

# NO MORE WAIT AND DELAYS:

STREAMLINE WORK FLOW TO DECREASE  
PATIENT TIME OF STAY FOR IMAGE GUIDED  
MUSCULOSKELETAL PROCEDURES

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## Problem

Providing the **right care for the right patient at the right time** is a new system-wide goal for patients at Dartmouth-Hitchcock Medical Center

Patients frequently **wait** for appointments and are **delayed** in obtaining image guided musculoskeletal (MSK) procedures.

# Project

## Assemble a team

- Secretaries, Technologists, Fluoroscopy team leaders, Radiology residents, MSK Attendings, and our departmental quality engineer

## Use the data driven Lean Six-Sigma (LSS)

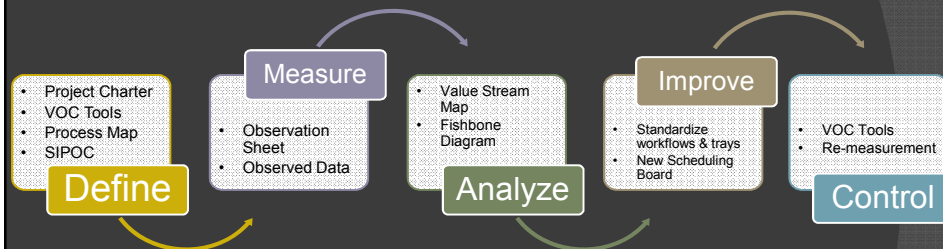
- Structured DMAIC methodology
- Define, Measure, Analyze, Improve, Control

The project took 6 months from start to completion

# Goal

- Decrease wait times, delays, and patient length of stay within the radiology department

# DMAIC Project Overview



VOC - Voice of Customer, a six sigma tool

SIPOC – Supply Process Input Output Customer, a six sigma tool

## Define Step

- ◉ Developed a Project Charter
  - Identified Key Stakeholders
- ◉ Using an open-ended VOC tool sent to key stakeholders, we agreed on the global aim of decreasing patients' time of stay within the department
- ◉ Detailed Process Maps and SIPOC diagrams further categorized our needs

Define

# Project Charter

<b>Project Description / Opportunity Statement</b>  Decrease MSK procedure cycle time in order to decrease patient time in the department.	<b>Project Scope</b>  All fluoroscopic guided MSK procedures performed in the core fluoroscopy suite; including injection, aspiration and arthrograms  <b>Goal Statement</b>  1. Decrease current cycle time	<b>Resource Plan</b>  <table border="1"> <tr> <td>Project Lead:</td> <td>Eric Goodman</td> </tr> <tr> <td>Project Sponsor(s):</td> <td>Jason Spaulding</td> </tr> <tr> <td colspan="2"><b>Team Members</b></td> </tr> <tr> <td>Tom YVC3</td> <td>Yvonne Cheung</td> </tr> <tr> <td>Paula H YVC4</td> <td>Nanci Adams</td> </tr> <tr> <td>Heather LaPorte</td> <td></td> </tr> </table>	Project Lead:	Eric Goodman	Project Sponsor(s):	Jason Spaulding	<b>Team Members</b>		Tom YVC3	Yvonne Cheung	Paula H YVC4	Nanci Adams	Heather LaPorte	
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<b>Team Members</b>														
Tom YVC3	Yvonne Cheung													
Paula H YVC4	Nanci Adams													
Heather LaPorte														
<b>Business Case</b>  Decrease cycle time will:  1. Increase number of procedures, thereby increasing revenue. 2. Improve same day access for add-on patients and therefore increase patient satisfaction.	<b>Measures</b>  1. Door to door time for patients 2. Technologists time spent on procedure 3. Radiology Resident time spent on procedure 4. Radiology Attending time spent on procedure	<b>Timeline</b>  <table border="1"> <tr> <td>Start Date</td> <td>8/15/13</td> </tr> <tr> <td>End Date</td> <td>3/15/14</td> </tr> </table>	Start Date	8/15/13	End Date	3/15/14								
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**Define**

