Improving MRI Reading and Reporting Time for Emergency Patients
At The University of Michigan Hospital

Delivered to:

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Introduction

The University of Michigan’s Emergency Department (ED) provides initial treatment to patients with a broad spectrum of illnesses and injuries, some of which may be life-threatening and require immediate attention. After initial triage is performed in the ED, patients may require a Magnetic Resonance Imaging (MRI) scan to diagnose their illness or injury. In emergency situations, it is crucial to report the results of the MRI back to the ED physician in a timely manner. However, the Emergency and Radiology Departments have expressed concern regarding the turnaround time of the current MRI reading and reporting process. There is concern that the current process is not standard and has many delays. Therefore, the Emergency and Radiology Departments would like to improve the efficiency of the reading and reporting process of an MRI scan.

Our team proposes to examine the MRI reading and reporting flow to identify waste and bottlenecks and recommend how to improve the process. This proposal presents a plan for performing tasks to develop recommendations including a detailed project plan and timeline.

Goals and Objectives

Primary goals of this project are to create a detailed value stream map of the current MRI process, identify waste in the process, improve turnaround time, and to recommend improvements. Our team will achieve these goals by performing the following tasks:

- Observe the MRI flow process
- Conduct time studies on the process
- Gather existing data of procedure times within the process
- Interview personnel involved in the process

With this information, we will:

- Identify waste in the current process
- Identify non-standard procedures
- Create a value stream map
- Revise ED MRI team flowcharts
- Develop recommendations

Background

There are currently two distinct processes that are used when an MRI scan is performed on an ED patient. From 8 AM to 5 PM on the weekdays, there is a certain process that is used, while a different process is used at all other times, including the weekend. These different processes produce different results in terms of overall lead time. It is also important to note that there is a different process in each of the three reading rooms. This also has an effect on the overall lead time for a MRI scan to be interpreted.
Weekday Daytime Process

Below is a general description of the current daytime process.

1. After the scan is complete, the images are archived on the disk and automatically sent to a router, and the MRI Tech tracks it out as complete.
2. The MRI Tech adds any necessary comments and prints control sheets.
3. The Tech places the patient paperwork in the pickup bin.
4. One of the Reading Room Coordinators picks up the paperwork from the bin (the bins are checked every five minutes).
5. The Reading Room Coordinator checks to make sure the images are loaded properly.
6. The ED MRI’s are stamped with a red “STAT”.
7. The Reading Room Coordinator delivers the paperwork to the appropriate Reading Room (Neuro or Body, all images are already on the system).
8. A Resident reads the scan. If the resident is comfortable, he/she will call the ED Doctor with the results. Otherwise, they will wait for a faculty doctor to go over it with them.
9. The Resident faxes the results to the ED.
10. The Faculty Doctor finalizes the results in CareWeb.

After Hours Process

Below is a general description of the current after hour’s process.

1. After the scan is complete, the images are archived on the disk and automatically sent to a router, and the MRI Tech tracks it out as complete.
2. The MRI Tech adds any necessary comments and prints control sheets.
3. The MRI Tech walks paperwork to Lead Tech.
4. The Lead Tech calls and tubes paperwork to 1800 Reading Room.
5. The 1800 Reading Room Assistant logs paperwork in ED log book.
6. The Resident reads MRI and writes preliminary report.
7. The Resident gives the preliminary report to the Reading Room Assistant and the Assistant faxes it to the ED.
8. The ED Clerk receives the fax and notifies the ED Doctor that the report is ready.
9. The report is finalized in CareWeb.

Project Plan

Key Issues

This project is needed due to these key issues:

- Perception of long overall lead time
- Perception that reading rooms are non-standard
• Perception that notification process is not standard
• Perception of multiple handoffs
• Perception of significant differences between day and night shift procedures

Project Scope

This project addresses the reading and reporting portion at the end of the MRI processes in the Emergency and Radiology Departments. The process begins when a MRI scan of an ED patient is completed and ends when the radiologist’s final results are posted to CareWeb for use by an ED physician.

