seems to suggest that missing information is linked with a shorter time in the system, there are several examples that do not follow this trend.

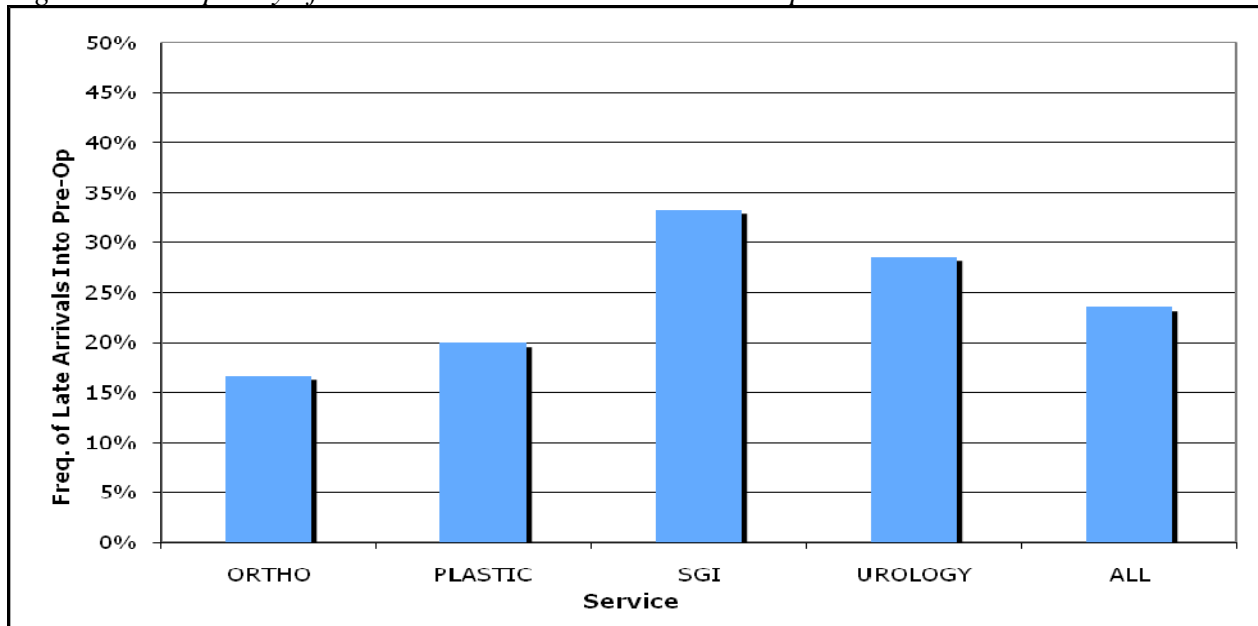
Additional Observations

During the data collection period, the team observed other factors of concern in the process.

Patient Arrives Late into Pre-Op

Generally, patients are instructed to arrive at the hospital 90 minutes before their scheduled surgery time. If the patient is brought into Pre-Op less than 45 minutes before their surgery time, they are defined as late. Figure 9 below displays the frequency of these late arrivals into the Pre-Op unit.

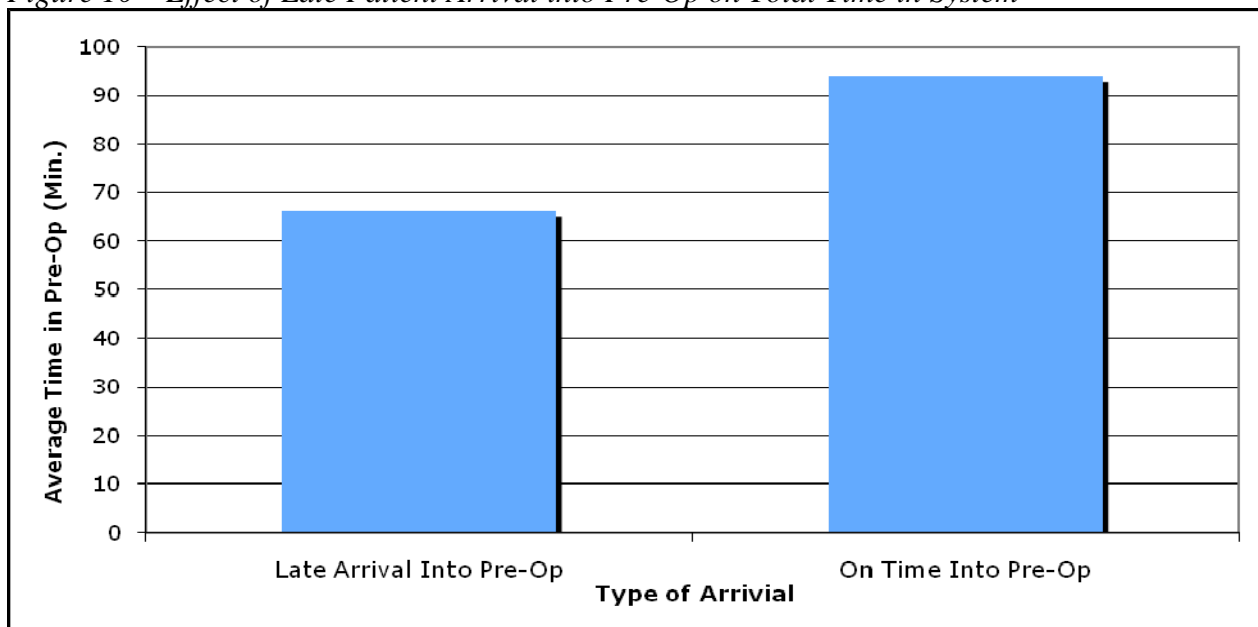
Figure 9 – Frequency of Late Patient Arrivals into the Pre-Op