## Assessing the VOC (Select Comments)

<b>Resident/Attending Comments</b>  <ul style="list-style-type: none"> <li>• Patients often positioned sitting in chair rather than on table for consent</li> <li>• Technologists disappear during the procedure to get a supply they should've had already</li> <li>• Technologists set up trays differently</li> <li>• Variability in technologist knowledge/ability</li> <li>• Required to write out a consent form each time</li> </ul>	<b>Technologist Comments</b>  <ul style="list-style-type: none"> <li>• Attending preferences differ, making it difficult to set up a room correctly</li> <li>• Supplies are not kept in a centralized location, or regularly restocked</li> <li>• Infrequently assigned to MSK procedures</li> </ul>
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**Define**

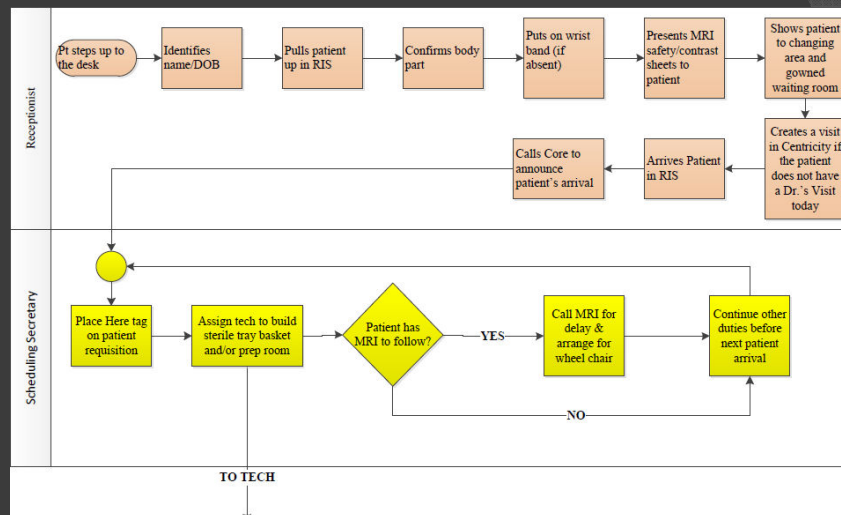
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**YYC3** Yvonne Y. Cheung, 10/28/2014

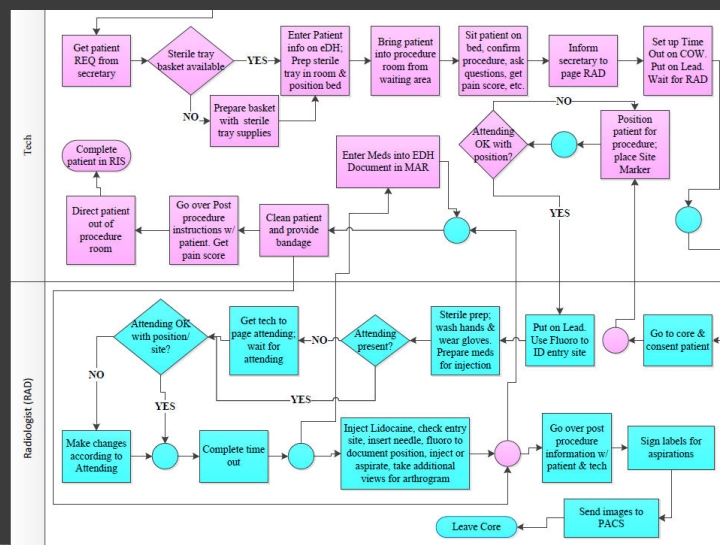
**YYC4** Anuoluwatomiwa Osunkoya  
Yvonne Y. Cheung, 10/28/2014

## Detailed Process Map (part 1)



Define

## Detailed Process Map (part 2)



Define

## MSK Rapid Improvement Project SIPOC

Suppliers	Inputs	Process	Outputs	Customers
<ul style="list-style-type: none"> <li>• Patient</li> <li>• Secretary</li> <li>• Schedulers</li> <li>• Radiology Technologist</li> <li>• Radiology Resident</li> <li>• Radiology Attending</li> <li>• Orthopedics</li> </ul>	<ul style="list-style-type: none"> <li>• Order</li> <li>• Demographic Info</li> <li>• Medications</li> <li>• Physician availability</li> </ul>	<ul style="list-style-type: none"> <li>• Register at Front Desk</li> <li>• Prepare Room for patient</li> <li>• Patient Brought to Room</li> <li>• Consent Patient</li> <li>• Position Patient</li> <li>• Perform Procedure</li> <li>• Give After Care instructions</li> </ul>	<ul style="list-style-type: none"> <li>• Treated Patient</li> <li>• Fluid for lab study</li> </ul>	<ul style="list-style-type: none"> <li>• Patient</li> <li>• Orthopedics</li> </ul>

