

# Healthcare Systems Engineering and Practice Optimization at Mayo Clinic

ELSS + AI Conference 2020



INSTITUTE OF  
**INDUSTRIAL  
& SYSTEMS**  
ENGINEERS







- Introduction
- Applying ISE to healthcare
- About Mayo Clinic
- ISE at Mayo Clinic
- Practice Optimization and Acceleration (POA) portfolio
- Case Study – PACE project
- Questions and discussions

# (a little) about me

- Originally from France
- Worked in Japan (manufacturing) for 7 years
- MSEM from UNC @ Charlotte
- Joined Mayo Clinic in 2016
- 2016 – 2020: Health Systems Engineer
- Current position: Quality Improvement Advisor II in research Administration



-  Need for quality / efficiency
-  Healthcare = systems and processes, supply chain, etc.
-  Highly rewarding, greater impact
-  Rapidly evolving regulatory environment

- One of the World's Largest Medical Centers
- More than 350,000 unique patients each year
- Clinical practice, research and education
- Multispecialty, integrated group practice
- Not-for-profit



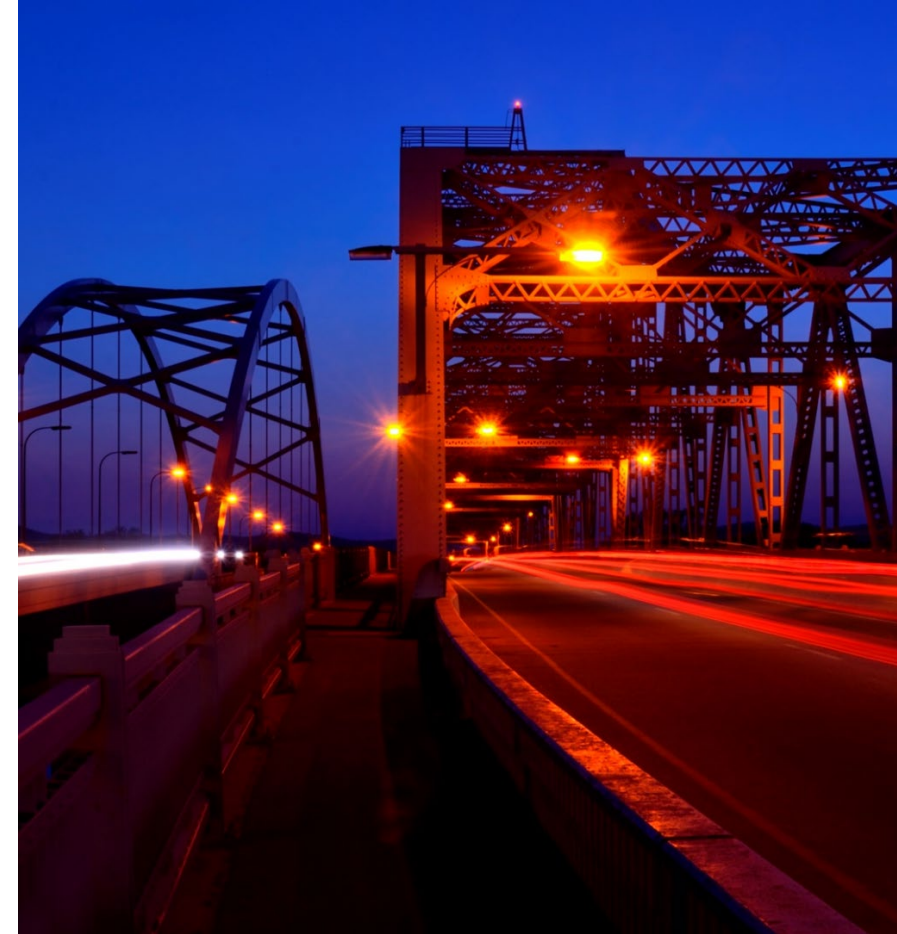
- Mayo Clinic has integrated ISE since 1947
- IEs / LSS professionals embedded in key departments  
Health Systems Engineer / Quality Improvement Advisor / Business Analyst / Lean Six Sigma Project Manager  
E.g.: in (anesthesia, radiology, laboratory, research, education, etc.)
- Kern Center for the Science of Health Care Delivery  
Research in health care delivery
- Quality Academy  
Lean Six Sigma / change management education, project guidance
- Management Engineering & Consulting department  
Internal consulting services to any Mayo Clinic group & externally

