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

RSNA 2020

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Background

- 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

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RSNA 2019 Quality Improvement Poster

Improving ED CT Patient Flow

EMORY HEALTHCARE

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1 Aim Statement

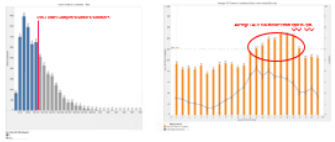
Increase percent of ED CT exams completed within 120 minutes from 61% to 71% by March 2019.

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 declined, resulting in widespread ED overcrowding. Overcrowding leads to delays in patient care, raises costs and creates patient flow challenges across the hospital system. Approximately 60% 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

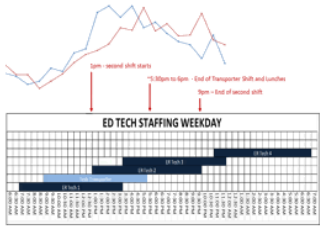
- EUH ED CT volume – 53 exams/day
- 60% of ED volume is between 11am to 11pm
- Capacity to meet CT demand lagged between 11am to 3pm

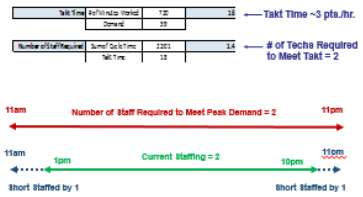


High-level Process Map

4 Gap Analysis

Tech Workflow Time Study

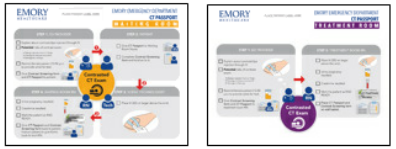




5 Solution Approach (If we…then we…) & Rapid Experiments

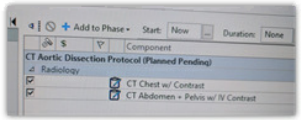
Test of Change 1 – Create Checklist and Standard Work for CT Patient Flow

Key Drivers Impacted – Improve patient communication and Prioritize CT exams.



Test of Change 2 – Revise CT Aortic Dissection PowerPlan

Key Drivers Impacted – Remove barrier to first pass yield and Eliminate non-value add work



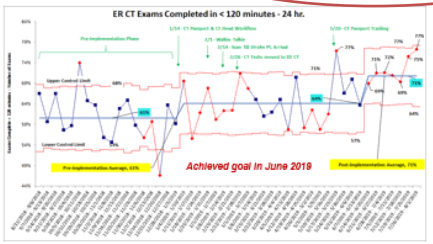
Test of Change 3 – Optimize Contrast Screening Form

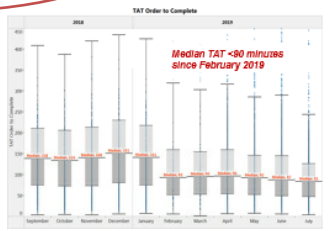
Key Drivers Impacted – Eliminate non-value add work

Questions	# of Questions		% Reduction
	Pre	Post	
Patient Facing	29	12	60%
Technologist Facing	28	10	65%

List of Tests of Changes – Completed, Abandoned, On Hold

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

$$\text{Time Saved Per Day}$$
$$= \text{Time Saved for One Process Cycle X Number of Times Process Performed in a Day}$$

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

$$\text{Time Saved in a Month or Quarter or Year}$$
$$= \text{Time Saved Per Day X Number of Days in a Month or Quarter or Year}$$

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

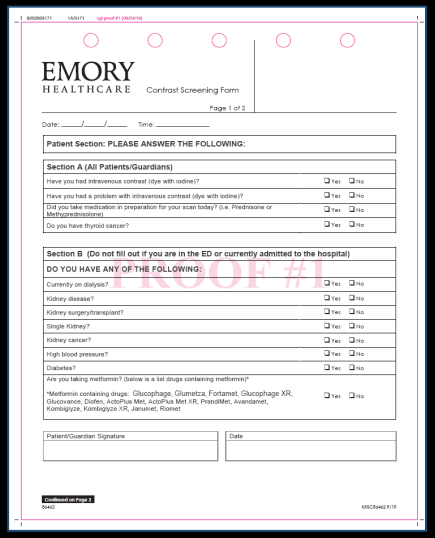
ED CTA Aortic Dissection Order

- 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



EMORY HEALTHCARE Contrast Screening Form

Page 1 of 2

Date: ____/____/____ Time: _____

Patient Section: PLEASE ANSWER THE FOLLOWING:

Section A (All Patients/Guardians)	
Have you had intravenous contrast (dye with iodine)?	❑ Yes ❑ No
Have you had a problem with intravenous contrast (dye with iodine)?	❑ Yes ❑ No
Did you take medication in preparation for your scan today? (i.e. Prednisone or Methylprednisolone)	❑ Yes ❑ No
Do you have thyroid cancer?	❑ Yes ❑ No

