Inpatient Cardiology Unit Analysis:
Collect, Categorize and Quantify Delays for Procedures
Final Report

To: Dr. Robert Cody, Director, Inpatient Services for Cardiology
   Barbara Radloff, Senior Management Coordinator

From: IOE 481 – Project Team 12, Programs and Operations Analysis
      Oluwatosin Alao
      Nan Luo
      Shu Yee Tan
      Candice Wee Li Yeung

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Executive Summary

The objective of this project is to present a quantitative assessment of the extent of service delays for procedures and treatments for the Cardiology Inpatient Services Unit at University Hospital. As part of a hospital-wide initiative to increase patient throughput and reduce service delays, the inpatient cardiology service is interested in categorizing and quantifying the volume of testing and procedure delays that are occurring.

Since the unit is a large service accommodating 50-60 patients at a time, and admissions are usually unplanned, it is critical that the unit efficiently and quickly administers patient treatment. Currently, delays occur in various stages of the diagnostic and treatment process. Hospital stays are unnecessarily prolonged by hours or even days which are spent waiting for procedures. This situation increases patient dissatisfaction and reduces the patient throughput rate.

From analysis of historical patient management data and unit interviews we observed that there are three key phases of a patient visit that may incur delays and that of the several procedures provided to cardiology unit patients some procedures incur longer delays than others.

Background
Cardiology patients are typically admitted through the emergency department or transferred from another hospital. In the emergency department patients receive consult from fellows to determine what procedure or treatment is required. A procedure date is then scheduled for the patient and the patients reside in the cardiology unit until their procedure date. Opportunities for delays during a patient visit are present during between the following events:

1. Emergency Department admission and Consult
2. Consult and Scheduling
3. Scheduling and Procedure Date

Methodology
To further investigate the efficiency of patient flow between each of these events the project was divided into the following four phases:

Interview Key Personnel
To understand the current patient flow we interviewed the Admissions Coordinator, Nurse Manager, and Discharge Planner. From the interviews, we gathered that consultation time and time for diagnostic test is not a significant cause for delays as they are completed within 24 hours of admission. Hence we were able to focus our study solely on the main procedures for the cardiology unit. From our interviews we also learned that procedures from the EP and Cath lab are the main services of the cardiac inpatient unit, hence we narrowed our project by looking at past delay records of these 2 procedures to provide insight to the situation in the inpatient unit.
Collect Data
Two sets of data were collected to gain quantitative insight on patient delay. A year’s worth of data (January 2004 to February 2005) was obtained from the Patient Management System that detailed the patient admission and procedure day for procedures offered by the EP and Cath labs. Three weeks of data was also collected from unit nurses during the project period to determine the number of delays that occurred for these same procedures once a procedure was scheduled and the length of these delays.

Analyze Data
Data from the patient management was analyzed to determine the length of pre-procedure days. The length of pre-procedure days gives insight into the amount of time a patient waits to receive their scheduled procedure. The data gathered from the unit nurses provided insight on the quantity of delays that result from a patient failing to receive a procedure on a scheduled date.

Develop Recommendations
Examining further our findings from the analysis phase, that gave evidence of EP lab procedure delays averaging two days longer than Cath lab procedures, we interviewed the EP scheduling coordinator to understand their scheduling process. From this interview we developed a flowchart to identify possible bottlenecks and further recommendation.

Findings and Recommendations
Based on our interviews and data analysis the major delay in patient flow occurs between the scheduling and procedure date. From the data collection process we see that it is rare to reschedule a procedure once scheduled, hence rescheduling is not a major cause for concern. We were also able to eliminate the consult period as a source of major delay during pre-procedure days as it is completed within 24hrs of patient admission. Our recommendation is to investigate the scheduling process to determine delays in patient flow.
Introduction

The inpatient cardiology patients within University of Michigan Hospitals and Health Centers often experience delays receiving necessary testing and procedures. The extent of these delays is unknown and a cause of concern for the patients, health care providers and management. The purpose of this study was to collect, categorize and analyze data to determine the extent and volume of delays within the unit. The goal of this project is to use this data to provide recommendations for future related studies. This document presents our analyzed data, findings and recommendations.

Goals and Objectives

The goals of this project are as follow:

- Collect data on the volume of testing and procedure delays that occur in the inpatient Cardiology service.
- Categorize and quantify the delays specific to procedures and days
- Provide recommendations for future related studies

Background

The Cardiology Inpatient Services at University Hospital currently admits more than 4,700 patients per year. This service is comprised of units 7B/C and 7D. 7B/C is a 47-bed Inpatient Cardiology Telemetry unit. The patient population consists of a large variety of cardiac patients. Some have recently been in the CICU, while others are admitted for invasive procedures such as balloon angioplasty and electrophysiology testing. In addition, at any given time there are several patients having work-ups for the treatment of heart failure and/or heart transplant evaluation.