- Practice Optimization and Acceleration
- Since 2012
- Redesign of Clinical Practice with the Goals of:
  - **Innovating:** New Standard of Future Practice
  - **Differentiating:** Improving Care and Satisfaction
  - **Simplifying:** Reducing Cost and Effort
- *What differentiates POA projects:*
  - *Action (practice is different and better at the end of the project)*
  - *Charters/ Check points / Clinical oversight and input*
  - *Accomplished in 1 year or less, track metrics for 5 years*

- **Catalogue**: Project library
  - History of all projects and key working documents; available to all
- **Clearinghouse**: Central point of contact; standard intake process
  - Provide education tools/documents to support redesign activities
- **Collaborate**: Partner with strategic groups
  - Quality Academy, Practice Subcommittees, and Departments
- **Communicate**:
  - Internal news stories
  - Sharing success and best practice



- Medical vs. Surgical
- Outpatient vs. Inpatient
- Number of Projects by Site
- Investment vs. Immediate Return
- High Value / Potential
- Placeholder Projects
- 12 month plan; next 4 months locked-in



## POA Resources

Project Manager

Analyst/Health System Engineer

Finance Analyst

Other:

Clinical Nurse Specialist

Informatics

Clinical Subject Matter Experts

## Clinical Area Resources

Physician Consultant

Administration

Nurse Administrator or Manager

Pharmacist

APP Supervisor

Other:

Scheduling, Desk, etc.

	~4 Weeks <i>Pre-Kick off</i>	6 Weeks <i>Initiate</i>	12 Weeks <i>Plan</i>	6 Months <i>Execute</i>	<i>Close</i>	5 Years <i>Monitor/Control</i>
POA	<ul style="list-style-type: none"> <li>• Resources</li> <li>• Initiate charter</li> <li>• Prepare Kick off</li> </ul>	<ul style="list-style-type: none"> <li>• Stakeholder analysis</li> <li>• Requirements</li> <li>• Brainstorming</li> <li>• Baseline Metrics</li> <li>• Review Data</li> </ul>	<ul style="list-style-type: none"> <li>• Current State</li> <li>• Future State</li> <li>• Define Pilots</li> <li>• Set Targets</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation</li> <li>• Change Management</li> <li>• Create Tracking Dashboard</li> <li>• Metrics Reported</li> <li>• <b>Transition Ownership</b></li> </ul>	<p>Project Closure Documents</p>	<p>Year 1-5 Actual Year End Metrics</p>
Practice	<ul style="list-style-type: none"> <li>• Identify Team</li> <li>• Prepare Practice</li> </ul>	<ul style="list-style-type: none"> <li>• Share practice knowledge</li> <li>• Input on Data</li> <li>• Obstacles/Strategy</li> </ul>	<ul style="list-style-type: none"> <li>• Engaged in Pilots</li> <li>• 'Sell' to practice</li> <li>• Feedback on +/-</li> </ul>	<ul style="list-style-type: none"> <li>• Change Management</li> <li>• Lead by Example</li> <li>• <b>Accept Operational Ownership</b></li> </ul>		



## Case Study – POA PACE project

- Implantation of Pacemakers and Implantable Cardiac Defibrillators (ICD) is a growing practice in Cardiology
- These procedures are associated with high cost, especially in supplies (device).
- Patient volumes continue to increase at all six sites that perform these procedures

