

University of Michigan Health System

Program and Operations Analysis

Analysis of the Preoperative Phone Call Process

Final Report

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Executive Summary

At University Hospital (UH), a part of the University of Michigan Health System (UMHS), the Post Anesthesia Care Unit (PACU) is responsible for calling patients the day before their procedure to ensure that patients are appropriately educated. The purpose of the phone call is to inform the patient of the time and location of the procedure and confirm the actions the patient must take before reporting to UH for their procedure. However, nurses in the PACU have reported that the pre-operative phone call is often time consuming and ineffective, leading to confused patients and, occasionally, cancelled appointments. Since no data has been collected about the phone call, the cause of these problems is unknown. Therefore, the Clinical Care Coordinator at the PACU would like to better understand the current state of the pre-operative phone call process. The Coordinator has tasked an IOE 481 student team with mapping the current state of the process and measuring the variation in call times by surgical service and patient path.

Methodology

To understand the pre-operative phone call process, the team observed pre-operative phone calls at the PACU as well as the patient education process at Dominos Farms, Otolaryngology, and Brighton. The team also surveyed patients and collected data about the length of the pre-operative phone calls. After observing the process, collecting and analyzing 65 patient surveys and 107 preoperative phone call lengths, the team developed a map of the current state and identified opportunities for improvements. These improvements will reduce the variation in call times among surgical service, and produce a more efficient patient education process leading to fewer confused patients and cancelled appointments.

Findings

In observations of the pre-operative phone calls, the team noticed that all calls followed a standard script. However, there was significant variation in the detail of the content covered depending on the nurse making the call. From observations of the patient education process at Dominos Farms and Otolaryngology clinics, the team discovered significant redundancy in the pre-operative education process. The information covered in the pre-operative phone call and clinic visits was almost identical, with the exception of the specific procedure time and location. The team also found that patients visiting Dominos Farms, Brighton, and Otolaryngology received paper copies of patient education information. However, the nurses in the clinics reported that patients occasionally lose this information, which can cause long pre-operative call times downstream. The team also observed that patients at Dominos Farms, Brighton, and Otolaryngology were told to call the PACU the day before their procedure. The Clinical Care Coordinator at the PACU confirmed that patients are told to call in if they are travelling or have a different preferred phone number than they had previously provided. Patients who call in are expected to leave a message, and a nurse in the PACU returns their call later in the day. However, at the pre-operative clinics, patients were not always told that they would have to leave a message, which led to frustration in patients who were expecting to speak with someone immediately upon calling in.

From the patient survey results, the team found that about 60% of respondents found pre-operative clinic visits and clinic visits with the surgeon helpful. The survey also showed that about 57% of patients found the pre-operative phone call helpful, and the patient ratings of their knowledge increased after the phone call. Finally, the patient comments indicated confusion about the purpose of the phone call. For example, some patients did not understand why the call occurred the day before their procedure.

The team analyzed the phone call data using Minitab and Microsoft Excel. The average phone call length was 5 minutes, and 10 seconds with a standard deviation of 3 minutes, and 8 seconds. The linear regression results from Minitab indicated that patient age and some surgical services were significant, ($p < 0.10$), but patient type (outpatient or admitted patient), nurse making the call, presence of a visit to Dominos Farms pre-operative clinic, and the number of days since the pre-operative clinic visit occurred were not significant.

Conclusions

The team developed three conclusions based on their findings. First, patient expectations do not match the reality of the pre-operative phone call process. For example, patients complained that they only received the pre-operative phone call the day before their procedure. However, this is the earliest that the patients can be called, because surgical schedules are not finalized until the day before the procedures occur. Similarly, patients were told to call the PACU the day before their surgery, but were not informed that they would need to leave a message. The purpose of the patients calling in is to ensure the nurses have up-to-date phone numbers to reach the patients at, and patients are called back according to the normal schedule. Second, the team found significant variation in the pre-operative phone call length. This is due in part to differences in the surgical services. Additionally, the team observed that there was variation in the way that nurses followed the call script. Third, the team noticed that information was not flowing well through the pre-operative phone call process. The nurses at the pre-operative clinics were entering information into MiChart, but the PACU nurses could only access it through a CareWeb portal. Many nurses in the PACU reported that the MiChart interface was confusing to them. Also, patients who visited pre-operative clinics received hard copies of the patient education information, but nurses reported that these sheets were often lost.

Recommendations

Observations at Dominos Farms and the Otolaryngology clinic showed that nurses were informing patients to call the UH PACU the day before their surgery between the hours of 9 and 11 am. However, patients were not told that they would have to leave a message and a PACU nurse would call them back later in the day. This confusion led to many patients calling in and being frustrated at having to leave a message. To eliminate this frustration, the team recommends that the PACU create a standardized procedure for the patients to call in and distribute it to the various pre-operative clinics. The observations also indicated that patients were occasionally losing the hard copies of patient education materials they were given during clinic visits. To resolve this loss of hard copies of patient education, the team recommends that a copy of the pre-operative education material be put on the Patient Portal, a part of the MiChart system. This will allow

patients to easily look up the pre-operative instructions from home, even if they did not visit a pre-operative or surgical clinic. Finally, the team found that there was considerable variation in the call length based on which nurse was making the call. After speaking to the Clinic Care Coordinator at the PACU, the team recommends that all nurses follow the same procedure of only reviewing medication information if the patient has questions.

Introduction

Before patients receive a surgical procedure, it is important that they are aware of the logistics of the procedure as well as any behaviors they must change prior to receiving treatment. At University Hospital (UH), a part of the University of Michigan Health System (UMHS), the Post Anesthesia Care Unit (PACU) is responsible for calling patients the day before their procedure to ensure that patients are appropriately educated. Specifically, the purpose of the phone call is to inform the patient of the time and location of the procedure and confirm the actions the patient must take before reporting to UH. The only new information that should be provided in the phone call is the location and time of the procedure, as the phone call is simply one part of a larger pre-operative patient education process. However, nurses in the PACU have reported that the pre-operative phone call is often time consuming and ineffective, leading to confused patients and, occasionally, cancelled appointments. Since no data has been collected about the phone call, the cause of these problems is unknown. Therefore, the Clinical Care Coordinator at the PACU would like to better understand the current state of the pre-operative phone call process. The Coordinator has tasked an IOE 481 student team with mapping the current state of the process and measuring the variation in call times by surgical service and patient path.

The student team observed the process, collected and analyzed data, and developed a current state map. Based on this information, the team identified opportunities for improvements. The purpose of this report is to present the team's analysis of the pre-operative phone call process, which includes their methods, findings, conclusions and recommendations for improvement.

Background

The pre-operative phone call process is pictured below in Figure 1. The process begins when patients' need for surgery is identified. Patients are required to have a history and physical consultation (H&P) in the six months prior to their surgical procedure. The day before the scheduled procedure, patients receive a pre-operative phone call from a PACU nurse. Finally, the patients receive their surgical procedure.

