Lean Process Improvement: Measuring the Impact of a Project to Increase ED CT Throughput

RSNA 2020

Pratik Rachh MD, MBA
Phuong-Anh Duong MD
Tarek Hanna MD
Andrew Pendley MD, MBA
Marta E Heilbrun MD, MS

Department of Radiology and Imaging Sciences & Department of Emergency Medicine
Emory School of Medicine and Emory Healthcare
Radiology and ED teams partnered on a LEAN process improvement project to reduce turnaround time (order to complete) for ED CT exams.

Project Goal: Improve frequency of CT acquisitions (order to exam complete) obtained in under 120 minutes by 10%, from a baseline of 61% to 71% by March 2019.

7 counter measures were instituted over 12 months.

Here we describe our methodology to quantify tangible project outcomes from 2 of the 7 counter measures.
RSNA 2019 Poster

Focused on demonstrating improvements in process metrics

RSNA 2019 Quality Improvement Poster

Improving ED CT Patient Flow

Pratik Rachh MD, MBA, CSSBB, CPHQ Philip Haun DNP, MBA, RN, NHDP-BC, CEN, NE-BC,
Sarah Omess MSN, APRN, AGCNS-BC, AGNP-BC, Phuong-Anh Duong MD, Marta Heilbrun MD, MS, Tarek Hanna MD, Daniel Close RT(R), Ashley Osborne RT(R) (CT),
Nataisia Terry MD MBA, Keith DellaGrotta MD, Jane Vitali BSRT(R) CV, Greg Pennington MBA, Susan Starr PFA, Andrew Pendley MD, MBA

1. Aim Statement
   Increase percent of ED CT exams completed within 120 minutes from 61% to 71% by March 2019.

2. Reason For Action
   Emergency Department (ED) visits have increased at twice the rate of the United States population growth, while the number of ED facilities across the nation has plateaued, resulting in increased ED overcrowding. Overcrowding leads to delays in patient care, raises costs, and creates patient flow challenges across the hospital system. Approximately 90% of our ED visits involve imaging, with CT as the most common imaging modality. As part of improving overall flow of patients through the ED, our team attempted to improve CT turnaround times.

3. Current State
   - EDH ED CT volume: 53 exams/day
   - 40% of ED volume is between 11am to 1pm
   - Capacity to meet CT demand lagged between 11am to 3pm

4. Gap Analysis
   Tech Workflow Time Study

5. Solution Approach (If we...then we...) & Rapid Experiments
   - Test of Change 1: Create Checklist and Standard Work for CT Patient Flow
     - Gap Analysis: Time between CT order placed and patient in CT
     - Solution: Standardized CT Order Process
   - Test of Change 2: Revise CT Aortic Stent Placement Protocol
     - Gap Analysis: Staffing and workflow issues
     - Solution: Revised CT Aortic Stent Placement Protocol
   - Test of Change 3: Optimize Contrast Screening Form
     - Gap Analysis: Current process for contrast screening
     - Solution: Optimization of Contrast Screening Form

6. Confirmed State

RSNA 2020 Poster

Showcases model for demonstrating outcomes metrics in Confirmed State
MODEL FOR MEASURING PROCESS OUTCOMES

STEP 1: Calculate Time Saved for One Cycle

\[ \text{Time Saved for One Process Cycle} = \text{Time to Complete New Process} - \text{Time to Complete Prior Process} \]

STEP 2: Calculate Time Saved Per Day

\[ \text{Time Saved Per Day} = \text{Time Saved for One Process Cycle} \times \text{Number of Times Process Performed in a Day} \]

STEP 3: Calculate Time Saved Per Month or Quarter or Year

\[ \text{Time Saved in a Month or Quarter or Year} = \text{Time Saved Per Day} \times \text{Number of Days in a Month or Quarter or Year} \]
LEAN STRATEGIES LEVERAGED

REDUCE “WASTE”

CT Contrast Screening Form
- Form had multiple redundant and non-actionable questions
- Took long to complete

Counter Measure #1:
Update CT Contrast Screening Form

STANDARDIZE PROCESSES

ED CTA Aortic Dissection Order
- Did not match Radiology CT protocol
- Exams ordered incorrectly and had to be corrected / re-ordered

Counter Measure #2:
Update CTA Aortic Dissection Order
COUNTER MEASURE #1
UPDATE CT CONTRAST SCREENING FORM

Previous CT Contrast Screening Form

New CT Contrast Screening Form

Time to Complete Contrast Screening - Before

<table>
<thead>
<tr>
<th>Time</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 minute 45 seconds</td>
<td></td>
</tr>
<tr>
<td>2 minutes 53 seconds</td>
<td></td>
</tr>
<tr>
<td>2 minutes 41 seconds</td>
<td></td>
</tr>
<tr>
<td>1 minute 28 seconds</td>
<td></td>
</tr>
<tr>
<td>1 minute 35 seconds</td>
<td></td>
</tr>
<tr>
<td>2 minutes 10 seconds</td>
<td></td>
</tr>
</tbody>
</table>

Average: 2 minutes 5 seconds

Time to Complete Contrast Screening - After

<table>
<thead>
<tr>
<th>Time</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>47 seconds</td>
<td></td>
</tr>
<tr>
<td>38 seconds</td>
<td></td>
</tr>
<tr>
<td>40 seconds</td>
<td></td>
</tr>
<tr>
<td>45 seconds</td>
<td></td>
</tr>
<tr>
<td>47 seconds</td>
<td></td>
</tr>
<tr>
<td>41 seconds</td>
<td></td>
</tr>
</tbody>
</table>

Average: 43 seconds
COUNTER MEASURE #1
UPDATE CT CONTRAST SCREENING FORM

<table>
<thead>
<tr>
<th>Previous CT Contrast Screening Form</th>
<th>New CT Contrast Screening Form</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>57 redundant and non-actionable questions</td>
<td>22 actionable questions</td>
<td>61% reduction in questions</td>
</tr>
<tr>
<td>125 seconds to complete</td>
<td>43 seconds to complete</td>
<td>82 seconds saved per screening form</td>
</tr>
</tbody>
</table>

MEASURING OUTCOME

82 seconds saved per screening form

778 contrast exams / month

12 months

212 hours saved

OR

5.3 weeks of full-time technologist hours saved
COUNTER MEASURE #2
UPDATE CTA AORTIC DISSECTION PROTOCOL

Previous ED CTA Aortic Dissection Order

Exams are ordered appropriately

New ED CTA Aortic Dissection Order

4 minutes to cancel incorrect exam, request ordering provider to enter new order, and process new order

Exams are ordered appropriately

Improvement

4 minutes saved per exam

MEASURING OUTCOME

4 minutes saved per exam

210 aortic dissection CTA exams / quarter

4 quarters

56 hours saved OR 1.4 weeks of full-time technologist hours saved
AGGREGATED OUTCOME

New CT Contrast Screening Form

ANNUAL TIME SAVED
212 hours / 5.3 weeks of full-time technologist hours

New ED CTA Aortic Dissection Order

56 hours saved / 1.4 weeks of full-time technologist hours

Cumulative Time Saved From 2 Countermeasures

267 hours / 6.7 weeks of full-time technologist hours
Conclusions

• Focus of Lean Management System is to reduce process wastes

• Highlighting the impact of Lean process improvement activities is essential to maintain buy-in of key stakeholders and Executive leadership sponsoring such activities

• Quantifying improvements in terms of time saved is a tangible way to demonstrate outcomes from process changes