7D (CICU) is a ten-bed intensive care unit for critically ill cardiac patients. The population includes adult men and women who may experience chronic as well as acute illness. Beds are managed by the Division of Medicine-Cardiology. Common medical diagnoses for these patients include: acute myocardial infarction, coronary syndromes, cardiogenic shock, congestive heart failure, Cardiomyopathy, Dysrhythmias, Pulmonary Hypertension, Valvular insufficiency/stenosis, dissecting thoracic/abdominal aortic aneurysm, pericarditis, sepsis, and heart transplant complications.

Key Issues

These key issues are the driving need for this project.

- Extent of delays that are causing bottlenecks to inpatient flow and the length of stay is unknown.
- Inpatient capacity within University Hospital is limited due to extremely high daily census.
- Need to reduce delays in inpatient flow and length of stay.
- Strong possibility that patients are dissatisfied with long waits.
Project Scope
The scope of this project is to collect, categorize and quantify delays in testing and procedures for the inpatient cardiology service and provide recommendations for future studies. We will only be analyzing data from inpatient service. We will not be investigating the causes of delay within various treatment departments. Any analysis beyond that will also not be investigated.

This project will only cover the University Hospital and does not cover the Mott Children’s Hospital and the Women’s Hospital.

Current Situation
Patients are typically admitted through the emergency department or transferred from another hospital. Expedient patient care services are expected on a fairly variable population. Cardiology patients are typically admitted through the emergency department or transferred from another hospital. In the emergency department patients receive consult from fellows to determine what procedure or treatment is required. A procedure date is then scheduled for the patient and the patients reside in the cardiology unit until their procedure date. Opportunities for delays during a patient visit are present between the following events:

1. Emergency department admission and consult
2. Consult and scheduling
3. Scheduling and procedure date

Hospital stays are unnecessary prolonged by hours or even days which are spent waiting for these procedures. This situation increases patient dissatisfaction and reduces patient throughput rate.

As part of a hospital-wide initiative to increase patient throughput and reduce service delays, the inpatient cardiology service is interested in categorizing and quantifying the volume of testing and procedure delays that are occurring. Since the inpatient cardiology is a large service, and admissions are usually unplanned, it is critical that the unit efficiently and quickly administers patient treatment. Collecting, categorizing and quantifying the volume of testing and procedure delays that occur on the inpatient cardiology service will therefore provide useful data and recommendations for future related studies.

Approach and Methodology
The project was completed in 4 phases:
1. Interviewed Key Personnel
2. Collected Data
3. Analyzed Data
4. Developed Recommendations

1. Interviewed key personnel
We started this project by interviewing key personnel from the Cardiology Unit. First we interviewed the Discharge Planner for the Cardiology unit. From the Discharge Planner and we received an overview of the Cardiology unit, possible sources for time delays, and some procedures that she felt have a substantially longer time delay. Next, we interviewed both the Admissions Coordinator and the Nurse Manager for the Cardiology unit, who gave us an overview of their job function and the current situation of the process.

2. Collected Data
Our next phase was a three week (excluding weekends) data collection period. With the cooperation of the Cardiology unit staff, the data was initiated and performed as follows:

   1. Nurse Manager made Nursing staff aware of the data collection process
   2. Clinical/Nurse supervisor and Admissions Coordinator were responsible for supervising process
   3. Charge nurses in units 7C and 7B collected the data from nursing team leaders during time period from 3am to 3pm weekdays
   4. Team leaders obtained information from nurses and reported to the charge nurse

The data obtained from this collection process will be used to quantify the number and length of delays for each procedure and treatment. It is important to note that the delay collected here is defined as a patient failing to receive a scheduled procedure on the scheduled procedure day. Refer to Appendix A for a sample of the data collection form.

3. Analyzed Data
Two sets of data were analyzed. One set of data was obtained from our project coordinator through University of Michigan Hospitals and Health Centers Patient Management System. The data contained all discharges from the inpatient cardiology services from 1/1/04 to 2/28/05. We identified the following by perform statistical calculations.

   • Number of days between admission day to procedure day
   • Day of the week procedure was completed
   • Average, standard deviation, maximum, and minimum number of pre-procedure days by procedure
   • Histogram of the volume of patients by the quantity of pre-procedure days by procedure
   • Volume of patients with procedures by day of week by procedure.
   • Average pre-procedure days by day of week

The second set of data was obtained through the Data Collection process. From this data set we obtained the number and length of delay for each procedure and treatment.
4. Developed Recommendations
The final phase consisted of identifying procedures with major time delays and compiling information on procedures that require further investigation. To develop recommendations based on findings from our data analysis phase, we interviewed the Electrophysiology (EP) scheduling coordinator to understand their scheduling process. From this interview we developed a flowchart to identify possible bottlenecks and further recommendation.