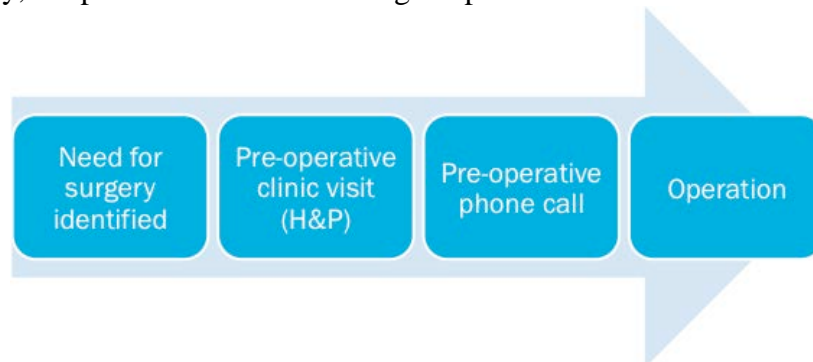


Figure 1. The pre-operative phone call process at UH.

H&P visits can be performed at the patient's primary care clinic, Dominos Farms pre-operation clinic, or at another clinic within UMHS. In many cases, the location of the

consultation is determined by the preference of the surgeon. During a typical H&P consultation, patients receive information about the actions they need to take before their procedure (e.g. medications to start or stop). Some patients might already have an active H&P or receive an H&P the same day as their procedure, and therefore bypass the H&P clinic visit in the process. Other patients may have additional clinic visits before their procedure (e.g. anesthesia clinic visits). The specific clinic visits or phone calls that a patient makes prior to his or her procedure will be referred to as their *patient path* for the purposes of this report.

Key Issues

The following issues are the factors that led to this project:

- Lack of data available about the current state of the pre-operative phone call process
- A perception among PACU nurses that the phone calls are time consuming and ineffective
- Occasional cancellations due to errors in patient education.

Project Goals and Objectives

The first goal of this project is to capture the current state of the pre-operative phone call process. To accomplish this goal, the team has set the following objectives:

- Identify patient paths
- Understand the flow of patient information (e.g. medical history)
- Isolate gaps in patient education.

The second goal of this project is to quantify the variation in the length of the pre-operative phone call. The team has identified the following objectives within this goal:

- Determine key factors that influence call time
- Measure impact of surgical service, patient path, and other relevant factors on call time.

A peripheral goal of this project is to make recommendations to streamline the phone call process and reduce the number of appointments cancelled because of insufficient patient education.

Project Scope

The scope of this project is the pre-operative phone call process at UH. The project primarily focused on the pre-operative phone calls itself, although some data was collected on H&P clinic visits. The team collected data on patients at UH receiving treatment from the following nine surgical departments: Oral, Thoracic, Neuro, Plastic,

Orthopedic, Sports Orthopedic, OB/GYN, Urology, and General Surgery. Only outpatients and admitted patients were considered.

This project excluded surgical patients who do not receive a pre-operative phone call (e.g. inpatients) and surgical procedures for which patients are not called. It also did not consider procedures at hospitals and healthcare facilities outside of UH.

Methodology

The team collected data about the pre-operative phone call process by observing pre-operative phone calls and the patient education process at pre-operative clinics, surveying patients in the operative clinic at the University Hospital and collecting data about the pre-operative phone call. These methods allowed the team to develop a qualitative and quantitative snapshot of the current state of the patient pre-operative education process. In total, the team spent approximately 30 hours observing the pre-operative phone call process, issued 65 patient surveys, and collected call length data for 107 phone calls and 5 nurses.

Observations of Pre-Operative Phone Call

The team observed the pre-operative phone calls to develop a better understanding of the project goals and to gather qualitative data about the variation in call length. The observation also provided visibility to what information the nurses are currently using to make the phone calls and where that information is housed in the University Hospital system.

Execution of Data Collection

The team observed nurses in the UH PACU making pre-operative phone calls to patients the day before their surgeries. The team did not listen in on the phone calls, although they could hear the nurses. While observing, the team took notes about the phone call content and length, as well as each patient's surgical service and doctor. Specifically, the team focused on observing differences in the phone call content that could explain variation in call length. The team members observed calls for patients receiving services from the following departments: Oral, Otolaryngology, Neuro, Plastic, Orthopedic, OB/GYN, Urology, Radiology, and General Surgery.

Time Frame of Collection

The team started observation of the pre-operative phone call on October 1, 2012, and continued observing on a biweekly basis until November 20, 2012. In total, the team observed pre-operative phone calls for about 25 hours.

Observations of Patient Education Process at Pre-Operative Clinics

The team observed the patient education process at a variety of pre-operative clinics within UMHS to understand the impact of patient paths on the pre-operative phone call process. The observations allowed the team to understand the information patients receive prior to the pre-operative phone call and the process by which patient data is transferred from the clinic to the PACU. Since surgeons often determine the pre-

operative clinic visits a patient makes, the observations also provided insight into the impact of surgical service on call length.

The team observed the patient education process at the following pre-operative clinics.

- Dominos Farms
- Otolaryngology
- Brighton urology

These clinics were chosen based on recommendations from the client because these clinics provided insight into different ways to approach the patient education process. This would allow the team to approach the UH PACU phone call process more objectively.

Execution of Data Collection

During the pre-operative clinic observations, each team member sat in on at least one patient appointment and took detailed notes regarding the patient education content. Specifically, the team member observed what information was provided to the patient and who was involved in the patient education process (e.g. RN or PA). The team member also observed the information flow, i.e. where the patient education information came from and where it was consolidated after the appointment.

Time Frame of Collection

The team observed at Dominos Farms for 4 hours on October 19, 2012, and at the Otolaryngology clinic at UH for 2 hours on November 7, 2012. The team observed 3 patient appointments at each clinic, for a total of 12 data points.

Survey of Patients in Operative Clinic at University Hospital

The team surveyed patients to measure their preparedness before their procedures. The purpose of the survey was to identify gaps patients perceive in their education and gauge the effectiveness of the pre-operative phone call. The survey asked patients to rank their comfort with the preparations required for their procedure before and after receiving the pre-operative phone call. It also asked patients to identify any problems they had with the process as well as aspects of the pre-operative phone call process that they found most helpful. The survey is included in Appendix A.

Execution and Analysis of Data Collection

This patient survey was issued in the UH general surgery waiting room to patients prior to their surgeries. The clerks at the desk in this clinic issued the survey along with the other forms patients had to complete. A pilot of the survey was planned, but was cancelled due to another survey being scheduled at the same time.

Time Frame of Collection

The survey was issued on November 2, 2012. The team collected 65 surveys.

Collection of Pre-Operative Phone Call Data

The team collected data about the pre-operative phone calls to quantify the variation in call length and identify the factors driving this variation. Factors considered include nurse making the call, patient path, surgical service, and patient language barriers. Based on the client's recommendation, the team relied on self-collection by nurses in the PACU.

Execution of Data Collection

PACU nurses are given a schedule at the beginning of the day that lists the medical information for each patient they have to call. During the data collection period, nurses observed the call length for each patient on their phone and recorded this on the schedule. The schedule was then used to identify the values for the relevant factors influencing call length, such as surgical service.

Time Frame of Collection

Data collection occurred during the weeks of November 12 and November 19, 2012. A total of 107 data points were collected across 5 nurses.

Analysis of Data

The purpose of the data analysis was to allow the team to create a process map of the current state and identifying factors causing variation in pre-operative call length. Throughout the data analysis process, the team, client and coordinator reviewed the data collected to verify accuracy.

