

Reducing MRI Delay at a Pediatric Hospital Setting through Improved MRI workflow: A Continuous Improvement Project



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DISCLOSURES

T Chandra: Nothing to disclose

C N Alsip: Nothing to disclose

M Epelman : Nothing to disclose

S Kirchner: Nothing to disclose

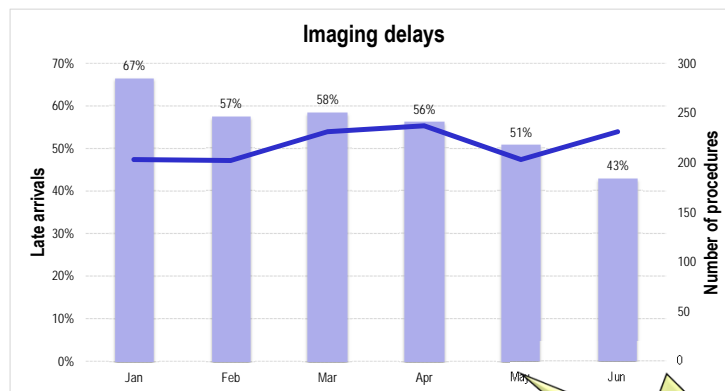
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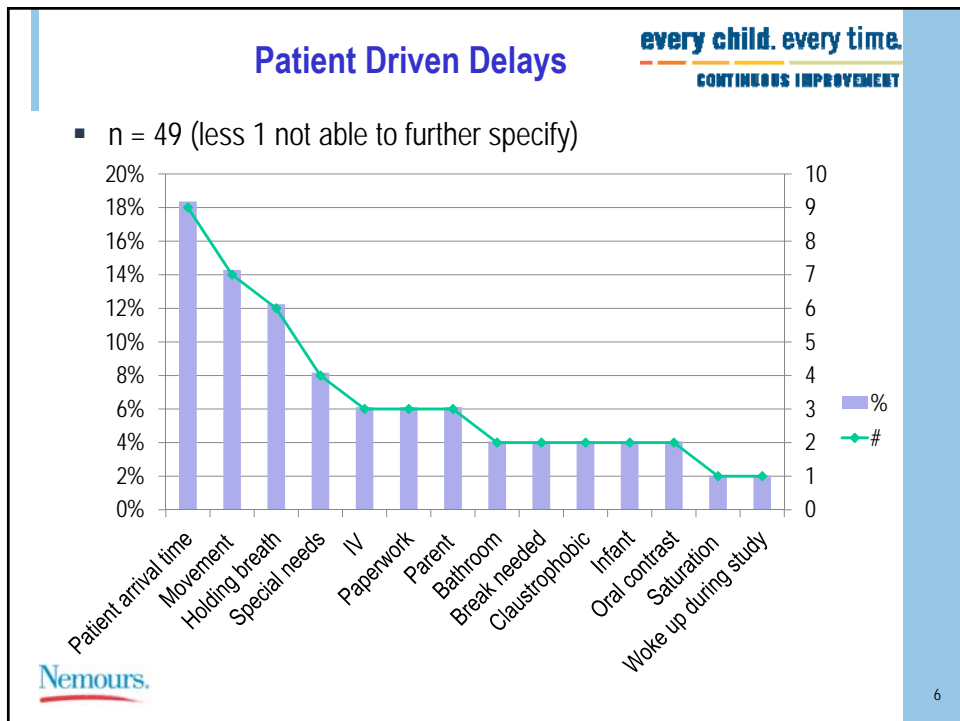
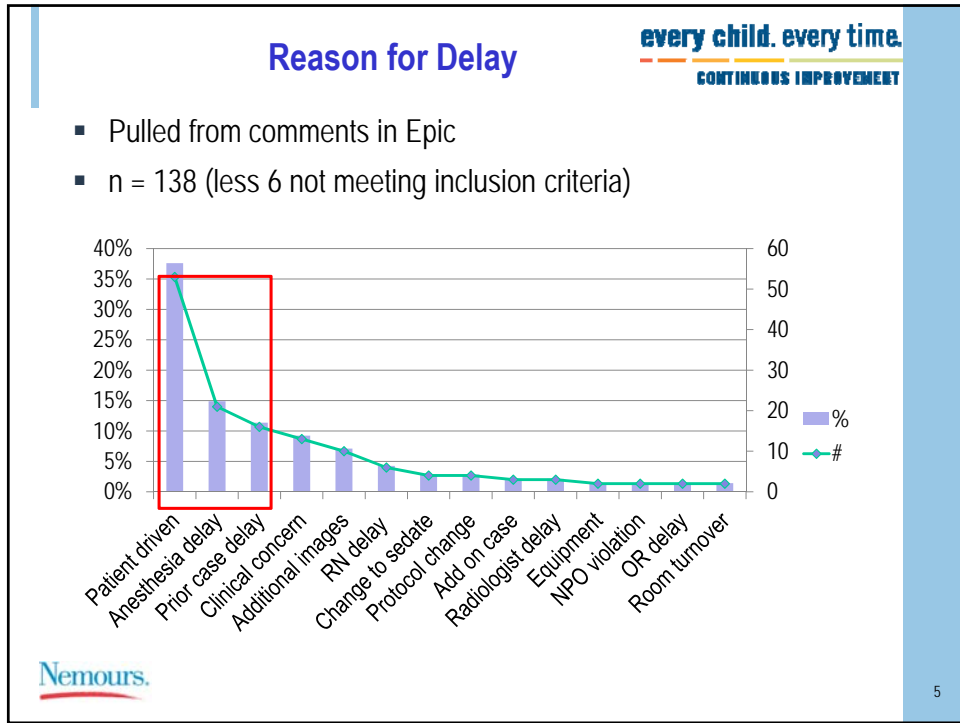