Source: IOE 481 Project Team 3 Observations Dates: October 24, 2007 to November 21, 2007 Sample Size: 12 Ortho, 5 Plastic, 3 SGI, 14 Urology, 34 Total

There was a direct correlation between patient arrival and time spent in the Pre-Op, as seen in Figure 10 below. On average, patients who arrived late spent 28 minutes less in Pre-Op than on-time patients. One explanation for this trend is that the staff could be waiting for the patient and thus they are seen quicker. However, late patients cause delays in surgery start times, which later have a compounding effect throughout the day.

Figure 10 – Effect of Late Patient Arrival into Pre-Op on Total Time in System

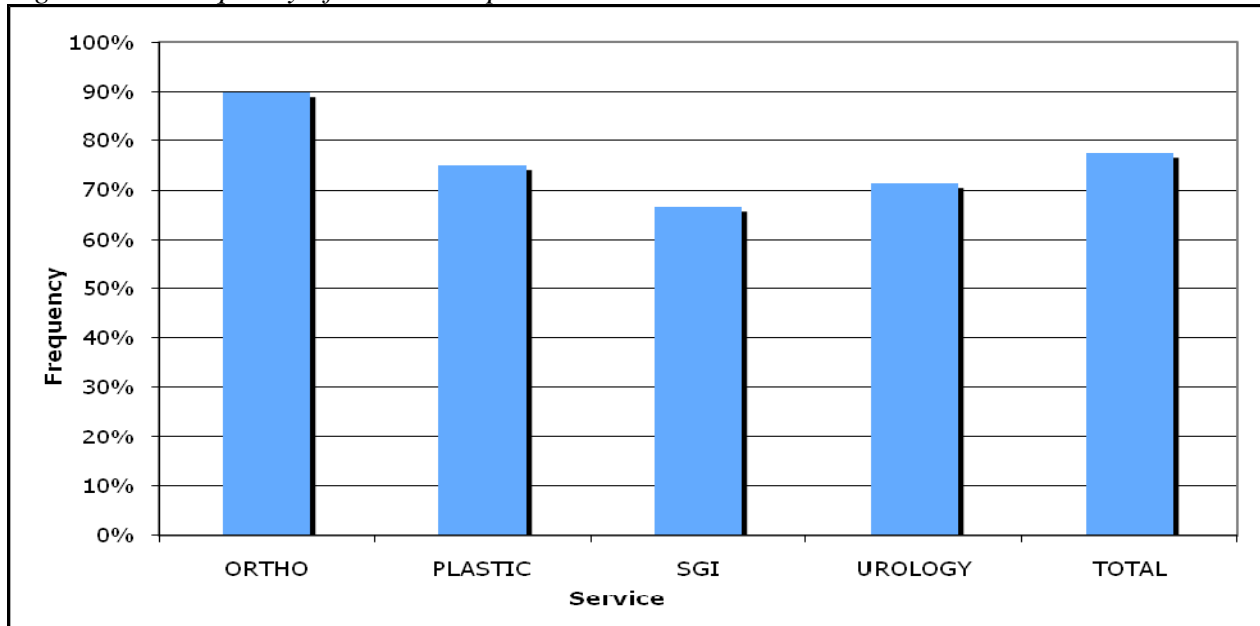


Source: IOE 481 Project Team 3 Observations Dates: October 24, 2007 to November 21, 2007 Sample Size: 8 Late Arrivals, 26 On Time Arrivals, 34 Total Arrivals

Patient Exits Pre-Op Late

Frequently, patients are late leaving Pre-Op to enter the operating room. Late exits are defined as when the time that the patient leaves Pre-Op is later than the scheduled start time of their surgery. Figure 11 displays the frequency of late OR arrivals by service, with an overall average of 77% of observed surgeries starting late.