Current State Process Map

Through the observations at the PACU, Dominos Farm, Otolaryngology, and Brighton, the team captured the current patient education process and created a current state process map. A key component of the current state map is the information flow through the system, specifically with regards to computer software such as MiChart and CareWeb.

Results from Patient Survey

The team analyzed the results from the patient survey in Excel. First, the team compiled the results and determined which were usable by marking incomplete surveys. Next, the team summarized the data using Excel.

Variation in Pre-Operative Call Length

The team analyzed the pre-operative call data in Excel and Minitab. First, the team determined how much variation exists in the call length. Next, the team ran a linear regression analysis in Minitab to determine significant variables influencing call length. Finally, the team used Excel to create graphs to visually represent the variation in call length.

Findings

The team's key findings are summarized below.

Observations of Pre-Operative Phone Call

The team's observations are summarized in the current state map pictured below, in Figure 2. The basic process consists of three steps: patients call into the PACU to leave their phone number in the morning, nurses call patients back in the afternoon, and then patients complete their procedures the following day.

During the pre-operative phone call, the team observed many potential sources of variation. Although a standard script exists for the calls, there was significant variation in the detail of the content covered depending on the nurse making the call. For example, if a patient had visited Dominos Farms pre-operative clinic, some nurses would not go through the medicine review unless the patient had questions while others would repeat the information. The team also noticed seasonal factors that could influence the length of a phone call. For example, during flu season (October, November), nurses making phone calls would remind patients that visitors with flu symptoms were not allowed in the hospital.

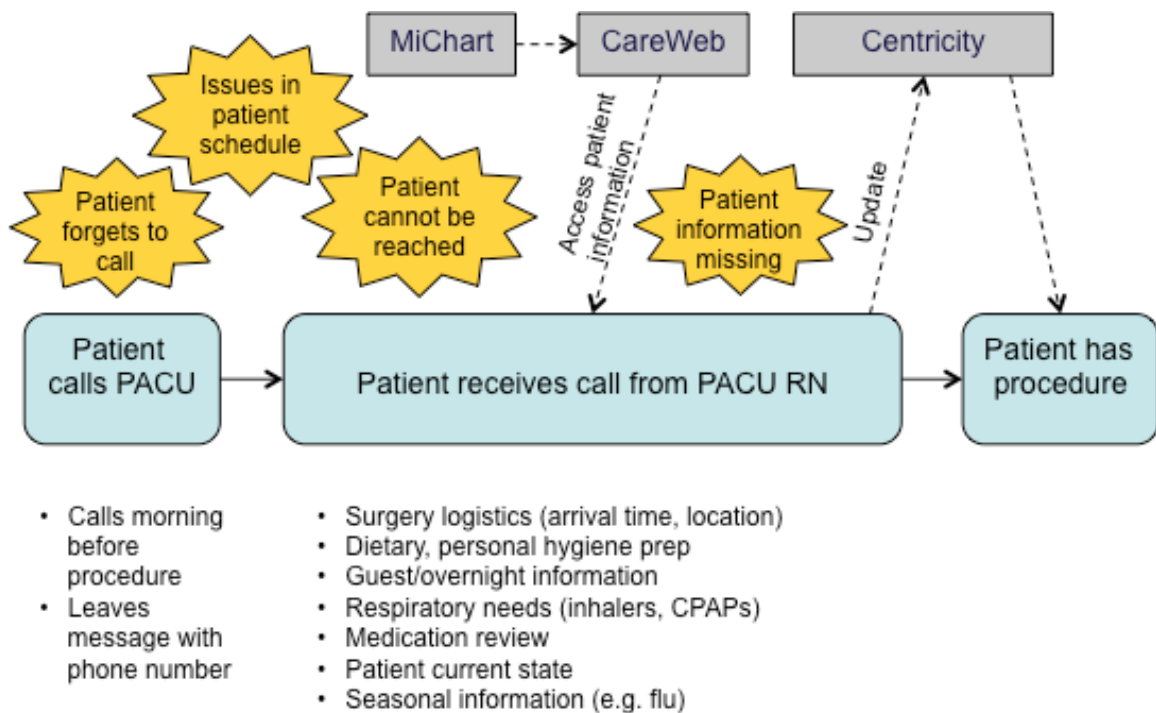


Figure 2. Current state map of pre-operative phone call.

The current state map in Figure 2 also depicts the flow of patient information during the pre-operative phone call process. The team observed that nurses in the PACU accessed patient history in MiChart through CareWeb. Some nurses indicated that they had trouble looking up information about a patient's previous clinic visits due to unfamiliarity with the MiChart system. After completing the phone call, nurses will update the patient information in Centricity, which is the system used by the surgical clinics.

The team observed four main problems during the pre-operative phone call process, indicated by the yellow kaizen bursts in Figure 2. First, many patients did not call the PACU the morning before their procedure. This led to wasted time, as nurses had to look up patient phone numbers in the system. In many cases, the nurses had to try multiple phone numbers before finding one that worked. Second, issues in the patient schedule caused further delays. For example, some patients were incorrectly classified as outpatients or admitted patients when they were actually inpatients. This created problems because PACU nurses do not call inpatients. Third, some patients could not be reached. This was often due to errors in the patient contact information listed online. Fourth, patient information was occasionally missing. This typically occurred when patients had completed their H&Ps outside of UMHS.

Observations of Patient Education Process at Pre-Operative Clinics

The team observed the patient education processes at the Dominos Farms pre-operative clinic, Brighton urology clinic, and Otolaryngology clinic. The information collected about Dominos Farms is captured in the current state map in Figure 3, below. Current state maps for Otolaryngology and Brighton can be seen in Figures B1 and B2 in Appendix B.