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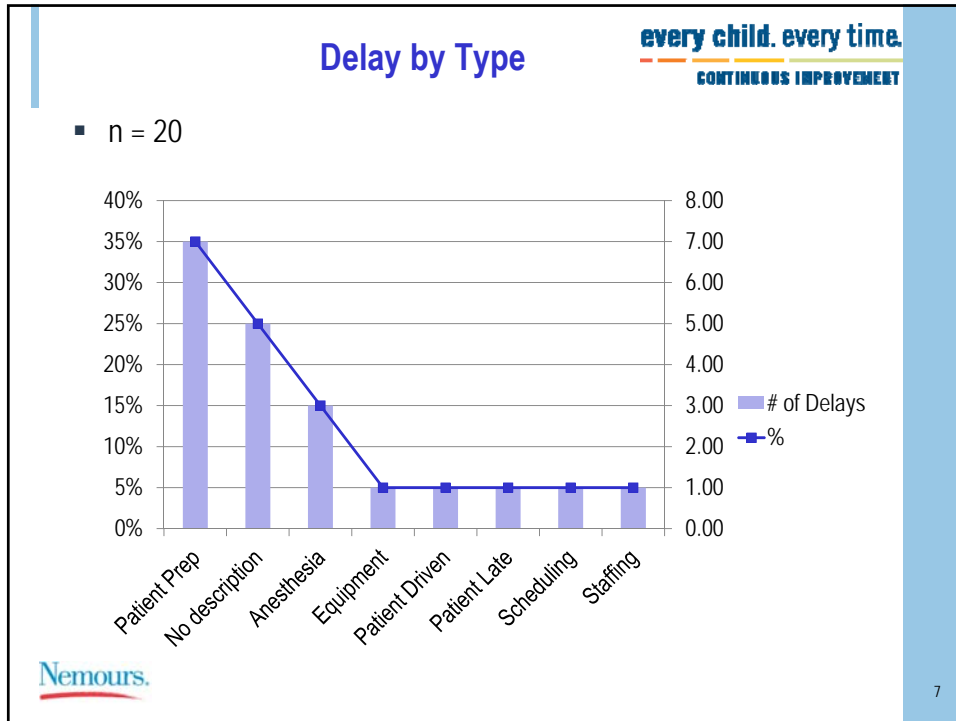
- Performing MRI in a tertiary pediatric hospital requires coordinated efforts of the entire healthcare team.
- As a busy tertiary care Pediatric hospital, we observed delays in MRI studies.
- MRI studies were starting on time in only 39% cases and exceeding scheduled appointment length over 40% of the time, causing a delay for patients and families, unacceptable Press Ganey scores and employee dissatisfaction.