Figure 11 – Frequency of Late Pre-Op Exits Into OR



Source: IOE 481 Project Team 3 Observations Dates: October 24, 2007 to November 21, 2007 Sample Size: 10 Ortho, 4 Plastic, 3 SGI, 14 Urology, 31 Total

Late exits are especially problematic because one surgery starting late results in all the subsequent surgeries scheduled in that room on that day starting late as well. There is no clear correlation between missing information and patients exiting the Pre-Op late, which suggests that this observation is a symptom of a larger problem.

Summary of Findings

- 81% of patients had at least one piece of missing or incomplete information.
- Patients with missing or incomplete information spend 11 minutes less in Pre-Op than patients with complete information.
- Patients with missing or incomplete information spend 68% more time with their service in the Pre-Op.
- Missing information causes no observable difference in work flow.
- No relationship between time spent in Pre-Op and missing information.
- No direct correlation between missing information and patients exiting the Pre-Op late.

Conclusions

From the findings, the team has determined the following conclusions regarding the frequency and impact of missing information, and how it impacts patient flow and work flow.

Frequency of Missing Information

Patients come into Pre-Op with at least one piece of missing information 81% of the time. Urology has the most frequent occurrence of missing information, with nearly a 100% rate, while SGI is the least frequent with a rate of 17%. The most common information to be missing is a consent form, and the least common is medication and test orders.

Impact of Missing Information

No correlation was established between missing information and time spent in the Pre-Op unit. In fact, patients with missing information spend less time on average in Pre-Op, however, time spent with the clerks, nurses, surgeons, and anesthesiologists increases when information is missing. As a result, the proportion of time that patients with missing information spend with their service is increased.

Also, missing information can impact employees. Extra time is required to locate missing information, and rework may be necessary.

Patient and Work Flow – Complete Versus Incomplete Information

There is no difference in patient or work flow when all information is present versus if there is missing information. Since they always visit the patient's bedside in Pre-Op, the surgeons are not alerted of any missing information. Any missing or incomplete information is then completed during one of those visits, if necessary. In general, missing information seems to be linked to a shorter time spent in Pre-Op, although the team observed examples where the opposite was true.

Additional Observations

The team made the following conclusions about the additional observations:

Patient Arrives Late Into Pre-Op

There is a direct correlation between late patient arrivals and the respective time spent in Pre-Op. Late arrival patients spent 28 minutes less in the Pre-Op process. This relationship may be due to the staff awaiting their arrival and the patient being seen more quickly.

Patient Exits Pre-Op Late

Overall, 77% of patients leave Pre-Op later than their surgery's scheduled start time. Late exits are extremely problematic because these late starts compound throughout the day, resulting in all surgeries starting late. There is not a clear correlation between patients with missing information and patients who exit Pre-Op late.

Recommendations

The team has generated following recommendations to help improve patient and information flow in the Pre-Op unit.

Standardize Data Entry Process Across All Services

The team recommends consistent use of Centricity and naming conventions for forms. Also, the use of electronic forms whenever possible is highly encouraged, to eliminate rework generated by paper copies. Consistency will make completed information easier to find. Also, it will decrease wasted time and work spent searching for forms.

Educate Services About Negative Effects of Missing Information

The team recommends that services be educated on how missing information negatively affects time spent with patients per surgery. The finding that missing information increases the overall time services visit with patients in the Pre-Op unit can be used to persuade information flow improvement.

Encourage Services to Consolidate and Standardize Service Visits

Surgical services should attempt to minimize patient visit time by consolidating multiple visits. This would encourage services to arrive earlier in the patient's Pre-Op stay to decrease the chance of a complication causing a delay. This will decrease overall service time, save time of the service staff, and increase service quality for the patient.

Appendix A – Original Data Collection Sheet

Date _____	Shift _____	Service _____	IP / OP / AP _____
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Pre-Op Forms	PATIENT INFO
(H) Health & Physical present? Y / N	Med/Test Orders present? Y / N
(B/C) Consent present? Y / N	(A) Anesthesia Procedure present? Y / N
(X) Other Y / N	(V) Operative "Shave" complete? Y / N
Notes: _____	

If forms are missing/incomplete...	Started	Completed
Time service first paged: _____	H&P _____	_____
Total number of pages: _____	Orders _____	_____
Solicited Service Visit? Y / N	Consent _____	_____
Notes: _____		

If late med/test order(s) are added...		
Item1 _____	Item2 _____	Item3 _____
Time added _____	Time added _____	Time added _____
Time started _____	Time started _____	Time started _____
Time finished _____	Time finished _____	Time finished _____
Notes: _____		