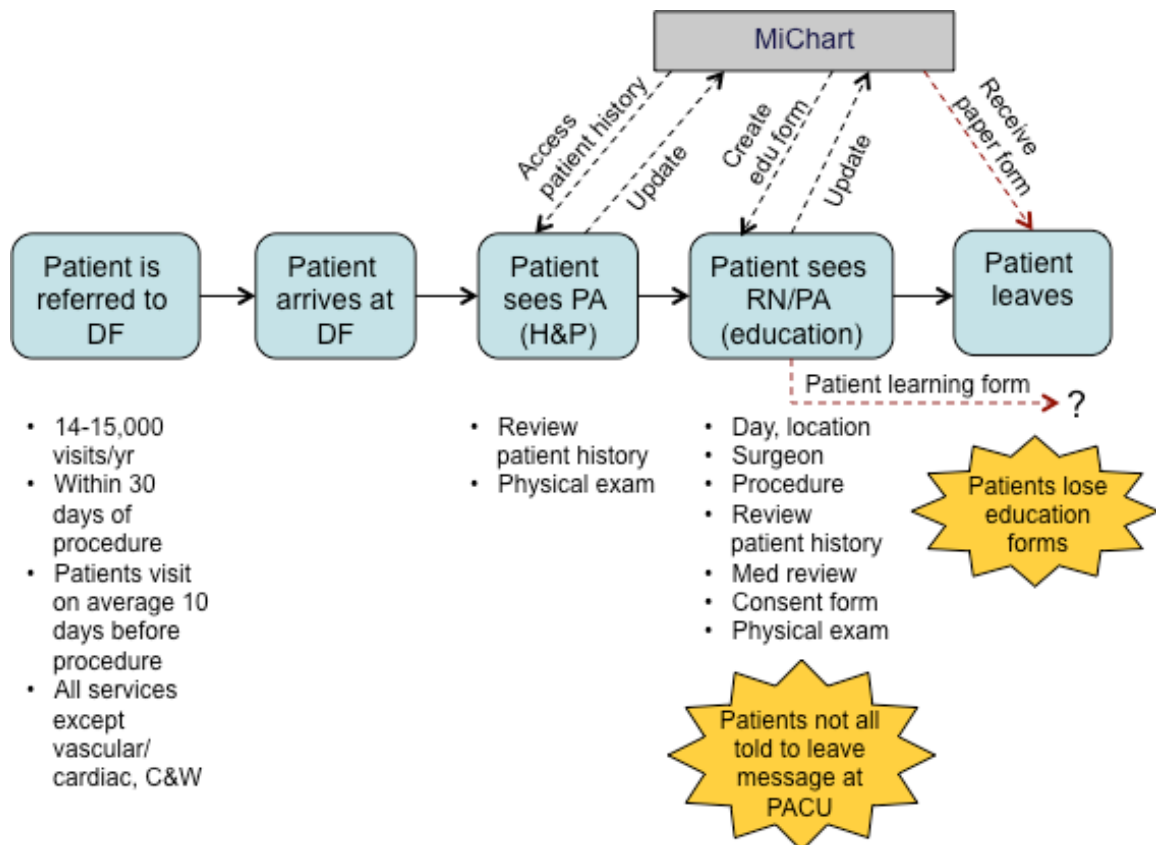


Figure 3. Current state map of Dominos Farm pre-operative clinic visit.

As seen in Figure 3, a pre-operative visit at Dominos Farms consists of four main parts: patients arrive, have an H&P, receive information about their procedure, and leave. The

team discovered that the information covered in a pre-operative phone call and the patient education part of a Dominos Farms visit was almost identical, with the exception of the specific procedure time and location. The patient education processes at Brighton and Otolaryngology were also very similar to the pre-operative phone call.

Nurses at Dominos Farms, Brighton, and Otolaryngology all use MiChart to collect patient information. The nurses create patient education forms by populating a standard template in MiChart. This form is then printed out and given to a patient before they leave. In Figure 3, electronic information flow is indicated as black dashed arrows, while paper information flow is indicated as red dashed arrows.

The team identified three main problems in the pre-operative clinics. First, not all patients are told to call the PACU the morning before their procedure and leave a message with their phone number. The patient education forms indicate that patients should call in, but nurses at the clinics do not always emphasize the importance of leaving a phone number. Second, nurses at all three clinics reported that patients occasionally lose the patient education forms they are given. Third, patients at Dominos Farms and Otolaryngology are given a learning assessment form that tracks the ways they best learn information, but the form is not readily available after the patient leaves the clinic. The assessment is a paper form at Dominos Farms, and an online form at Otolaryngology. The team was unable to determine where the information from the learning assessment forms went, as PACU nurses were not familiar with the information.

During observations at the Otolaryngology clinic, the team learned of an online patient portal tool that could be used to share pre-operative education documents and medical records with the patient. A nurse at the Brighton urology clinic confirmed that the patient portal was becoming increasingly popular among patients across age groups.

Survey of Patients in Operative Clinic at University Hospital

The team originally planned to pilot the survey before collecting results, but due to another survey being issued, the pilot was cancelled. As a result, the survey responses were not as useful as the team had hoped. In particular, many patients appeared to be confused by the first question (see Appendix A). The team was able to collect 65 total surveys, of which 42 were used for analysis. The remaining 23 surveys were deemed unusable due to completion errors (e.g. patients did not complete both “before” and “after” rows in Question 1).

The results for Question 1 are shown below, in Figure 4. The question asked patients to rank their comfort with various pieces of information on a scale of 1-5 before and after receiving the pre-operative phone call.

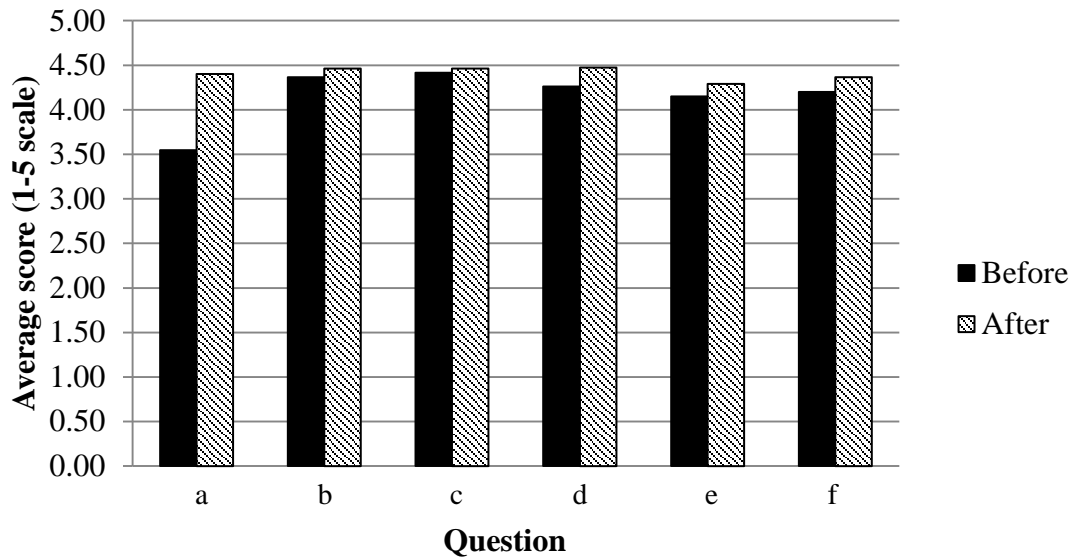


Figure 2. Patients are more comfortable with information after receiving a pre-operative phone call. The text of each question can be seen in Appendix A.

As seen in Figure 4, the average score for each question is higher after the call. The results also indicate that most patients are receiving some education prior to the phone call, because the “Before” scores are quite high.

Analysis of Question 3 showed that of the 42 respondents, 24 (57%) found Dominos Farms pre-operative visits helpful, and 25 (60%) found clinic visits with the surgeon helpful. Although these percentages are relatively low, the team believes they demonstrate the effectiveness of pre-operative clinic visits because not all patients visit a pre-operative clinic. For example, the Clinical Care Coordinator at the PACU estimated that only about 60% of patients are seen at Dominos Farms. The team’s pre-operative phone call data similarly indicated that about 55% of patients are seen at Dominos Farms (see next section). In contrast, all patients receive a pre-operative phone call, but only 24 believed the call helped prepare them for their procedure. In the comments section, patients listed two main problems with the call: it provided too much new information and the call only occurred one day before the procedure.

Pre-Operative Phone Call Data

The team collected data for 107 pre-operative phone calls. The average phone call length was 5 minutes, 10 seconds with a standard deviation of 3 minutes, 8 seconds. The distribution of the call lengths can be seen in Figure 5, below. The majority of data points appear to be clustered between 2 and 8 minutes in length, with some outliers having call lengths greater than 15 minutes.