→ A POA project: POA PACE was initiated in November 2016

**D**

## DEFINE

- Define Scope / goal of project
- Project Charter

**M**

## MEASURE

- Measure Baseline
- Quantify Target

**A**

## ANALYZE

- Process Mapping
- Summarize / Select Interventions

**I**

## IMPROVE

- 18 interventions performed
- Resulted in cost reduction

**C**

## CONTROL

- Control plan for next 5 years

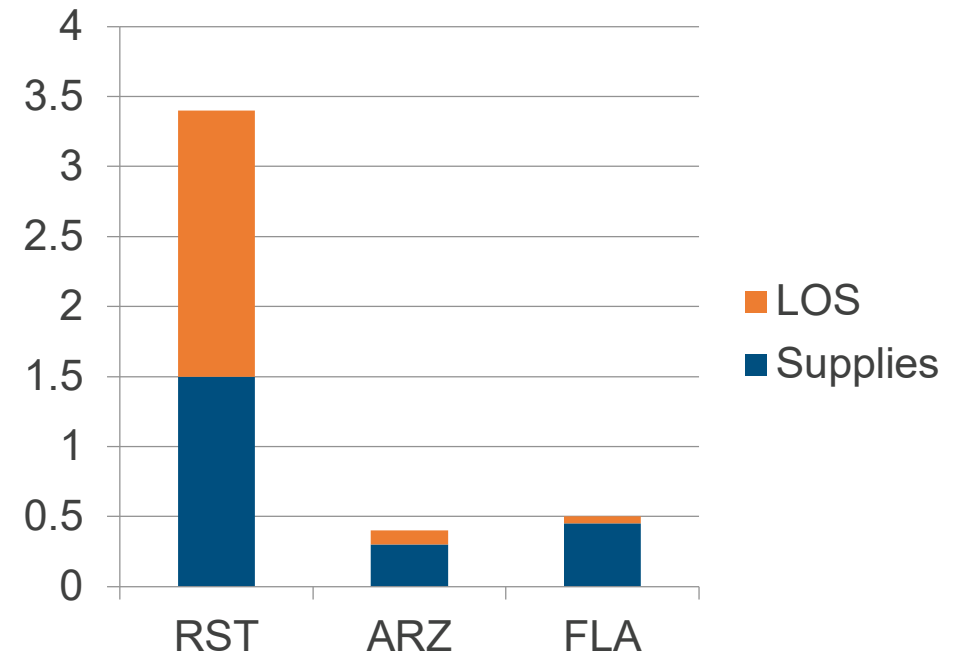


## Mayo Clinic Enterprise Project Charter

- Project Charter
  - Set goal
  - Scope project

<b>Project Name:</b>	<b>Manage To Reimbursement: ICD/PACE</b>		
① Primary Executive Portfolio	Enterprise Practice Portfolio		
② Primary Program			
② Governance Level	1 - Enterprise Portfolio	① <a href="#">Project Size</a>	Large
① Approved Stage	Plan		
① Description <i>(255 Character Limit)</i>	<p>The MTR PACE project is a collaborative effort across the 6 sites (Rochester, Arizona, Florida, Mankato, Eau Claire, La Crosse) to reduce the total cost associated with ICD/PACE care while maintaining or improving outcomes for these procedures and hospitalizations. The total cost (excluding heart transplant) associated with ICD/PACE was \$43.5 million.</p> <p>Cost reduction and revenue generation/protection are expected through the following sub-strategies:</p> <ol style="list-style-type: none"> <li>1) Reduce supplies costs (standardization, contracting) - \$2.25M</li> <li>2) Reduce Length of Stay for both inpatient and outpatient - \$2.05M</li> </ol> <p>Normalized to 2015 costing, volumes and complexity.</p>		
① Primary Operating Objective	C5c. Manage to Reimbursement (MTR) Initiatives		
① Secondary Operating Objective	C5. Improve productivity, effectiveness and efficiency, and reduce costs		