Section B (Do not fill out if you are in the ED or currently admitted to the hospital)	
DO YOU HAVE ANY OF THE FOLLOWING:	
Currently on dialysis?	❑ Yes ❑ No
Kidney disease?	❑ Yes ❑ No
Kidney surgery/transplant?	❑ Yes ❑ No
Single Kidney?	❑ Yes ❑ No
Kidney cancer?	❑ Yes ❑ No
High blood pressure?	❑ Yes ❑ No
Diabetes?	❑ Yes ❑ No
Are you taking metformin? (below is a list drugs containing metformin)*	
*Metformin containing drugs: Glucophage, Glumetza, Fortamet, Glucophage XR, Glucovance, Diaformin, ActoPlus Met, ActoPlus Met XR, PrandiMet, Avandamet, Kombiglyze, Kombiglyze XR, Janumet, Riomet	❑ Yes ❑ No

Patient/Guardian Signature | Date

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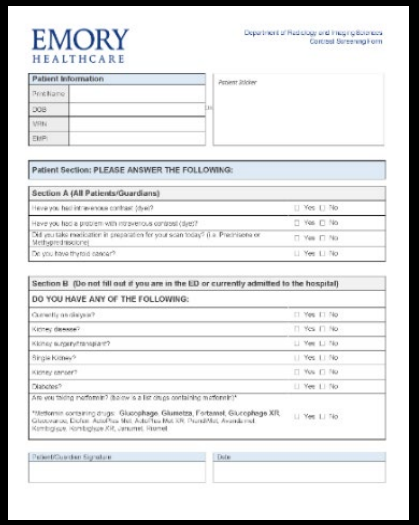
PROOF #1

New CT Contrast Screening Form



EMORY HEALTHCARE

Department of Radiology and Imaging Sciences
Contrast Screening Form

Patient Information

Patient Sticker

Patient Section: PLEASE ANSWER THE FOLLOWING:

Section A (All Patients/Guardians)

Section B (Do not fill out if you are in the ED or currently admitted to the hospital)

DO YOU HAVE ANY OF THE FOLLOWING:

Patient/Guardian Signature | Date

Time to Complete Contrast Screening - Before
1 minute 45 seconds
2 minutes 53 seconds
2 minutes 41 seconds
1 minute 28 seconds
1 minute 35 seconds
2 minutes 10 seconds
Average: 2 minutes 5 seconds

Time to Complete Contrast Screening - After
47 seconds
38 seconds
40 seconds
45 seconds
47 seconds
41 seconds
Average: 43 seconds

COUNTER MEASURE #1
UPDATE CT CONTRAST SCREENING FORM

Previous CT Contrast Screening Form	New CT Contrast Screening Form	Improvement
57 redundant and non-actionable questions	22 actionable questions	61% reduction in questions
125 seconds to complete	43 seconds to complete	82 seconds saved per screening form

MEASURING OUTCOME

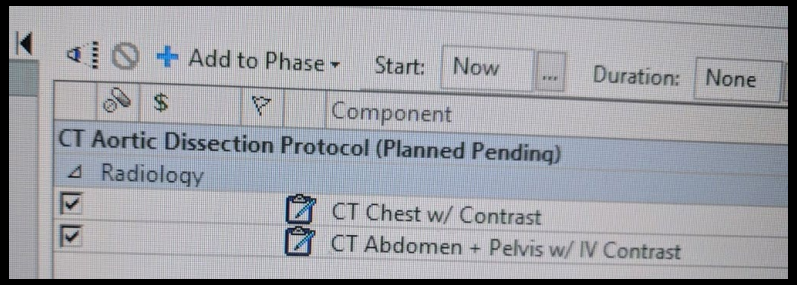
82 seconds saved per screening form  778 contrast exams / month  12 months  212 hours saved

OR

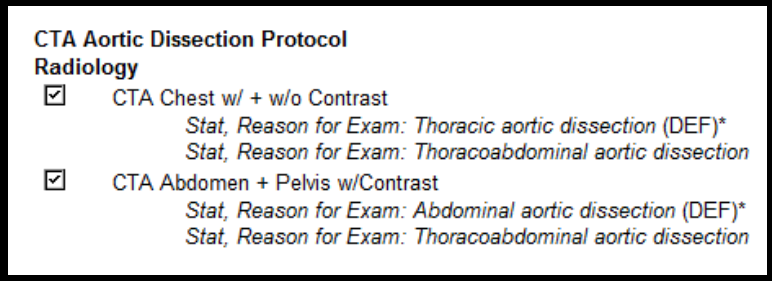
5.3 weeks of full-time technologist hours saved

COUNTER MEASURE #2
UPDATE CTA AORTIC DISSECTION PROTOCOL

Previous ED CTA Aortic Dissection Order



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

	ANNUAL TIME SAVED
New CT Contrast Screening Form	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