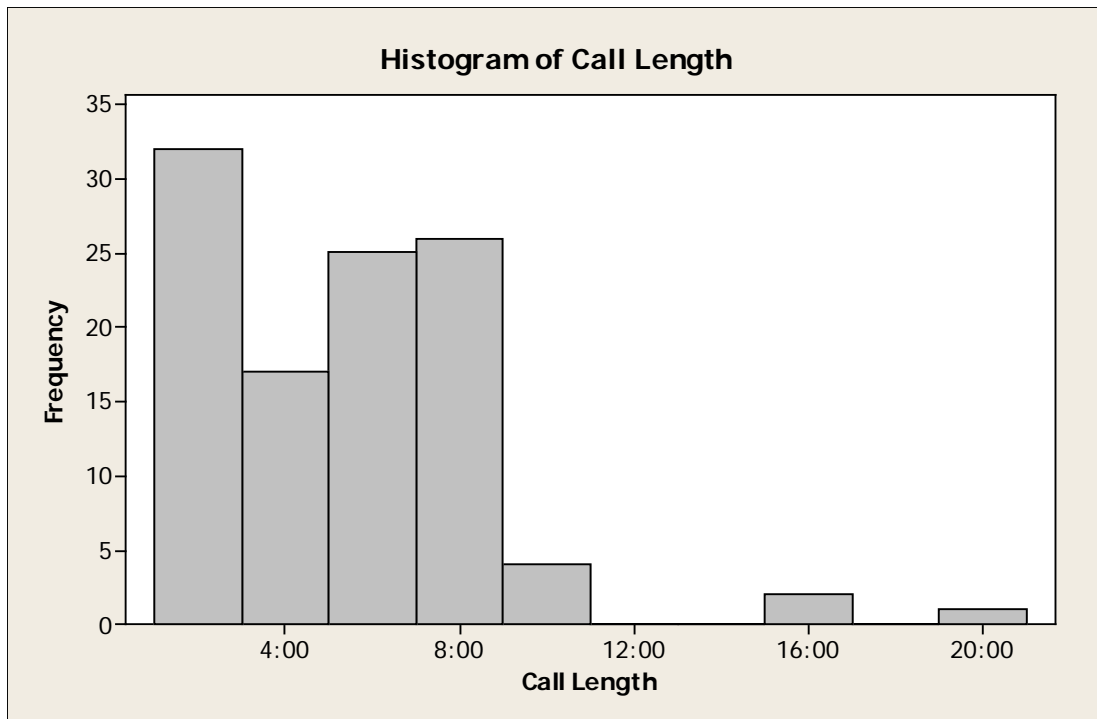


Figure 5. Distribution of pre-operative phone call lengths.

The team ran a general linear regression to determine the significance of the following six factors: patient age, patient type (outpatient vs. admitted patient), surgical service, nurse making the call, presence of visit to Dominos Farms, and number of days since H&P visit. The regressions were run in Minitab, and the complete output can be seen in Appendix C.

The age of the patient was a significant predictor of call length. Figure 6, below, shows that as patients' ages increase, so does the average call length. The relationship between age and call length can explain the outliers in Figure 5, because those data patients represent patients over 80 years of age.

Patient type was not a significant factor. The average call length for admitted patients was 4 minutes, 55 seconds, and for outpatients was 5 minutes, 28 seconds. Both of these numbers are close to the overall average call length.

Within the surgical services collected, only those with sample sizes greater than 3 were used in the regression analysis. The regression indicated that orthopedic and otolaryngology procedures were significant predictors of call length. Table 1, below, shows the average and standard deviation of call length for each of the surgical services analyzed. It is clear that orthopedic patients have a lower average call time as well as a lower variation in call times. In contrast, otolaryngology patients have a higher average call time and a large variation in call times.

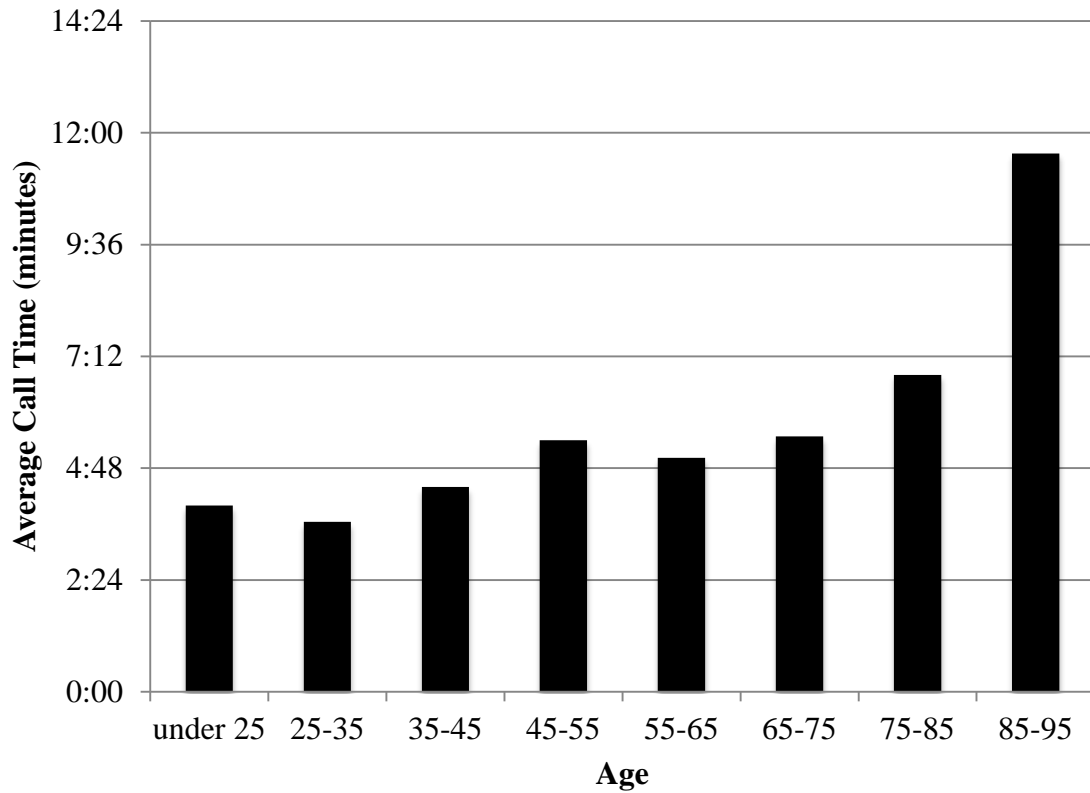


Figure 6. Average call length increases with patient age.

| Surgical service | Sample size | Average call length | Std Dev call length |
|-------------------------|--------------------|----------------------------|----------------------------|
| ORTH | 16 | 3:43 | 1:32 |
| OTO | 7 | 7:13 | 5:45 |
| RAD | 4 | 4:00 | 4:00 |
| UROL | 22 | 5:16 | 2:45 |
| NSA | 7 | 5:19 | 2:13 |
| GYN | 13 | 5:50 | 3:38 |
| PLA | 9 | 5:52 | 2:22 |
| SON | 6 | 6:05 | 2:24 |

Table 1. Orthopedic and otolaryngology procedures are significant indicators of call length.

The nurse making the call was not a significant factor affecting call length. However, the team only analyzed call lengths for five nurses over 107 samples, so it is possible that a more in-depth analysis of nurses could yield different results.