Patient arrival _____ (YELLOW) Nurse Assessment start _____ Nurse Assessment end _____ Ready for anesthesia _____ Anesthesia start _____ Anesthesia complete _____ OR is ready for patient _____ Patient taken to OR _____ Notes: _____ _____ _____	PROCESS TIMES
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Any inappropriate orders/blood drawn? Y / N If Yes... Item1 _____ Item2 _____ Item3 _____ Time added _____ Time added _____ Time added _____ Time started _____ Time started _____ Time started _____ Time finished _____ Time finished _____ Time finished _____ Notes: _____ _____ _____	OVERVIEW
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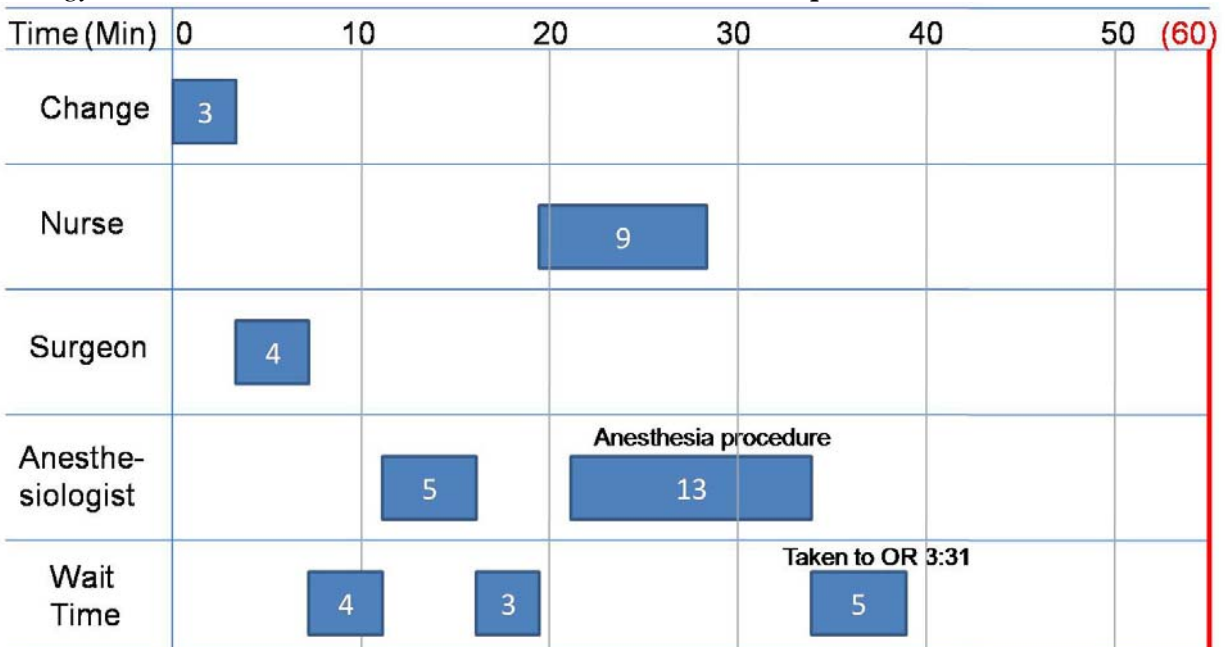
Red - Assigned slot, NOT here	White - Present, waiting for nurse	Blue - Ready
Purple - Assigned slot, in building	Yellow - Assessment in-process	B / 10-22-07