Findings and Conclusions

Phase 1: Information from Interviews
We identified that EP was a main concern for delays in the inpatient unit from the interview with the Clinical nurse coordinator and the beds and admissions coordinator. Both of them unanimously agreed that from daily observations, EP seems to be a causing unnecessary longer patient stays in the inpatient unit. This is usually due to cancellation of scheduled procedures. The delay was estimated to be 3-5 days.

The coordinators also suggested that Echo may be a unit worth focusing our study on. Though the problem is not as outstanding as the EP unit, Echo does often cause inpatient unit delays. An estimate of the days of delay was not available.

It was also pointed out that consultation time and time for diagnostic test is not a significant cause for delays. Hence we are able to focus our study solely on the main procedures for patients in the unit.

From the interviews, we also gathered that EP and Cath lab are the main procedures of the cardiac inpatient unit and hence we would like to narrow our project by looking at past delay records of these 2 procedures to provide insight to the situation in the inpatient unit. Also, since EP has been highlighted as a possible concern for study, we would compare the data of these procedures to verify the anecdotes and quantify the delays.

Phase 2: Data Collection Analysis
From the data collected, we observe that there are not many cases in which procedures are cancelled. In particular, there were no cases when an EP procedure has to be cancelled resulting in extended inpatient stay.

This finding suggests that delays caused by EP unit may not be due to cancellations of scheduled procedure. Hence, we have to identify other possible causes of delays by the EP. Also, this finding is inconsistent from the anecdotes provided during the interview which suggests that most of the EP delays are caused by cancellations. We believe that this inconsistency is due to the limited sample size.

Phase 3: Patient Management System Data Analysis
The data from Patient Management Systems looks at the date when a patient is admitted into the hospital to the day when the required procedure is administered. This time frame
includes the time a patient spends waiting for consult and diagnostic tests, waiting for an available slot for required procedure and possible delays in the scheduled procedure. Please refer to Appendix B for timeline.

From our data, we verified that patients who require EP procedures do have a longer average day of stay as compared to patients who require Cath lab. The days spent in the hospital is an average of 5 days which is 2 days longer than the average length of stay for a patient requiring a Cath lab procedure.

We did not find any significant correlation between the day of the week that the surgery is scheduled and the days of delays.

Referring to the timeline in Appendix B, having identified that consulting, diagnostic and cancellation to scheduled delays are not significant problems, we were able to conclude that the main cause of delay is in getting the procedure in EP scheduled. i.e. patients are waiting for days before a procedure.

**Recommendation**

We recommend that further studies to be conducted to identify the causes of the delay in getting a procedure scheduled in the EP unit as our study showed that it is a main cause of delay in the inpatient unit.

From our interview with the EP unit scheduling nurse, we developed a flowchart of the unit’s processes, as shown in Appendix C, which we can use to identify the process in the scheduling that requires attention. The area bounded is the processes that we feel improvements will help in patients flow.

**Disclaimers**

*Data Collection*
The 3 weeks of data collection that was conducted did not yield many data and hence we not able to observe any of the trends in delays as suggested in the interviews. A longer data collection period may yield more samples and better illustrate the current situation.

*Data from Patient Management System*
The past data that we analyzed includes the time taken for consulting, diagnostic tests, scheduling delays and cancellation delays. We were not able to accurately quantify the length for each step of the process for each patient, especially so for the consulting and diagnostic tests. Further studies can be conducted to quantify the times for these processes and could be used to verify our project.
*EP Unit*

From the interview with the EP scheduling nurse to develop the flowchart, we recognized that apart some of the issues that may indirectly lead to the inefficient EP scheduling are lack of resources such as labs and doctors. Scheduling of anesthesia nurses is also a persisting problem within the unit and is indirectly causing the longer stays for EP patients. These are some areas that future studies to identify causes of delay within EP unit can investigate.
Appendix A: Data Collection Form

Delays for Cardiac Procedures

Date: 3 April 05 (Sun)

Instructions: Kindly fill in the patients' last name, first name and check all the reasons that apply. Thank you very much!

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<th>Last Name</th>
<th>First Name</th>
<th>Await CATH</th>
<th>Await Consult</th>
<th>Await CT</th>
<th>Await Discharge Planning</th>
<th>Await ECHO</th>
<th>Await EP Study</th>
<th>Await MRI</th>
<th>Await Other Radiology</th>
<th>Await Pacemaker/ICD</th>
<th>Await PT Education</th>
<th>Await Stress Test</th>
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Comments:
Appendix B: Patient Flow Timeline

Patient Management System Data

- Consult
- Schedule
- Procedure Date

Time to when patient is consulted
Time for diagnostic testing
Time spent waiting for an available slot for procedure

Procedure Delayed

Our Data Collection

Time delays are not significant
Appendix C: EP Unit Process Flowchart

Consult form to EP

Fellows do consults

Is procedure required?

Other diagnostic tests required?

Diagnostic Tests

Scheduler in EP

Urgent?

Schedule Next Available