Finally, the team found that the presence of a visit to Dominos Farms pre-operative clinic and the number of days since an H&P visit were both insignificant factors. The average call lengths for patients who had visited Dominos Farms and those who hadn't were identical, at 5 minutes, 10 seconds.

Conclusions

The team synthesized their findings into three main conclusions, listed below.

Conflicting Patient Expectations

Patient expectations conflict with the pre-operative patient education process. The team's observations and patient survey indicated that the pre-operative clinic visits were effective at preparing patients for their procedures. However, patients were unaware that the purpose of the pre-operative phone call is to inform them of the time and location of their procedure. Surgery schedules are only finalized the day before the procedures occur, which necessitates the phone call occurring the day before the procedure. Additionally, patients who visited pre-operative clinics were told to call the PACU, but were not informed that the purpose of their call was to leave a message with a phone number. The mismatch between patient expectations and the patient education process leads to frustration, as the team saw in the survey results.

Variation in Pre-Operative Phone Call

There is significant variation in the pre-operative phone call. Analysis of the phone call data yielded an average of 5 minutes, 10 seconds with a standard deviation of 3 minutes, 8 seconds. Some of this variation likely results from differences in surgical services, as the analysis also showed that Orthopedics and Otolaryngology were significant predictors of phone call length. Additionally, the team observed that nurses in the PACU had differing ideas about the importance of redundancy, causing variation in the level of detail of phone calls.

Interrupted Information Flow

Information flow throughout the pre-operative phone call process is interrupted. First, the pre-operative clinics all enter data using MiChart, but the PACU nurses can only access it through a CareWeb interface. This is often time-consuming, because the PACU nurses are not familiar with MiChart. Second, the patients receive paper copies of patient education instructions when they leave pre-operative clinics, which are easily misplaced. Patients who do not visit a pre-operative clinic do not receive paper copies of patient education instructions.

Recommendations

Through their analysis, the team concluded that there is a mismatch between patient expectations and the pre-operative phone call process, there is significant variation in the pre-operative phone call length, and the information flow through the pre-operative phone call process is interrupted. The team has developed a number of recommendations that are expected to help resolve these issues.

In addition, the team recommends that further analysis is conducted to determine other factors that could influence the length of the pre-operative phone call. Possible factors to consider include the surgeon, the presence of visits to surgical clinics, whether or not the patient is new to UMHS, and the patient's primary language.

Establishing Patient Expectations

Observations at Dominos Farms, Brighton, and Otolaryngology clinics showed that nurses were telling patients to call the UH PACU the day before their surgery between 9 and 11 am. However, patients were not told that they would have to leave a message and a PACU nurse would call them back later in the day. This led to many patients calling in and being frustrated at having to leave a message. In addition, because many patients do not visit a pre-operative clinic, nurses were making calls in the order listed on their schedule, regardless of whether or not a patient had called in. This was causing further frustration in patients who called in during the morning, but did not hear back until the afternoon. To resolve this issue, the team recommends that nurses at the pre-operative clinics make it clear to patients that they should call in, leave a message, and expect a call back by the end of the day. To facilitate this, the team recommends that the PACU create a standardized procedure for the patients and distribute it to the various pre-operative clinics. Additionally, patients should be informed that scheduling occurs the day before their procedure, and that they are told the time of their procedure as soon as possible.

Standardizing Pre-Operative Phone Call Script

The team found that there was considerable variation in the call length. Some of this is explained by the differences in surgical services, which cannot be controlled. However, observations showed that there is a lack of standardization in the script. For example, if a patient had visited a pre-operative clinic, some nurses would ask if the patient had questions, but not review the pre-operative medication instructions. Other nurses would review the medication instructions regardless of if the patient had visited a pre-operative clinic. After speaking to the Clinic Care Coordinator at the PACU, the team recommends that all nurses follow the same procedure of only reviewing medication information if the patient has questions. This will ensure that both patient and nurse time is being respected.

Streamlining Patient Information Flow

The team's final conclusion was that the information flow through the pre-operative phone call process was interrupted. Much of this problem stems from the mismatching computer systems as the hospital transitions from CareWeb to MiChart. The team believes these problems will be resolved when the PACU transfers to MiChart in 2014. Additionally, patients who visit pre-operative clinics receive hard copies of patient education materials that are easily lost. To resolve this, the team recommends that a copy of the pre-operative education material be put on the Patient Portal, a part of the MiChart system. Conversations with nurses at Otolaryngology and Brighton clinics revealed that the Patient Portal has had success so far. Putting information online will allow patients to easily look up the pre-operative instructions from home. The Patient Portal is advantageous because it allows even patients who did not visit a pre-operative clinic to access patient education material.

Appendix A: Patient Survey



Survey Number: _____

The purpose of this survey is to collect data to improve the pre-operative patient education process. Thank you for helping us to improve the patient experience at UMHS.

1. Please rate on the 1 to 5 scale (1=Strongly Disagree, 5=Strongly Agree) **before and after** receiving the pre-operative phone call in relation to the following statements. Please note that the pre-operative phone call refers to the phone call you should have received **the day before your procedure** informing you of the time of your procedure.

| | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|--------------------------|-----------------|----------------|--------------|-----------------------|
| a. I was aware of the time and location of my procedure. | | | | | |
| Before Call: | 1 | 2 | 3 | 4 | 5 |
| After Call: | 1 | 2 | 3 | 4 | 5 |
| b. I was aware of the medications (if any) I was supposed to stop taking before my procedure. | | | | | |
| Before Call: | 1 | 2 | 3 | 4 | 5 |
| After Call: | 1 | 2 | 3 | 4 | 5 |
| c. I was aware of the medications (if any) I was supposed to start/continue taking before my procedure. | | | | | |
| Before Call: | 1 | 2 | 3 | 4 | 5 |
| After Call: | 1 | 2 | 3 | 4 | 5 |
| d. I was aware of the policies for eating and drinking before my procedure. | | | | | |
| Before Call: | 1 | 2 | 3 | 4 | 5 |
| After Call: | 1 | 2 | 3 | 4 | 5 |
| e. If staying overnight, I was aware of the items I was supposed to bring on the day of my procedure. | | | | | |
| Before Call: | 1 | 2 | 3 | 4 | 5 |
| After Call: | 1 | 2 | 3 | 4 | 5 |
| f. If not staying overnight, I was aware of the policies for having a driver on the day of your procedure. | | | | | |
| Before Call: | 1 | 2 | 3 | 4 | 5 |
| After Call: | 1 | 2 | 3 | 4 | 5 |

2. Which (if any) were problems you experienced with the education process before your procedure? Check all that apply.

- I did not receive a phone call
 Some information was not provided
 Some information was conflicting
 Other: _____

3. Which (if any) of the following services did you find most helpful in preparing you for your procedure? Check all that apply.