Appendix B - Swim Lane Diagrams

Plastic - Scheduled 3:00 – 38 minutes in Pre-Op



Urology - H&P, Orders - Scheduled 4:00 - 39 minutes in Pre-Op



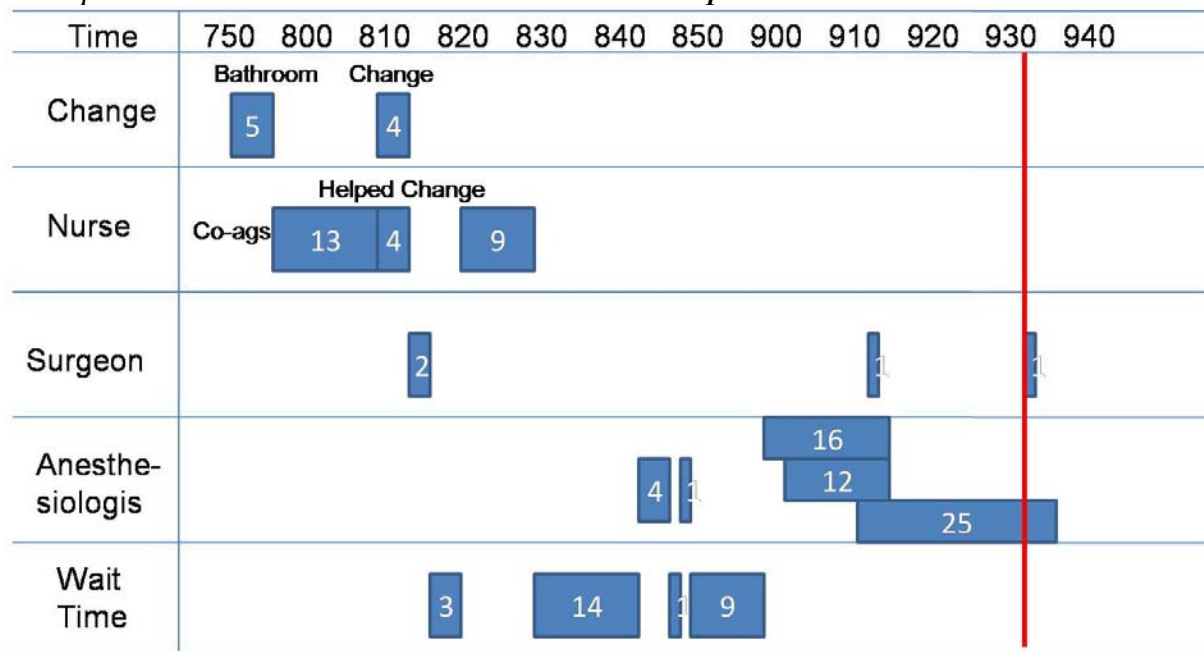
Orthopedics - Scheduled 7:30 – 122 minutes in Pre-Op

Time	530	540	550	600	610	620	630	640	650	700	710	720	730	740	750
Change		7													
Nurse			12												
Surgeon													Mark site 3		
Anesthe- siologis					Anesth. procedure		33	33				18			
Wait Time				33						17					

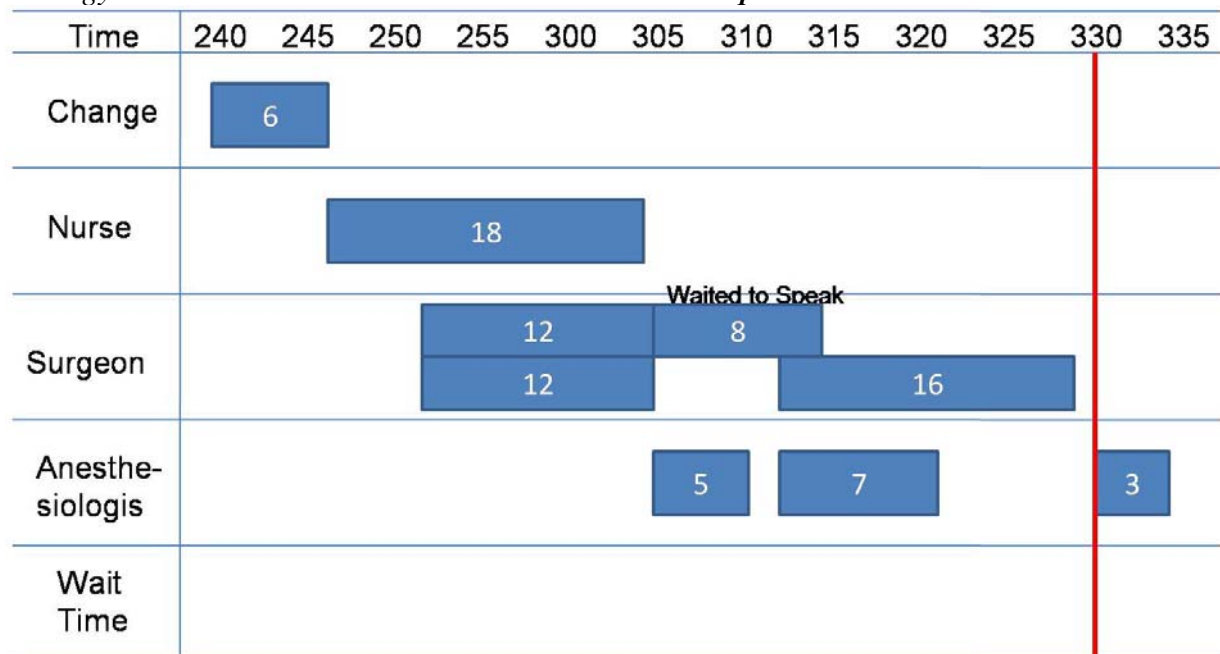
Urology - H&P, Consent - Scheduled 2:00 - 129 minutes in Pre-Op

Time (Min)	0	10	20	30	40	50	60	70	80	90	100	110	120	130
Change	5													
Nurse	Pregnancy Test 5		Find Vein 17											
Surgeon												9	4 2	3
Anesthe- siologist								6				1	1	3
Wait Time		9				37				28				2

Orthopedics – Scheduled 9:30 – 115 minutes in Pre-Op



Urology – H&P – Scheduled 3:30 – 53 minutes in Pre-Op



Appendix C – Limitations & Difficulties of Collected Data

Limitations of Collected Data

After collecting and analyzing the patient data, the team determined some limitations that should be considered when applying the findings of this report.