The Project Scope Includes:
• All non-pediatric ED MRI scans, including the day and night shifts
• MRI technicians completing scans
• IMACS clerks handling paperwork
• Radiologist reading and reporting MRI scans to ED in neuro, body and 1800 reading rooms
• Transportation of ED MRI patient post-scan relocation

The Project Scope Excludes:
• Preparing patients for MRI scan
• Relocating patients to MRI scanning room
• Non ED MRI scans
• Pediatric MRI scans
• Patient care while ED physician waits for MRI results

Proposed Approach

The ED MRI team will follow a detailed methodology in order to make a final recommendation for ER MRI reading and reporting process. The methodology is outlined below in three phases:

Data Collection:
• Observe current process from start to finish in order to create a current state flow chart
• Perform time studies to collect data on specific times required to perform tasks
• Collect data from computer systems to determine the current total process times
• Conduct literature search to find similar studies including a study conducted by another IOE 481 group in Fall ’07 regarding the ED CT Scan process
• Interview Attending/Fellow/Resident Radiologists, Radiology Room Coordinators, MRI technicians, MRI Clerks, and ED physicians

Analysis:
• Draw a value-stream map to aid in the identification of waste in the process to identify total MRI reading and reporting lead time
• Identify any bottlenecks in the current process
• Determine which steps of the process cause variation in the process
• Comparisons between processes used during different shifts, and also between different reading rooms

Recommendations:
• Propose improvements to current ED MRI reading and reporting process to reduce total lead time
• Standardize process in order to reduce overall variation of the ED MRI reading and reporting process
• Prepare final written report with data, analysis, and recommendations included
• Present findings to the client

Expected Impact

After following the methodology described above, the project team will provide final recommendations for improvement of the ED MRI reading and reporting process. These recommendations will result in:
• Reduced average lead time of MRI’s reading and reporting time from the ED
• Reduced the waste from process MRI’s reading and reporting time from the ED
• Reduced variation in lead time of MRI’s reading and reporting time from the ED
• Improve overall efficiency of the MRI’s reading and reporting time from the ED

Project Team and Experience

Project Client
Caroline Blane, MD: Professor of Radiology, U of M Medical School
Jeffrey Desmond, MD: Clinical Assistant Professor, Department of Emergency Medicine
Susan Fisher: Special Project Coordinator, Department of Radiology

Project Coordinator
Sheri Moore: Senior Industrial Engineer

Project Team
Jimmy Cicala: Senior Industrial and Operations Engineering Student
Jon LaCross: Senior Industrial and Operations Engineering Student
Brad Murphy: Senior Industrial and Operations Engineering Student
Audrey Osinski: Senior Industrial and Operations Engineering Student

Support Required from Operating Entities

The team will receive support from the following entities: the client, coordinator, and hospital staff that has a direct influence on the ED MRI process.

The clients have provided the scope and desired goals for the project. They led the team on a tour of the current process flow of the ED MRI cases and introduced the team to
contacts within the involved departments for the project. The clients will provide ongoing details of the problem, contact information, expectations, and relevant data. The clients will also be available for any questions the team might have throughout the course of the project.

The coordinator has provided the team with the high-level process flow. She will mentor the team by providing expectations and feedback throughout the life of the project. She will aid in sustaining a successful relationship with the client.

The hospital staff involved in the current process includes MRI techs and lead techs, reading room coordinators, radiology MDs, radiology residents, reading room assistants, ED clerks, and ED techs. These persons will aid the team by answering questions the team might have and providing more detailed information of the process.

**Schedule**

To collect data in the MRI and ED areas, analyze this data, and eventually provide recommendations to decrease the turnover time of the ED MRI process, the team will adhere to the following schedule.

**Key Dates**

The following dates are representative of the key activities of the project. The Gantt chart, found in Appendix A, provides a more detailed project schedule.

- Perform time studies: January 22-February 22, 2008
- Interview key personnel: January 22-February 22, 2008
- Receive relevant data: January 28-February 4, 2008
- Analyze collected data: March 4-21, 2008
- Deliver interim report: March 10, 2008
- Develop recommendations: March 23–30, 2008
- Deliver final report: April 6, 2008
- Present final presentation: April 10, 2008

The team will have weekly meetings with the coordinator from 4PM to 5PM on Wednesdays and have weekly meetings with the client from 11AM to 12PM on Fridays. The team also expects to meet with one another once or twice a week.

**Estimated Team Hours Required**

The team estimates that this project will require 8-10 hour per week per team member to successfully complete the project.