- Pre-operative clinic visit at Dominos Farm
 Phone call with anesthesiologist
 Clinic visit with surgeon
 Other: _____
 Pre-operative phone call

4. Please write any additional comments here or on the back side of this sheet.

Appendix B: Current State Map

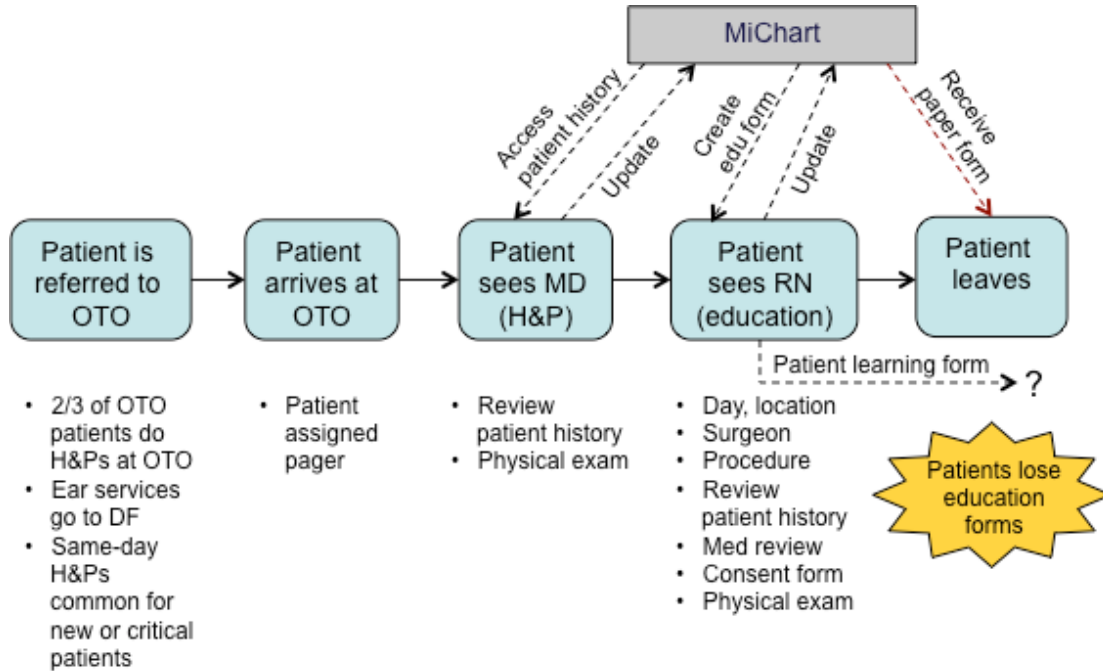


Figure B1. Current state map of Otolaryngology H&P visits.

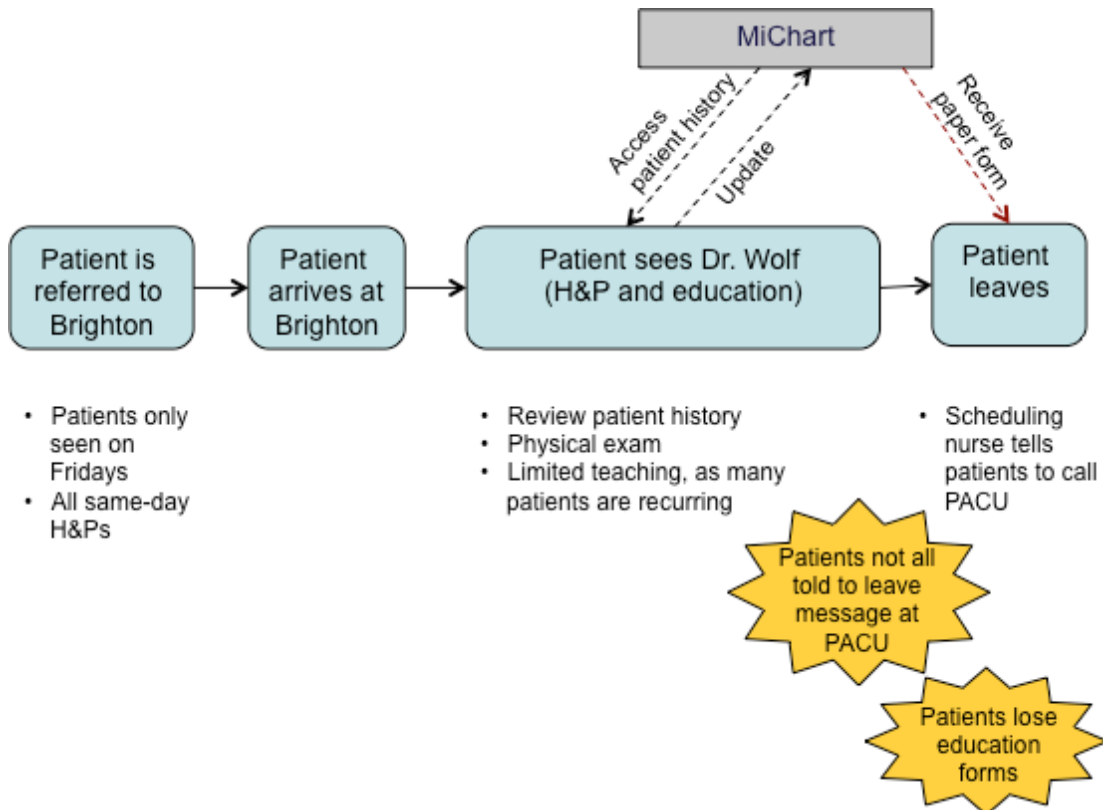


Figure B2. Current state map of Brighton urology visits.

Appendix C: Regression Analysis of Call Length Data

Regression Analysis: Call Length versus AGE

The regression equation is

$$\text{Call Length} = 0.0667 + 0.00283 \text{ AGE}$$

| Predictor | Coef | SE Coef | T | P |
|-----------|-----------|-----------|------|-------|
| Constant | 0.06673 | 0.03861 | 1.73 | 0.087 |
| AGE | 0.0028266 | 0.0006967 | 4.06 | 0.000 |

S = 0.122225 R-Sq = 13.6% R-Sq(adj) = 12.7%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|----------------|-----|---------|---------|-------|-------|
| Regression | 1 | 0.24592 | 0.24592 | 16.46 | 0.000 |
| Residual Error | 105 | 1.56859 | 0.01494 | | |
| Total | 106 | 1.81451 | | | |

Unusual Observations

| Obs | AGE | Call Length | Fit | SE Fit | Residual | St Resid |
|-----|------|-------------|--------|--------|----------|----------|
| 51 | 81.0 | 0.6250 | 0.2957 | 0.0229 | 0.3293 | 2.74R |
| 55 | 94.0 | 0.8194 | 0.3324 | 0.0311 | 0.4870 | 4.12RX |
| 61 | 0.0 | 0.0833 | 0.0667 | 0.0386 | 0.0166 | 0.14 X |
| 67 | 49.0 | 0.6250 | 0.2052 | 0.0121 | 0.4198 | 3.45R |

R denotes an observation with a large standardized residual.

X denotes an observation whose X value gives it large leverage.

Regression Analysis: Call Length versus NURSE

The regression equation is

$$\text{Call Length} = 0.236 - 0.00724 \text{ NURSE}$$

| Predictor | Coef | SE Coef | T | P |
|-----------|-----------|----------|-------|-------|
| Constant | 0.23638 | 0.02820 | 8.38 | 0.000 |
| NURSE | -0.007241 | 0.008896 | -0.81 | 0.418 |

S = 0.131044 R-Sq = 0.6% R-Sq(adj) = 0.0%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|----------------|-----|---------|---------|------|-------|
| Regression | 1 | 0.01138 | 0.01138 | 0.66 | 0.418 |
| Residual Error | 105 | 1.80313 | 0.01717 | | |
| Total | 106 | 1.81451 | | | |

Unusual Observations

| Obs | NURSE | Call Length | Fit | SE Fit | Residual | St Resid |
|-----|-------|-------------|--------|--------|----------|----------|
| 51 | 2.00 | 0.6250 | 0.2219 | 0.0147 | 0.4031 | 3.10R |
| 55 | 1.00 | 0.8194 | 0.2291 | 0.0206 | 0.5903 | 4.56R |
| 67 | 4.00 | 0.6250 | 0.2074 | 0.0164 | 0.4176 | 3.21R |

R denotes an observation with a large standardized residual.