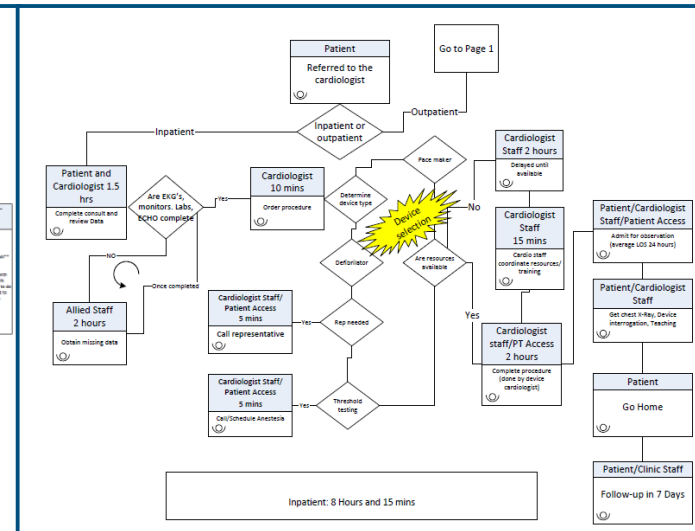
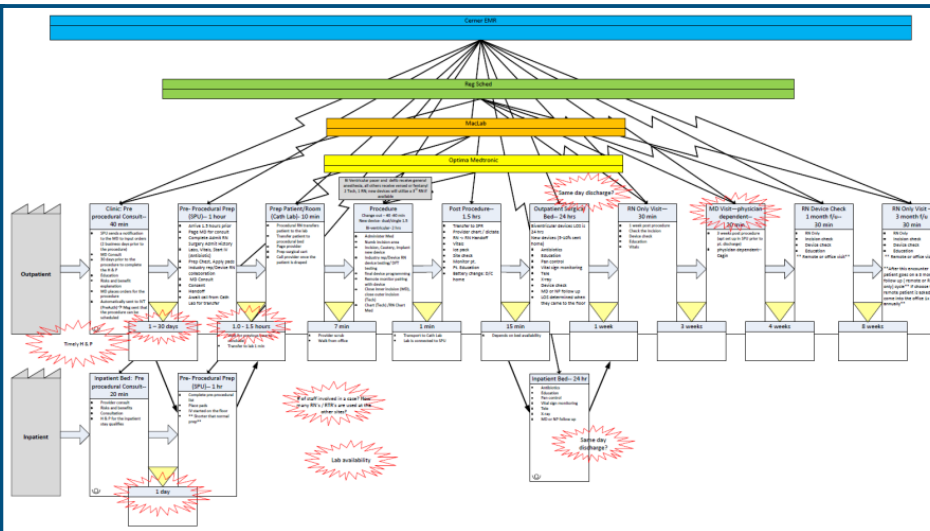
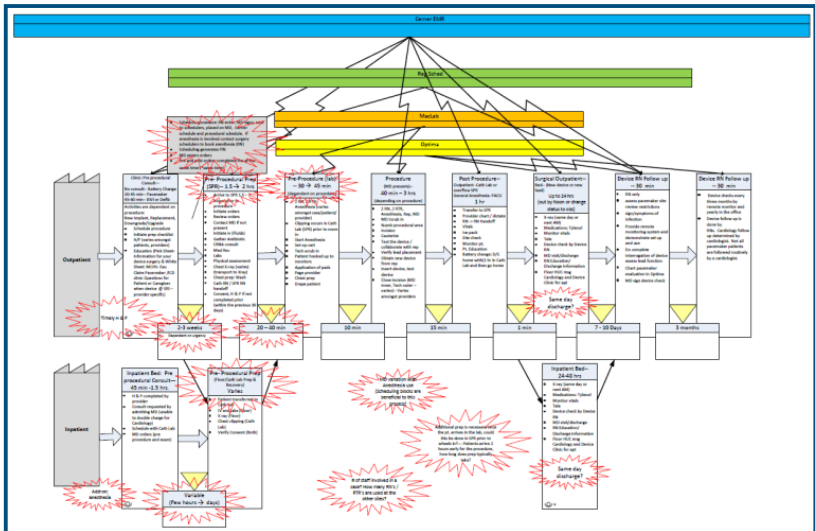
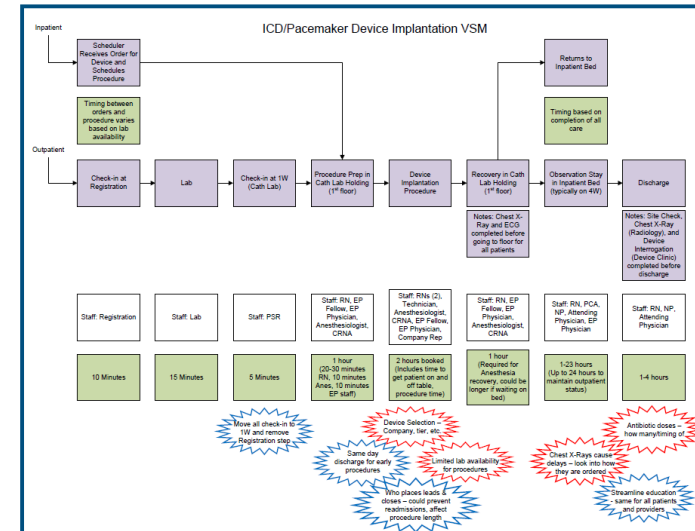
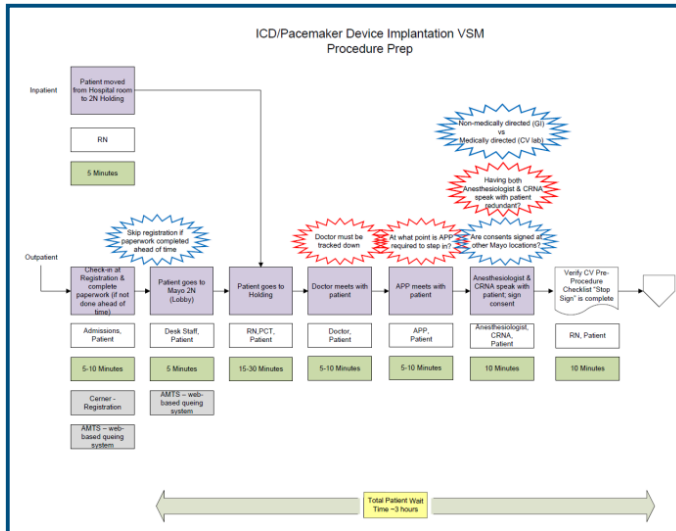