Define

## Measure Step

- An observation tool was created
  - Time stamps were gathered for specified intervals, reflecting the work flow for 2 weeks
- Average time intervals were calculated

Measure

## Observation Sheet (Pre-Procedure)

MSK PRE-PROCEDURE AREA OBSERVATION SHEET			Date:	Accession #:		
	Start	Finish				
Patient Arrives at front desk						
Check-In process						
Patient filling out contrast sheet						
Patient changing						
Call to Core to Announce Patient Arrival						
Does the Patient need a Contrast Questionnaire?		Y	N			
Was the Patient given a Contrast Questionnaire?		Y	N			
Patient Demographics	Age		Procedure Information	Fluoroscopy	Ultrasound	
	M	F	Exam Type?	Arthrogram	Aspiration	
	Inpatient	Outpatient	1 side or both?	Injection	Biopsy	
	Scheduled	Add-On	Joint of Interest?	Unilateral	Bilateral	
	Ambulatory	Non-Ambulatory		Hip	Knee	Shoulder
				Other:		
Notes:						

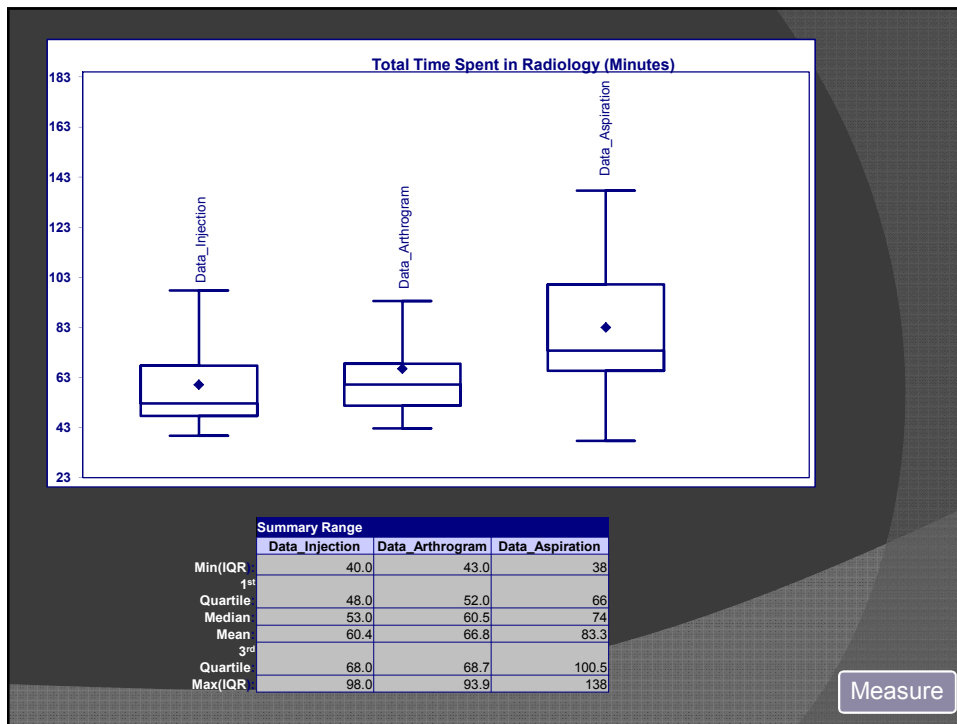
Measure

## Observation Sheet (Procedural)

MSK PROCEDURE AREA OBSERVATION SHEET			Date:	Accession #:		
	Start	Finish				
Receive Call from front desk						
Assign Room & Tech for procedure						
Tech room prep						
Bring patient to room						
Tech pre-procedure questions						
Page to Radiologist Arrival						
Radiologist Arrival Time						
Patient Consent			Patient positioning during consent process:	On Exam Table	In Chair	
Pre-Fluoro Exam positioning			Was patient properly undressed before consent?	Y	N	
Fluoro-guided positioning by Rad			Who wrote out the consent? Physician Tech Other:			
Complete Time-Out			Physician initiating procedure:			
Rad sterile prep			1st 2nd 3rd 4th (yr resident) Attending			