Imaging Delays (Jan – June 2015)



55% of procedures had an imaging delay





Aim

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- We focused on all MRI studies on non-sedated children with a scheduled scan time of 60 minutes or less for this study.
- The target was to start 75% cases on time, 50% improvement in adherence to appointment length and improvement in our top box likelihood to recommend Press Ganey scores to > 90% from the baseline 80.5%.
- We aimed to accomplish these targets in a timeframe of 45 days, while maintaining image quality.
- The overall aim was to improve patient, provider and staff satisfaction as the MRI volumes continue to increase.

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TARGET




Baseline	Target
39% cases start on time	75% cases start on time
Adhere to scheduled appointment length MRI Room 1: 56.7% MRI Room 2: 61.0%	50% Improvement MRI Room 1: 85% MRI Room 2: 92%
—	Compliance to Standard Work 15 Days: 50% 30 Days: 75% 45 Days: 100%



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TARGET

	Goal	Baseline	Target
Child & Family Experience	Improve Likelihood to Recommend Scores	81.4% Top box for Likelihood to recommend in MRI	>90.5% Top box for Likelihood to recommend in MRI
Delivery	Improve on time starts	39% of cases start on time	75% of cases start on time
Delivery	Improve adherence to appointment length	Adhere to scheduled appointment length (July) MRI Room 1: 56.7% MRI Room 2: 61.0%	50% Improvement MRI Room 1 : 85% MRI Room 2: 92%
People	Compliance to Standard Work	—	Compliance to Standard Work 50% at 15 days 75% at 30 days 100% at 45 days

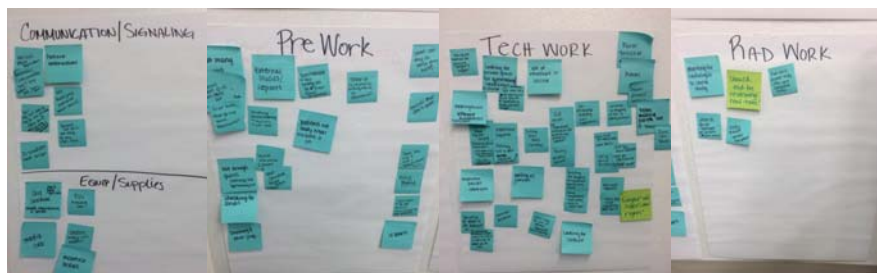


METHODS

- After identifying the problem and setting up goals, the entire process from the time of arrival of the patient to our facility to the time MRI ends was diligently mapped in a 3-day Focused Improvement Event (FIE).
- Individual steps were carefully sorted out by role and problems in each step in the process were identified and categorized.

METHODS

- Mapped the Process
- Identified problems with each step in the process
- Categorized problems



Focused improvement Event



The Event Team

Focused improvement Event - Aim

Event Purpose:

- To improve the flow of MRI studies, focused on 60 minute, non sedated procedures

Event Scope:

- Beginning: Patient arrives
- Ending: Patient exits MRI Suite

What problem are we trying to solve?

MRI studies starting late (60%) and exceeding scheduled appointment length (50%) causes a delay for patients and families. As our volume increases, improved flow impacts patient, provider, and staff satisfaction.

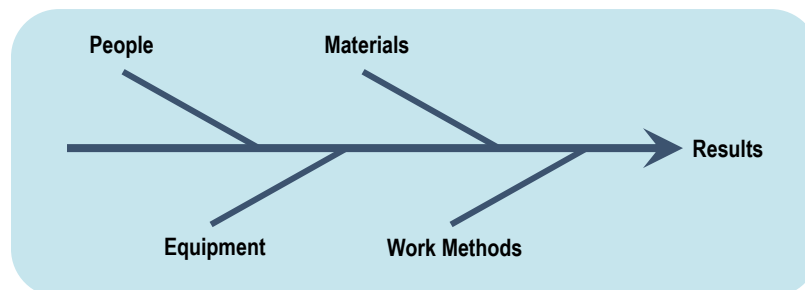


METHODS

- After an elaborate discussion and brainstorming with members of the team involved in the entire process, countermeasures were suggested for each problem and prioritized based upon frequency, impact, and control.
- Variations in process were identified and their major causes discussed.
- A new workflow process map and standard work was created to formulate a predictable, stable process with little variation in output.

METHODS

- We performed a root cause analysis to identify cause and effect using tools such as fishbone diagram and the 5-whys to identify various factors causing delay in the workflow.