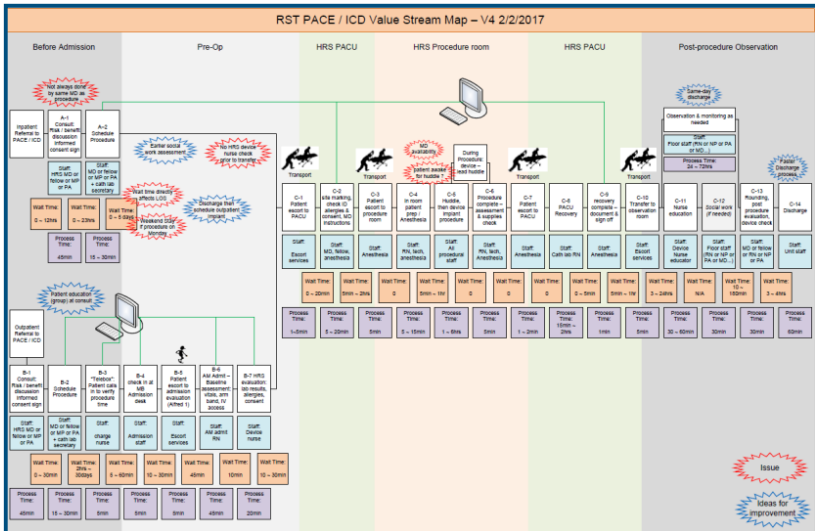
- Measure Baseline
- Quantify Targets
- 2 main categories identified:
  - Reduce supplies costs
  - Reduce Length of Stay (LOS) (both inpatient and outpatient)