Regression Analysis: Call Length versus AP=1/OP=2

The regression equation is
 Call Length = 0.183 + 0.0227 AP=1/OP=2

| Predictor | Coef | SE Coef | T | P |
|-----------|---------|---------|------|-------|
| Constant | 0.18265 | 0.03919 | 4.66 | 0.000 |
| AP=1/OP=2 | 0.02266 | 0.02543 | 0.89 | 0.375 |

S = 0.131084 R-Sq = 0.8% R-Sq(adj) = 0.0%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|----------------|-----|---------|---------|------|-------|
| Regression | 1 | 0.01364 | 0.01364 | 0.79 | 0.375 |
| Residual Error | 105 | 1.80422 | 0.01718 | | |
| Total | 106 | 1.81785 | | | |

Unusual Observations

| Obs | AP=1/OP=2 | Call Length | Fit | SE Fit | Residual | St Resid |
|-----|-----------|-------------|--------|--------|----------|----------|
| 15 | 1.00 | 0.6250 | 0.2053 | 0.0172 | 0.4197 | 3.23R |
| 67 | 2.00 | 0.6250 | 0.2280 | 0.0187 | 0.3970 | 3.06R |
| 74 | 2.00 | 0.8194 | 0.2280 | 0.0187 | 0.5915 | 4.56R |

R denotes an observation with a large standardized residual.

Regression Analysis: Call Length versus Service

Coefficients

| Term | Coef | SE Coef | T | P |
|----------|----------|-----------|---------|-------|
| Constant | 0.226049 | 0.0158558 | 14.2566 | 0.000 |

Service

| | | | | |
|------|-----------|-----------|---------|-------|
| GYN | 0.017541 | 0.0343684 | 0.5104 | 0.611 |
| NSA | -0.003926 | 0.0444763 | -0.0883 | 0.930 |
| ORTH | -0.069712 | 0.0317310 | -2.1970 | 0.031 |
| OTO | 0.075142 | 0.0444763 | 1.6895 | 0.095 |
| PLA | 0.018781 | 0.0399302 | 0.4704 | 0.639 |

RAD -0.059382 0.0572119 -1.0379 0.303

SON 0.028002 0.0476018 0.5883 0.558

Summary of Model

S = 0.126950 R-Sq = 10.39% R-Sq(adj) = 2.14%

PRESS = 1.55944 R-Sq(pred) = -14.09%

Analysis of Variance

| Source | DF | Seq SS | Adj SS | Adj MS | F | P |
|--------|----|--------|--------|--------|---|---|
|--------|----|--------|--------|--------|---|---|

| | | | | | | |
|------------|---|---------|---------|-----------|---------|----------|
| Regression | 7 | 0.14207 | 0.14207 | 0.0202962 | 1.25937 | 0.281889 |
|------------|---|---------|---------|-----------|---------|----------|

| | | | | | | |
|---------|---|---------|---------|-----------|---------|----------|
| Service | 7 | 0.14207 | 0.14207 | 0.0202962 | 1.25937 | 0.281889 |
|---------|---|---------|---------|-----------|---------|----------|

| | | | | | | |
|-------|----|---------|---------|-----------|--|--|
| Error | 76 | 1.22483 | 1.22483 | 0.0161162 | | |
|-------|----|---------|---------|-----------|--|--|

| | | | | | | |
|-------|----|---------|--|--|--|--|
| Total | 83 | 1.36691 | | | | |
|-------|----|---------|--|--|--|--|

Fits and Diagnostics for Unusual Observations

| Obs | Call Length | Fit | SE Fit | Residual | St Resid | |
|-----|-------------|-----|--------|----------|----------|--|
|-----|-------------|-----|--------|----------|----------|--|

| | | | | | | |
|----|----------|----------|-----------|----------|---------|---|
| 12 | 0.625000 | 0.243590 | 0.0352095 | 0.381410 | 3.12710 | R |
|----|----------|----------|-----------|----------|---------|---|

| | | | | | | |
|----|----------|----------|-----------|----------|---------|---|
| 43 | 0.819444 | 0.301190 | 0.0479825 | 0.518254 | 4.40945 | R |
|----|----------|----------|-----------|----------|---------|---|

| | | | | | | |
|----|----------|----------|-----------|----------|---------|---|
| 55 | 0.416667 | 0.166667 | 0.0634748 | 0.250000 | 2.27393 | R |
|----|----------|----------|-----------|----------|---------|---|

R denotes an observation with a large standardized residual.

Regression Analysis: Average Call Len versus Average of Days

The regression equation is

Average Call Length = 0.211 - 0.00135 Average of Days Before Surgery

| Predictor | Coef | SE Coef | T | P |
|-----------|------|---------|---|---|
|-----------|------|---------|---|---|

| | | | | |
|----------|---------|---------|------|-------|
| Constant | 0.21128 | 0.06019 | 3.51 | 0.004 |
|----------|---------|---------|------|-------|

| | | | | |
|--------------------------------|-----------|----------|-------|-------|
| Average of Days Before Surgery | -0.001352 | 0.003549 | -0.38 | 0.710 |
|--------------------------------|-----------|----------|-------|-------|

S = 0.101491 R-Sq = 1.2% R-Sq(adj) = 0.0%

Analysis of Variance

Source DF SS MS F P

Regression 1 0.00149 0.00149 0.15 0.710

Residual Error 12 0.12360 0.01030

Total 13 0.12510

Regression Analysis: Call Length versus DF Visit

The regression equation is
Call Length = 0.216 + 0.0001 DF Visit

| Predictor | Coef | SE Coef | T | P |
|-----------|---------|---------|-------|-------|
| Constant | 0.21564 | 0.01540 | 14.00 | 0.000 |
| DF Visit | 0.00013 | 0.02732 | 0.00 | 0.996 |

S = 0.131578 R-Sq = 0.0% R-Sq(adj) = 0.0%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|----------------|-----|---------|---------|------|-------|
| Regression | 1 | 0.00000 | 0.00000 | 0.00 | 0.996 |
| Residual Error | 105 | 1.81785 | 0.01731 | | |
| Total | 106 | 1.81785 | | | |

Unusual Observations

| Obs | Visit | Call Length | Fit | SE Fit | Residual | St Resid |
|-----|-------|-------------|--------|--------|----------|----------|
| 18 | 0.00 | 0.6250 | 0.2156 | 0.0154 | 0.4094 | 3.13R |
| 26 | 1.00 | 0.6250 | 0.2158 | 0.0226 | 0.4092 | 3.16R |
| 58 | 0.00 | 0.8194 | 0.2156 | 0.0154 | 0.6038 | 4.62R |

R denotes an observation with a large standardized residual.