Draw-up medication			Did the physician need to request additional items for procedure? Y / N			
Recheck entry site			If yes, what did they request?			
Page Attending (if applicable)			Did the technologist leave the room for any reason? Y/ N			
Final entry site check w/ Attending			If yes, what was the reason?			
Procedure			Procedure Attending Name: Goodwin Graham Cheung			
Attending Departure Time/Resident Departure Time						
Tech cleans patient			Did the patient require additional imaging?	Y	N	
Tech post-procedure instructions			If Y, where did they go next? CT MR Angio			
Patient discharge			Was there a delay in leaving the procedure room? Y / N			
Tech COW work			If Y, why?			
Tech RIS work						
Room clean up			Was fluoroscopy time/pain score documented by tech? Y / N			
Image Transfer			Who archived the images? Attending Resident Tech			
Notes/Delays:						

Measure





## Analyze Step

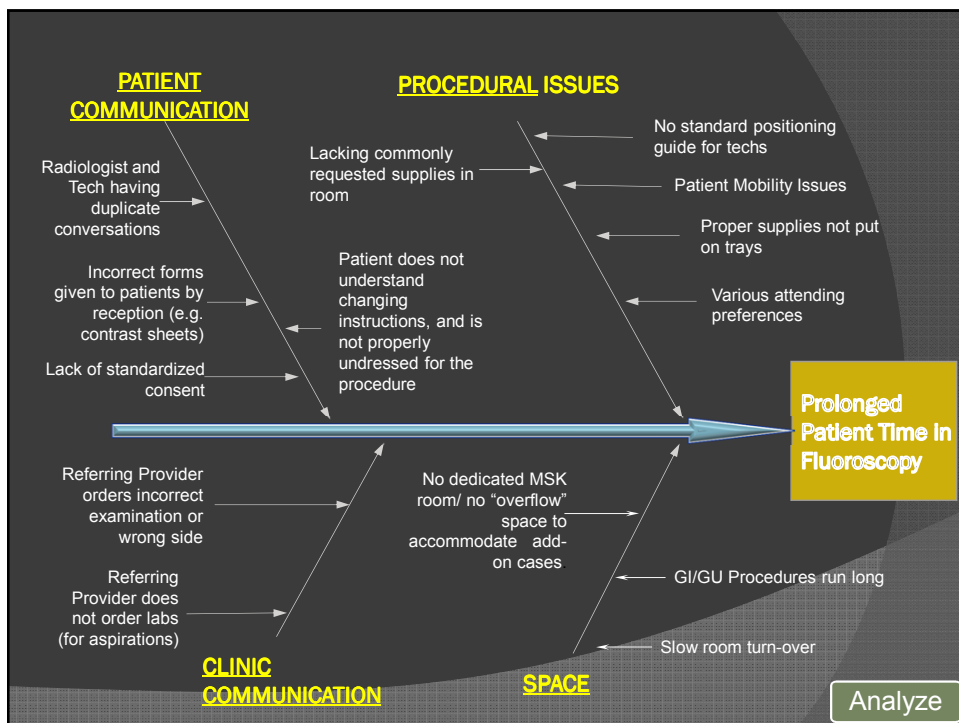
- From the collected data, a value-stream map was created that linked work and information flow, exposing waste and potential for improvement
- A root cause “fishbone” diagram allowed the team to pinpoint factors leading to delays and potential solutions

Analyze

# Value Stream Map

	Check In	Waiting Room	Tech Pre-Procedure Work	Rad Consent	Patient Positioning	Procedure	Tech Post-Procedure Work
Cycle Time	0:03:18	0:20:30	0:03:00	0:04:18	0:04:36	0:05:42	0:00:54
Process Time	0:04:24	0:20:30	0:07:24	0:04:18	0:04:36	0:14:30	0:07:18

Analyze



## Improve Step

- Using lean concepts, the team standardized workflow to decrease variation and eliminate duplicate work
  - Streamlined check-in
  - Created Standardized trays
  - Standardized consent forms