METHODS - Countermeasures:

Technologist Standard Work and Reliable Methods, such as:

- Patient Flow Board
- MRI Specific Readiness Board
- Scripting
- Streamlined Intake Process
- Visual Cues for Prep Rooms
- Patient Education Materials
- Cross Training
- Escalation Process for Delays
- Audit Structure

Problem	Countermeasure
Frequency of audits is low	Engage techs from other modalities to audit Post stoplight report to huddle board
When only two techs are working and one scanner is running behind, and lead tech not available, potential delay in prepping patient	Cross train techs from other modalities on reliable methods
Patient movement is the most frequent cause of delay	Print additional flash cards and use on every patient
Nurse not always available for difficult IV sticks	Explore using phlebotomists from lab
MRI form not through forms committee; ask to standardize with AIDHC	Reach out to forms committee chair



METHODS - Process Audits

MRI Flow Audit

MRI Discharge & Room Turnover Audit

Auditor: _____ Date: ____ Time: ____ Contrast: **Yes / No**
 Department/Area: **MRI Flow Audit** Tech Initials: _____

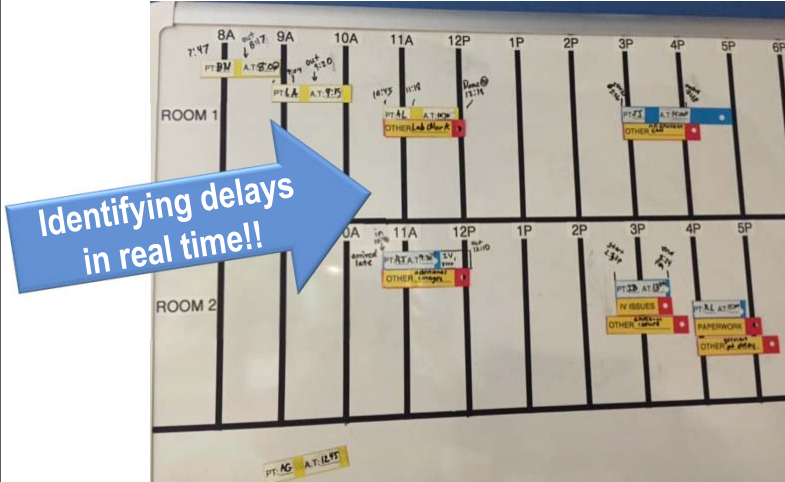
Reliable Method Audit - Rooming	Response	Feedback/Barriers:
Retrieve Pt from Waiting Area - 1 Min	Y N N/A	
1. Used AIDET		
2. Discussed requirements for parent to enter MRI using scripting		
Height & Weight - 1 Min	Y N N/A	
3. Properly obtained & Recorded Measurements		
Screening Process - 2:30 Min	Y N N/A	
4. Information from patient packet verified		
5. Interviewed, screened parent and patient using questionnaire		
6. Instructed parent to change into scrubs (if staying in the MRI room)		
7. Informed patient of importance of holding still using flashcards / reliable method		
MRI Prep - time: _____		
8. While patient/parent changes, tech retrieved and loads movie		
9. If contrast is needed, ordered contrast while patient changed		
IV Placement		
10. If tech initiated IV stick, escalated to RN after 5 minutes if unsuccessful		
11. #		
Take Patient to MRI Room		
12. If parent is staying in MRI Room, instructed parent to stand on footcage		
Total Time (<12 min goal)	Y/N	Don't forget to enter these results in the Frequency Tracker at the board!

Auditor: _____ Date: ____ Time: ____ Contrast: **Yes / No**
 Department/Area: **MRI Discharge and Room Turnover** Tech Initials: _____

Reliable Method Audit - Rooming	Response	Feedback/Barriers:
Discharge of Patient from Room - 3 min	Y N N/A	
1. Remove headphones, coils, and other devices		
2. Answer pt/family questions; inform about survey and follow up referring to FAQ document		
Transport patient out - 4 min	Y N N/A	
3. Thanks patient/family for choosing Nemours		
Clean room - 2:30 min	Y N N/A	
4. Don gloves and removes dirty linen		
5. Wipes down equipment/pillows		
Set up for next patient - 2:30		
6. Switches to appropriate coil		
7. Place padding on bed		
8. Places linen on bed/chair		
9. Places cover on earphones		
10. Returns monitor to place		
Total Time (<12 min goal)	Y/N	Don't forget to enter these results in the Frequency Tracker at the board!