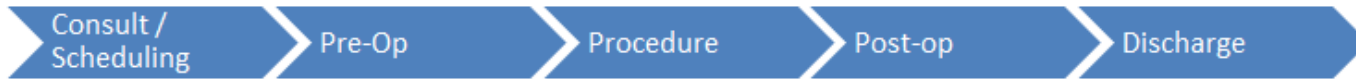




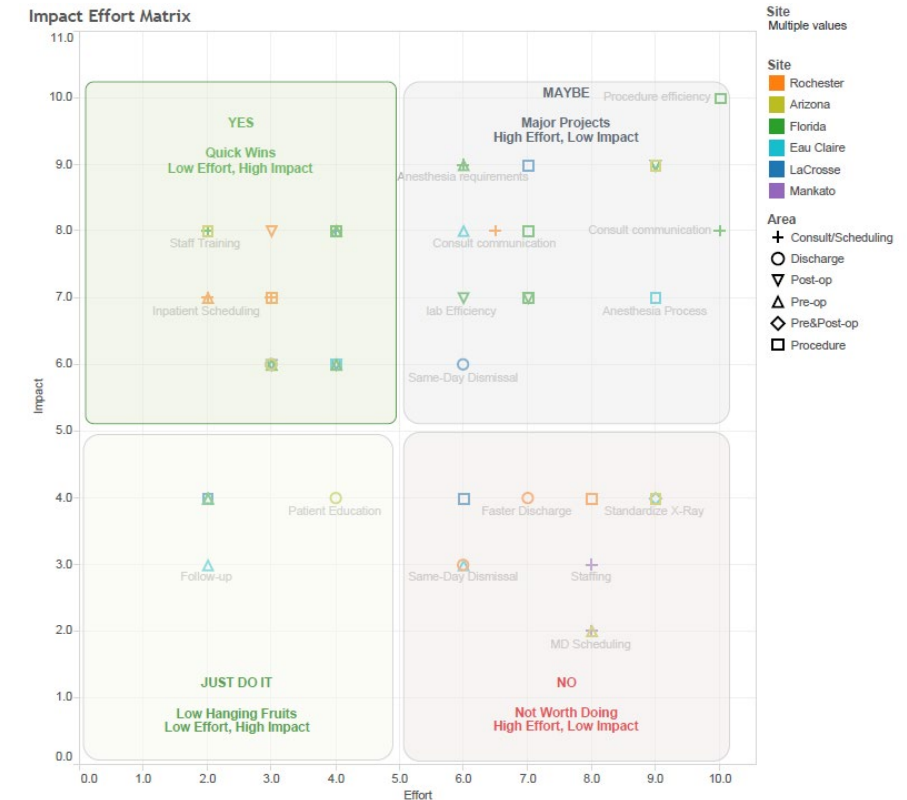
# POA PACE - ANALYZE



- Summarize opportunities by site & process step
- Effort / Impact Matrix to select high impact interventions



Site	Consult	Pre-Op	Procedure	Post-Op	Discharge
<b>Rochester</b>	<ul style="list-style-type: none"> <li>Improve communication between MDs / fellows (documentation)</li> <li>Use of micro-consult take outside (e.g. inpatient consult)</li> <li>Inpatient discharge and schedule device implant as outpatient</li> </ul>	<ul style="list-style-type: none"> <li>Standardize lab / antibiotic requirements from anesthesia</li> </ul>	<ul style="list-style-type: none"> <li>Make sure Patient is awake for huddle (or do the huddle in prop area?)</li> <li>Videokonfernce?</li> <li>Standardize anesthesia (type / dose)</li> </ul>	<ul style="list-style-type: none"> <li>Procedural PACE MD seeing the patient</li> </ul>	<ul style="list-style-type: none"> <li>Same-day dismissal when appropriate</li> <li>Speed-up the discharge process (meds, X-ray, device check, rounding)</li> </ul>
<b>Florida</b>	<ul style="list-style-type: none"> <li>Retain staff that anesthesiologist add-ons go through Mogen &amp; steady only, forward with procedure</li> <li>Standardize &amp; implement grid for eqpt, lab requirements</li> <li>EP Doc of the Day - Standardize bumping</li> <li>Standardize MD to MD communication; Attending vs Fellow/APP</li> </ul>	<ul style="list-style-type: none"> <li>Show patient in holding area</li> <li>Patient prep in lab prop area, prior to anesthesiology initiation</li> <li>Supplies board in IP service offices</li> <li>Eqpt, PC online, not visual required - standardize a phone call</li> <li>Discuss eqpt/CNNA duplication with MD</li> </ul>	<ul style="list-style-type: none"> <li>Mandate compliance to standard antibiotic practice</li> <li>Modulate sedation for device implant</li> <li>PCT assigned to EP</li> <li>Standardize and improve physician efficiency</li> </ul>	<ul style="list-style-type: none"> <li>APP: Lab efficiency like AM workup post-op orders</li> <li>EP turnaround time: Make more efficient with DoPro in room &amp; standardization</li> <li>Streamline to reduce PACE notification redundancy</li> <li>Standardize 23 hour observation</li> </ul>	