Improve

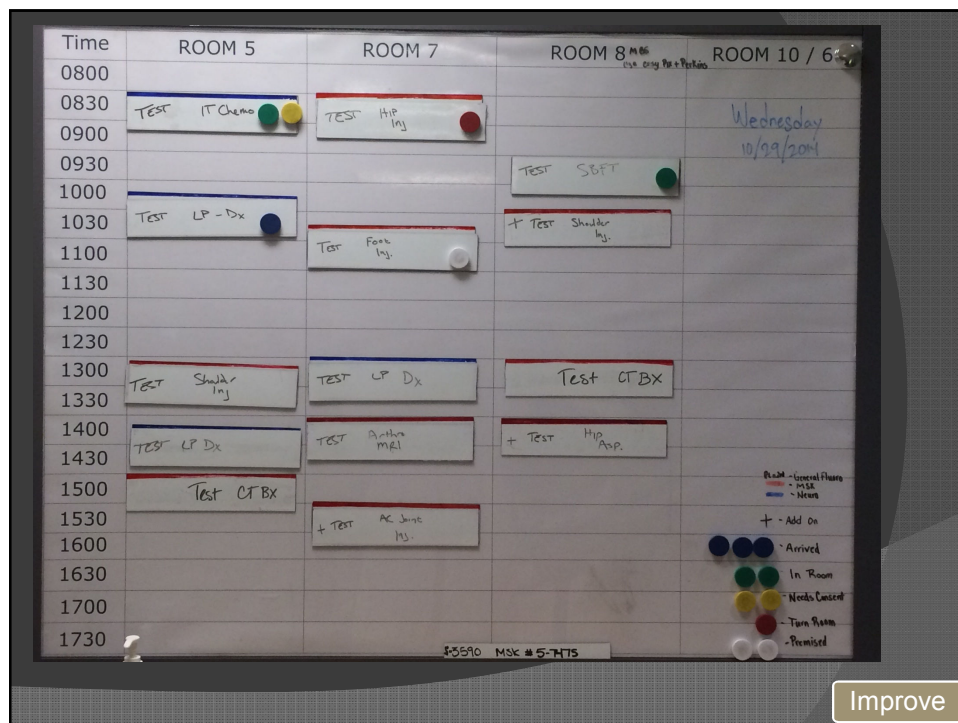


Improve

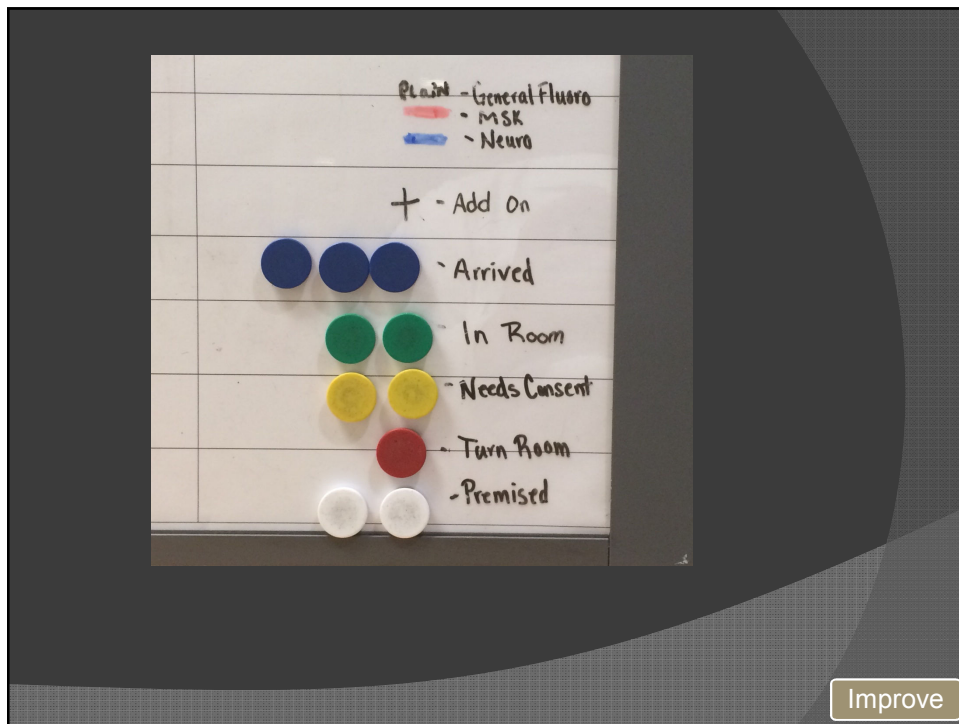
# Improvements

- A “schedule board” was created
  - This allowed all available technologists to see the progress of a procedure, and help in the throughput and room turnover process
  - Secretaries could visualize and manage the work in multiple procedure rooms, helping to control work flow and quickly assign space for add-on requests