Clerk Data Limitations

The clerk data that was gathered helped determine the proportion of services. However, when comparing the clerk data log sheet, the team found that the missing information records were not consistent. Several contributing factors led to the inconsistencies in data. One is that the notation of patient arrival was inconsistent between personnel. Multiple people fill the position of Pre-Op clerk, which increases the possibility of error via different data collection techniques. As a result, the clerk data showed missing information 14% of the time as compared to 81% of the time from team observations.

Limited Sample Size of Certain Services

The proportion of observed patients when broken down by service was accurate with the proportion of all patients when broken down by service. Therefore, the team's overall findings and averages in the Pre-Op are representative of the process. However, as a result of this accurate proportion, data in certain services included only a limited sample size of observations. Specifically, data from six plastic surgery patients and six SGI patients were collected.

Difficulties while Observing the Process

While data collection was usually limited to one or two patients at a time, there were still several challenges in observing the process and recording accurate data.

Difficulty Involved in Identifying Personnel

The team had difficulty identifying personnel due to the attire of the personnel being similar, and the speed of which certain personnel would come and go. A way to overcome this difficulty was by reading the employee's badge or by simply inquiring about that employee's position at an appropriate time; however, this was not always possible.

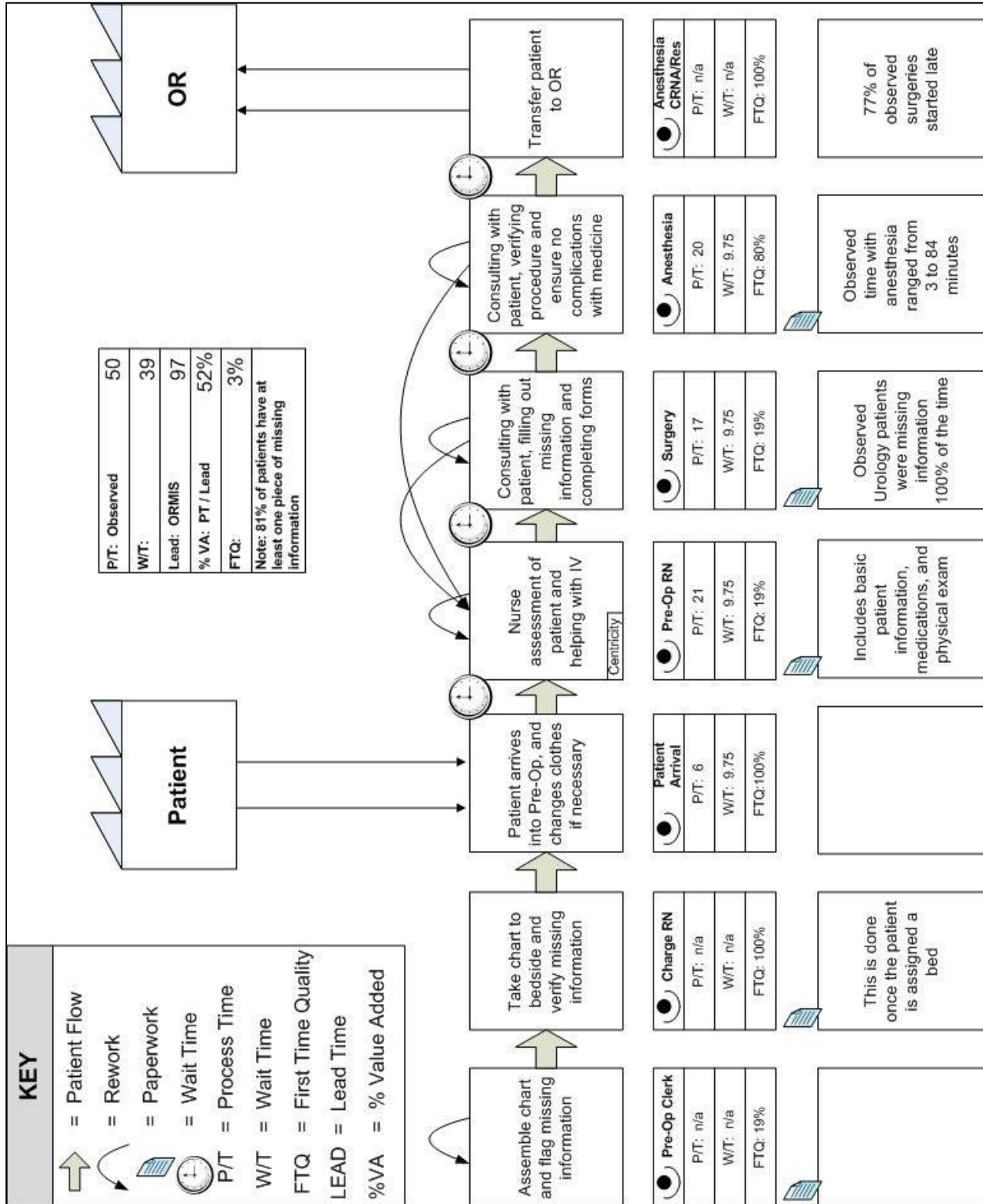
Difficulty Determining What is Happening in the Process