<b>Arizona</b>		<ul style="list-style-type: none"> <li>Move all checkin processes to 1W and remove general registration stop</li> </ul>	<ul style="list-style-type: none"> <li>Standardize who places leads and closes (potentially reducing readmissions and procedure length)</li> <li>Standardize device selection process</li> <li>Improving efficiency of Anesthesia processes</li> </ul>		<ul style="list-style-type: none"> <li>Same day discharge for early procedures</li> <li>Streamline education so it's the same for all patients and providers; provide more interactive education materials</li> </ul>
<b>Eau Claire</b>		<ul style="list-style-type: none"> <li>H &amp; P completed prior to day of procedure</li> <li>Pre procedural patient prep in SPT</li> <li>Schedule post-procedure follow-up at prop visit</li> <li>Standardize when an x-ray is necessary pre-op and/or post-op</li> <li>Provider orders received prior to patient arrival</li> </ul>	<ul style="list-style-type: none"> <li>Standardizing anesthesia processes</li> <li>Increase availability for weekend implants (eqpt, lab staff)</li> <li>Understanding optimal staffing ratio for efficient turnarounds</li> </ul>	<ul style="list-style-type: none"> <li>Standardize when an x-ray is necessary pre-op and/or post-op</li> </ul>	<ul style="list-style-type: none"> <li>Same day discharges for new devices</li> </ul>
<b>LaCrosse</b>	<ul style="list-style-type: none"> <li>Standardize device selection</li> <li>Standardize online for urgent vs non-urgent classification</li> <li>Inpatient Procedures; discharge and schedule as an outpatient</li> </ul>		<ul style="list-style-type: none"> <li>Standardized anesthesia process</li> <li>Determine # of ideal staff involved in a case? (Anesthesia vs. Non Anesthesia)</li> </ul>	<ul style="list-style-type: none"> <li>Standardize timing and number of X-rays</li> <li>Continue to investigate the opportunity to complete post procedure device checks remotely?</li> </ul>	<ul style="list-style-type: none"> <li>Same day discharge</li> </ul>
<b>Mankato</b>	<ul style="list-style-type: none"> <li>Arc Beds and Staff available</li> <li>Physician Scheduling</li> </ul>		<ul style="list-style-type: none"> <li>Device selection protocol</li> </ul>		<ul style="list-style-type: none"> <li>Discharge protocol (Same Day)</li> </ul>