METHODS - Flow Board



METHODS - Audits


- Daily MRI audits were planned and results were reviewed at 15, 30 and 45 days and critically analyzed by the work team to make adjustment to the workflow and refine the process.

MRI Flow Audit

Auditor:	Date:	Time:	Contract:	Yes / No
Department/Area: MRI Flow Audit Tech Initials:				
Reliable Method Audit - Rooming				
Review Pt Room Waiting Area - 1 Min				
1. Used ADDET	Y	N	N/A	
2. Documented requirements for patient to enter MRI using cart/piggy				
Single & Weight - 1 Min				
1. Request (Standard & Specialized Measurements)	Y	N	N/A	
Rooming Process - 2:30 Min				
1. Information from patient/patient method	Y	N	N/A	
2. Initial verbal consent patient and patient using procedure				
3. Informed patient to change into scrubs if changing to the MRI room				
4. Informed patient of importance of holding still using feedback, reliable method				
MRI Prep Time:				
1. MRI prep room charges, tech consented and ready to go				
2. If consented in another, ordered consent while patient changed				
PT Placement				
1. If tech initiated IV stick, recalled to MRI after a routine timeframe				
2. If				
Take Patient to MRI Room				
1. If patient is waiting in MRI room, instructed directly to stand on hallway				
Total Time (1:12 min goal)	1:12			
Don't forget to enter these results in the Frequency Tracker at the board!				

MRI Discharge & Room Turnover Audit


Auditor:	Date:	Time:	Contract:	Yes / No
Department/Area: MRI Discharge and Room Turnover Tech Initials:				
Reliable Method Audit - Rooming				
Discharge of Patient from Room - 2 min				
1. Remove headphones, coils, and other devices	Y	N	N/A	
2. Answer pt/family questions, inform about survey and follow up relating to FAQ document				
Transport patient out - 4 min				
1. Thank patient/family for choosing Nemours	Y	N	N/A	
Clean room - 2:30 min				
1. Don gloves and remove dirty items	Y	N	N/A	
2. Wipe down equipment (pillows)				
Set up for next patient - 2:30				
1. Switches to appropriate coil				
2. Place padding on bed				
3. Place lines on bed chair				
4. Place cover on equipment				
5. Return monitor to place				
Total Time (1:12 min goal)	1:12			
Don't forget to enter these results in the Frequency Tracker at the board!				




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RESULTS

- The new workflow was implemented on 9/1/2015 with the end point of 10/15/2015.
- In this period of 45 days, there was improvement in on-time starting MRI studies from a baseline of 39% to 65% (67% improvement).
- Additionally, the average delay time of studies starting late decreased from 30 minutes to 18 minutes.
- Furthermore, the number of MRI studies with adherence to appointment time increased from 59% to 83%.
- This all reflected in our top notch likelihood to recommend Press Ganey scores for MRI, which increased from 80.5% to 100%.






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RESULTS

Goal	Target	Baseline	45 Day	Δ
Delivery Increase cases that start on time	75% Start on Time	39% Start on Time	65% Start on Time	 67% Improvement
Delivery Adherence to Appointment Length	50% Improvement MRI Room 1 : 85% MRI Room 2: 92%	MRI Room 1: 56.7% MRI Room 2: 61.0%	MRI Room 1: 87% MRI Room 2: 79%	 53% 30% Improvement



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RESULTS : Adherence to Appointment Time

Target: 50% Improvement Implementation

41% improvement overall!

	Target	Jul Baseline	Aug	Sept	Oct	Nov	Dec	Δ	Status
Total Studies		#	#	#	#	#	#		
NCH MRI ROOM 1		67	78	64	74	65	70		
NCH MRI ROOM 2		77	40	67	66	81	89		
TOTAL		144	118	131	140	146	79.5		
Under Appt Time		%	%	%	%	%	%	% Improvement Δ Jul Δ Aug	
NCH MRI ROOM 1	85%	56%	62%	92%	87%	81.5%	88.6%	58% 43%	●
NCH MRI ROOM 2	92%	61%	78%	87%	79%	90.1%	75.3%	23% -3%	●
TOTAL	88.5%	59%	67%	89%	83%	85.8%	81.9%	39% 22%	●