During the observational process, the team had difficulty determining what process steps were happening due to the consistently occurring instances of several personnel being present at the patient's bedside all at once. This problem was compounded by the difficulty identifying personnel, the rate at which staff came and went from the patient's bedside, and the team not wanting to interrupt conversations amongst staff.

Difficulty Due to Closed Patient Curtain

There were instances during the Pre-Op process where the staff had to close the curtain that surrounds the patient's bedside area. This was done primarily due to privacy concerns. When staff would need to reveal the patient's skin to properly evaluate them, it is considerate for them to conceal this from the rest of the Pre-Op. The team observed closed curtains to be more common with Anesthesiology procedures and Urology patients.

Appendix D – Pre-Op Unit Value Stream Map



Appendix E – Raw Data

Team Observed Data

Date	Op Room	Service	Pt Type	Sched. Time	Item Present?			Patient Arrival	Change Clothes	Nurse Assess.	Total Wait Time	Taken to OR	Late OR?
11/16/07	16	ORTHO	IP		Missing	n	Missing	14:38	0	38	7	15:30	
11/7/07		ORTHO	OP	13:00		Missing	Missing	12:28	4	13	41	13:50	-0:50
11/21/07	16	ORTHO	OP	9:30	Missing			8:17	14	5	42	9:46	-0:16
10/30/07		ORTHO	IP	14:00		Missing		12:30	0	45	48	14:15	-0:15
10/24/07		ORTHO	AP	15:00		Missing		13:00	5	29	52	14:48	0:12
11/8/07		ORTHO	AP	15:00			Missing	14:19	10	28	52	16:07	-1:07
11/20/07	15	ORTHO	OP	7:30		Missing		5:40	3	6	49	7:32	-0:02
11/21/07	10	ORTHO	OP	9:30	Missing	Missing		7:50	7	28	65	9:49	-0:19
11/20/07		ORTHO			Missing	Missing	Missing						
11/20/07		ORTHO			Missing	Missing	Missing						
	14	ORTHO	IP	15:00				13:14					
	10	ORTHO	AP	14:30	Missing		Missing	13:28	7				
11/6/07	5	ORTHO	AP	13:00				12:07	9	9	36	13:43	-0:43
11/20/07	10	ORTHO		9:30				7:51	4	11	10	9:36	-0:06
11/20/07	10	ORTHO	OP	7:30				5:31	7	12	52	7:33	-0:03
11/1/07	9	PLASTIC	OP	13:30		Missing		11:37	5	36	96	14:20	-0:50
11/20/07	12	PLASTIC	OP	7:30			Missing	6:34	2				
11/6/07	12	PLASTIC	OP	12:30				11:04		24	38	13:20	-0:50
11/21/07	11	PLASTIC	AP	7:30	Missing	Missing		7:05	1	30	0	7:35	-0:05
10/24/07		PLASTIC	IP	15:00	Missing			14:07	0	8	31	14:45	0:15
11/20/07		PLASTIC					Missing						
11/12/07	10	SGI		13:00				13:08	7	44	22	14:19	-1:19
11/20/07		SGI			Missing	Missing							
11/20/07	13	SGI		7:30				6:31	7	11	14	7:29	0:01
11/21/07	13	SGI	AP	11:00				8:56	10	24			
10/24/07		SGI	OP	15:00				14:11	3	10	34	15:26	-0:26
11/20/07		SGI											
11/8/07		UROL	OP	16:00	Missing		Missing	14:52	7	9	25	15:31	0:29
11/8/07		UROL	AP		Missing	Missing				41		13:23	
11/21/07	24	UROL	AP	7:30			Missing	6:45		37	5	7:31	-0:01
11/20/07	24	UROL		9:00		Missing		7:49	8	16	3	8:40	0:20
11/16/07	28	UROL	AP	15:30	Missing			14:40	6	18	7	15:30	0:00
10/30/07		UROL	OP	15:30	Missing	Missing		14:36	8	10	39	15:30	0:00
11/7/07		UROL	OP	13:30		Missing		12:38	2	9	34	13:38	-0:08
11/16/07	24	UROL	OP	13:30		Missing		13:22		25	53	14:30	-1:00
11/1/07	24	UROL	OP	13:30		Missing		12:46	8			14:12	-0:42
		UROL	OP		Missing	Missing		10:13		63		11:52	
11/9/07		UROL	AP	13:30	Missing	Missing		12:31	5	8	67	14:20	-0:50
11/21/07	14	UROL	AP	9:30	Missing			7:58	7	5	53	9:50	-0:20
11/9/07		UROL	OP	16:00		Missing	Missing	14:07	3	12	70	16:11	-0:11
11/12/07	24	UROL	OP	14:00	Missing	Missing	Missing	13:08	5	31	80	15:17	-1:17
11/9/07		UROL	OP	15:00	Missing	Missing	Missing	14:08	5	9	67	16:43	-1:43
11/20/07		UROL			Missing	Missing	Missing						
11/20/07		UROL				Missing	Missing						
11/20/07		UROL				Missing	Missing						
11/20/07		UROL				Missing	Missing						
11/16/07	19	UROL	AP	13:30	Missing	Missing	Missing	14:29	7	16	21	15:08	-1:38
AVERAGE									5.5	21.2	39.1		
ST. DEV.									3.2	14.3	24.3		