## Enterprise – wide Interventions:

1. Standardize Device Selection
2. Standardize criteria for urgent cases classification
3. Standardize anesthesia lab requirements and practices
4. Standardize staffing model
6. Same day discharge
7. Centralize recall handling process

### Rochester Interventions:

1. Schedule non-urgent inpatients as outpatient procedure
2. Introduce micro-consult
3. Post-op MD visit to patient

### Florida Interventions:

1. Formalize process for scheduling add-ons
2. Optimize procedure rooms utilization
3. Standardize discharge

### Arizona Interventions:

1. Streamline education material

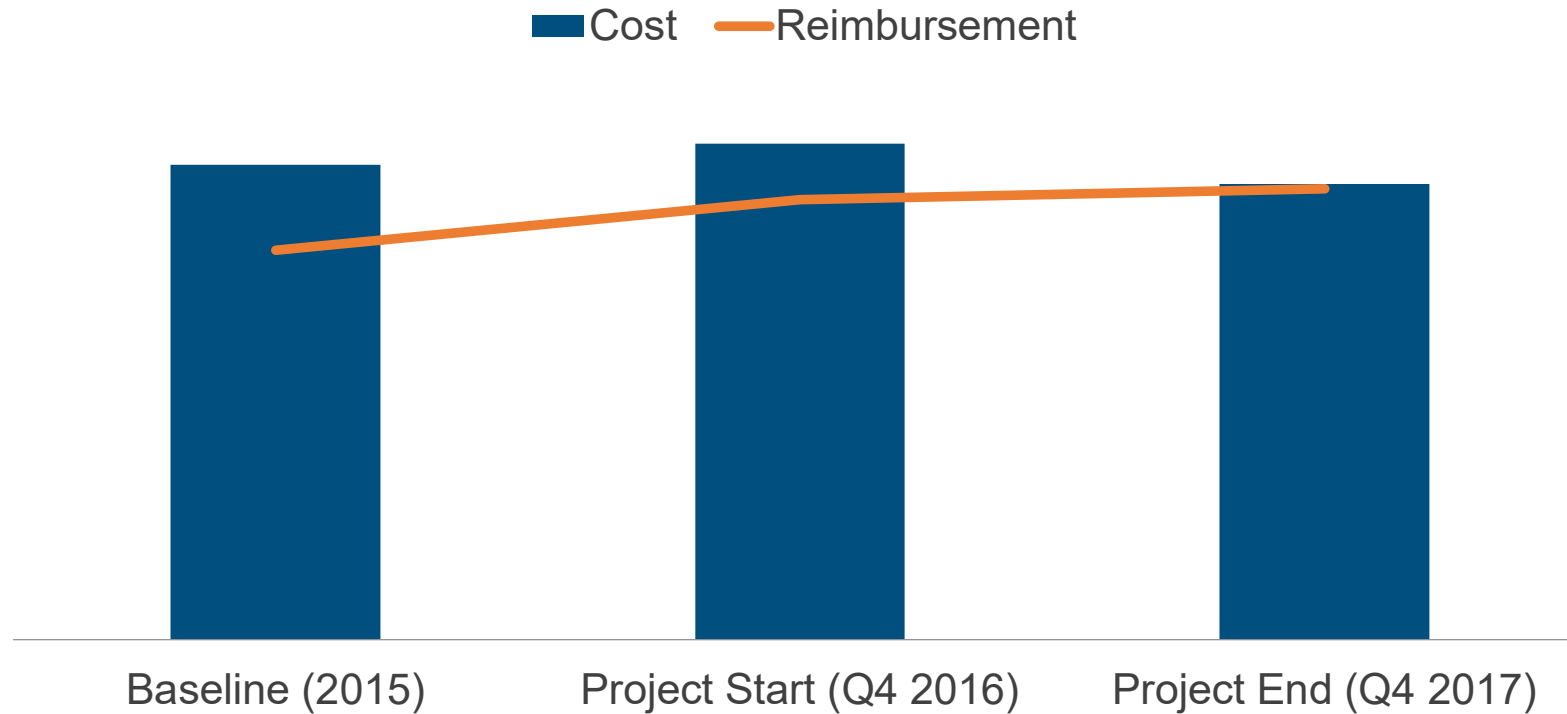
### Eau Claire (WI) Interventions:

1. Optimize pre-procedural information recording
2. Schedule post-procedure visit earlier

### Lacrosse (WI) Interventions:

1. Standardize timing and number of X-rays
2. Complete post-procedure check remotely

Lowering of the average costs / case to a near-break even point



## Control Plan – 5 years

Control Subject	Subject Goal	Frequency of Measure	Criteria for Decision	Action/ Responsible Party	Analysis Method
Costs / case	Target to be calculated each quarter	Quarterly	5% over Target	PACE practice leadership to review data and trigger interventions if needed	Financial Analysis
ALOS	RST: 5.2days FLA: 3.2days ARZ:4days	Monthly	More than 0.5 day over target		
Device costs / case	Target to be calculated each quarter	Quarterly	More than 10% over target in more than 3 device categories		

- Standardized several practice processes including:
  - Device buying and inventory management
  - Same Day Discharge
  - Device Recall Process
- Created opportunities for continuous improvements, including cost reductions and best practices, beyond the actual scope of the project

- Following process thoroughly (DMAIC) enabled quick progress and results
- Project structure with defined Leadership team in Rochester helped with consistent communication following the organizational structure
- Practice variation between sites makes standardization more difficult than originally thought



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CONFERENCE**  
OCT. 12 - 14, 2020

The banner features a dark blue background with various icons representing engineering, data, and artificial intelligence, including a globe, gears, a lightbulb, a rocket, a brain with 'AI' inside, and a bar chart.

## KEYNOTE SPEAKERS



**Victoria Jordan, Ph.D.**  
Vice President - Quality,  
Emory Healthcare



**Ben Amaba, Ph.D.**  
Chief Innovation Officer,  
IBM Watson and Cloud Division

- Featuring:
  - Artificial Intelligence Symposium
  - LSS Applications & Training Track
  - LSS Research & Education Track
  - Panel Session
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- Learn More at [iise.org/LeanSixSigma](https://iise.org/LeanSixSigma)



- Links:
  - [Mayo Clinic Kern Center for the Science of Health Care Delivery](#)
  - [Mayo Clinic Management Engineering & Consulting](#)
- Resources:
  - [Recorded Webinar: POA TAVR](#)
  - [How Mayo Clinic Got Buy-In for a Plan to Reduce Hospital Stays \(HBR article\)](#)