Improve



Improve



## Improvements

- Technologists were rotated more frequent and regular basis through MSK procedures
  - While this caused some difficulty at first, the large pool of available technologists are now comfortable assisting the radiologist in MSK procedures
  - Radiologists got used to working with a wide variety of technologists

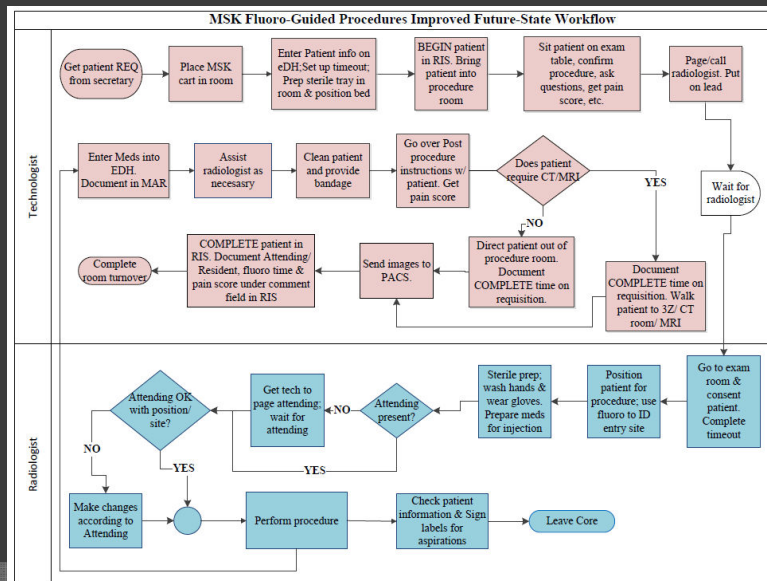
Improve

## Control Step

- Continued documentation of standard practices
  - Training in new practices for secretaries, technologists, and radiologists to reduce variation
- Repeated the VOC tool and measure phase in August 2014 to document gains

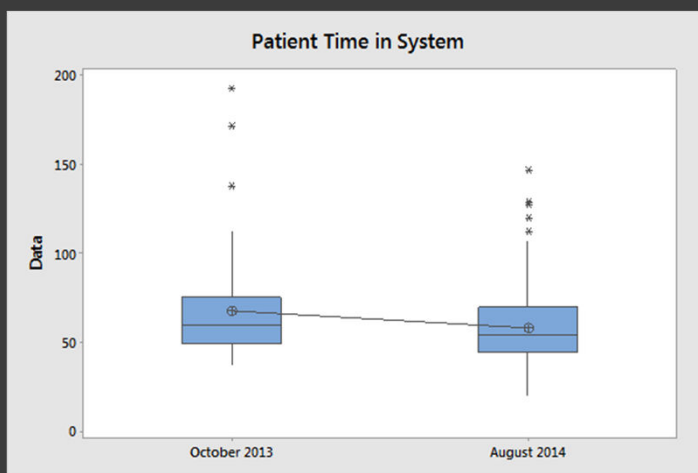
Control

## Standardized Workflow



Control

## Total Patient time in System



Control

## VOC (Select Comments)

### Technologists

- With standardized workflow and increased time I spend doing MSK procedures, the variation between radiologists is reduced, and I can be more confident that I am doing the right thing
- Standardized trays make set up easy and reduces the amount of dead time between procedures

### Secretaries

- I can more easily assign patients to rooms and avoid delays caused by a procedure running long
- My ability to accommodate add-ons has increased, I am turning fewer people away each day

Control

## Control

- The process has been handed off to section leaders for:
  - ongoing tracking of key performance indicators
  - regular meetings with stake holders

Control

## Conclusion

- Using a lean six-sigma methodology, we streamlined and stabilized our workflow in fluoroscopy guided MSK procedures
  - This has led to shorter time of stay and reduction of waits and delays for our patients