Team Observed Data

Date	Op Room	Service	Pt Type	Sched. Time	All info present?	Total Service Time	Total Anesth Time	Time Before Schedule Late Pre-Op? (45 Min)	Total Time in Pre-Op
11/16/07	16	ORTHO	IP		N	23	9		52
11/7/07		ORTHO	OP	13:00	N	16	22	0:32	82
11/21/07	16	ORTHO	OP	9:30	N	27	39	1:13	89
10/30/07		ORTHO	IP	14:00	N	6	3	1:30	105
10/24/07		ORTHO	AP	15:00	N	12	7	2:00	108
11/8/07		ORTHO	AP	15:00	N	6	26	0:41	108
11/20/07	15	ORTHO	OP	7:30	N	22	47	1:50	112
11/21/07	10	ORTHO	OP	9:30	N	21	11	1:40	119
11/20/07		ORTHO			N				
11/20/07		ORTHO			N				
	14	ORTHO	IP	15:00	N			1:46	
	10	ORTHO	AP	14:30	N			1:02	
11/6/07	5	ORTHO	AP	13:00	Y	4	52	0:53	96
11/20/07	10	ORTHO	OP	9:30	Y	4	46	1:39	105
11/20/07	10	ORTHO	OP	7:30	Y	3	84	1:59	122
11/1/07	9	PLASTIC	OP	13:30	N	31	38	1:53	163
11/20/07	12	PLASTIC	OP	7:30	N			0:56	
11/6/07	12	PLASTIC	OP	12:30	Y	3	37	1:26	136
11/21/07	11	PLASTIC	AP	7:30	N	31	6	0:25	30
10/24/07		PLASTIC	IP	15:00	N	7	8	0:53	38
11/20/07		PLASTIC			N				
11/12/07	10	SGI		13:00	Y	14	3	-0:08	71
11/20/07		SGI			N				
11/20/07	13	SGI		7:30	Y	17	12	0:59	58
11/21/07	13	SGI	AP	11:00					
10/24/07		SGI	OP	15:00	Y	27	16	0:49	75
11/20/07		SGI			Y				
11/8/07		UROL	OP	16:00	N	5	13	1:08	39
11/8/07		UROL	AP		N	28	3		43
11/21/07	24	UROL	AP	7:30	N	9	13	0:45	46
11/20/07	24	UROL	OP	9:00	N	12	13	1:11	51
11/16/07	28	UROL	AP	15:30	N	36	15	0:50	53
10/30/07		UROL	OP	15:30	N	15	6	0:54	54
11/7/07		UROL	OP	13:30	N	24	7	0:52	60
11/16/07	24	UROL	OP	13:30	N	39	20	0:08	68
11/1/07	24	UROL	OP	13:30	N	9	4	0:44	86
		UROL	OP		N	6	11		99
11/9/07		UROL	AP	13:30	N	28	7	0:59	109
11/21/07	14	UROL	AP	9:30	N	11	40	1:32	112
11/9/07		UROL	OP	16:00	N	17	28	1:53	124
11/12/07	24	UROL	OP	14:00	N	26	11	0:52	129
11/9/07		UROL	OP	15:00	N	41	16	0:52	146
11/20/07		UROL			N				
11/20/07		UROL			N				
11/20/07		UROL			N				
11/20/07		UROL			N				
11/20/07		UROL			N				
11/16/07	19	UROL	AP	13:30	N	13	8	-0:59	39
AVERAGE						17.4	20.0	0.0	86.1
ST. DEV.						11.1	18.2	0.0	35.5