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RESULTS – Flow Board

Target: 75% of cases start on time

	Baseline	15 Day	30 Day	45 Day	Cumulative
Total # of 60 min Non Sedated MRI		18	18	29	65
% of appointments w. early/on time start	39%	55.5%	67%	65%	65%
% of appointments w. late start	61%	44.5%	33%	35%	35%
Average delay length of late starts		30.5 min	22.5 min	18 min	22 min (median= 15)

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RESULTS - Audits

Process Audit	15 day (n)	30 day (n)
MRI Flow Audit	74% (3)	92% (9)
MRI Discharge and Room Turnover	68% (2)	100% (1)
Overall Compliance to Standard Work	71% (5)	87.5%

*Compliance to standard work=completing processes on time

Audits let us know if the process we created is being sustained. Audits are a check that alert us if additional improvements are needed to achieve targets for a process



DISCUSSION - What is CI ?

A strategy focused on relentless pursuit of becoming the best in quality, cost, delivery, safety, & engagement by removing waste out of the processes & maximizing value and customer satisfaction.

- Creates a culture of respect and a community of problem-solvers at all levels in the organization.
- Sets the expectations of continuous improvement as a strategic advantage against competitors.
- Leverages the limited resources to create the greatest possible value while ensuring stable long term growth.



CI Philosophy and Strategy

- Removes barriers or “burdens” experienced by staff as they do their best on behalf of patients and families
- Embraces and values people involvement as the foundation of our change strategy...
 - Supports our spirit of inquiry
 - Recognizes that this is a long term commitment to our people
 - Requires rapid cycling of the PDCA cycle to promote continuous learning
 - Uses standardization as a basis for learning
 - Uses facts and data as a basis for decision making
- Recognizes that technology is an enabler; not “the answer”
- Refuses to let “silos” become barriers to dramatic improvement

Quality Improvement – Essential Concepts

- Identification of process variation
- Stable and unstable processes
- Major causes of variation
- Variation in how work is done
- Requirements for adherence to a reliable method

Moving To Stable Process

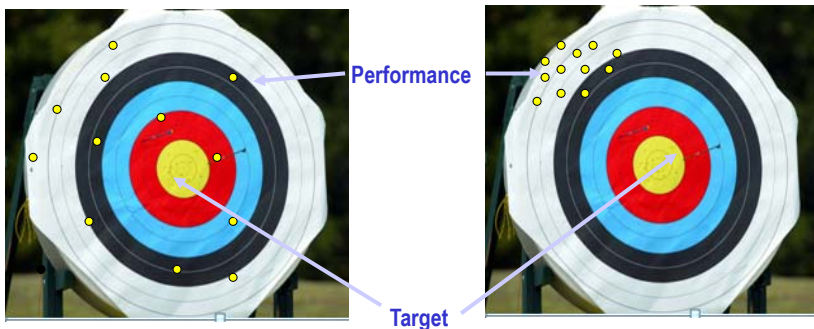
- Predictable process with little variation in output
- Process may be stable but not capable of meeting targeted performance levels
- Stable processes are easier to diagnose for problems

Elimination of Waste



Waste comes cleverly disguised as real work

Elimination of Variation in Process



A – High level of Variation

B – Low level of Variation

Lean Challenges Us to Cut Waste in Half Today!

- Half the errors
- Half the cost
- Half the space
- Half the labor
- Half the time



- Half the complexity
- Half the steps
- Half the.....



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True North – Nemours Philosophy


- True North sets institutional value system and priorities. It's our aspiration. "Above all things, this is what we are about."
- It is based upon aspirational goals that focus on the services we deliver to our patients and families.
- These goals measure our effectiveness in efficiency, clinical quality and clinical service delivery.



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True North – Nemours Philosophy



“Help me receive exactly the care I need and want, how and when I need and want it .”

Child and Family Experience	
QUALITY AND SAFETY	Error Free; Zero Defects; Perfect Care
DELIVERY	No Delays
COST	Achieve Greatest Value at Lowest Cost
PEOPLE	100 Percent Engagement



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CONCLUSION

- MRI workflow can be optimized by following a standard procedure and elimination of variations.
- This process is sustainable over time and leads to not only cost savings and increased revenue, but also improved consistency and work efficiency.
- This project emphasizes the value of involving the entire team including the technicians and the support staff in planning and implementation.
- This goes a long way in improving patient, provider and staff satisfaction.