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Costas T. Lambrew Research Retreat 2021

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2021

Improving safety using HFMEA and insitu simulation prior to initiating contrast MRI studies in an ambulatory setting

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Recommended Citation

Chipman, Micheline; Dadaleares, Todd; Beaulieu, Heather; and Mallory, Leah, "Improving safety using HFMEA and insitu simulation prior to initiating contrast MRI studies in an ambulatory setting" (2021). *Costas T. Lambrew Research Retreat 2021*. 8.
<https://knowledgeconnection.mainehealth.org/lambrew-retreat-2021/8>

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BACKGROUND

- Simulation is an educational modality that enhances knowledge and improves skills, behaviors and team performances.
- In situ simulation* can test systems to enhance patient safety.
- When used in this way, simulation can reveal and mitigate latent safety threats (LST.)
- New procedures or processes present safety risks.
- Gadolinium can trigger rare and life threatening contrast reactions.
- MMP Orthopedics and Sports Medicine Practice leadership engaged the Simulation Team to test emergency response to contrast reactions prior to initiating gadolinium enhanced MRI at their ambulatory center.

OBJECTIVE

The objective of this event was to test a new system for emergency response to MRI contrast reactions by ensuring staff familiarity with emergency equipment and a newly drafted emergency response protocols, and to mitigate any LST identified.



* simulation conducted in a native clinical care environment

METHODS

- A draft response protocol, including treatment guidelines, medications, equipment and supplies was developed with input from other ambulatory practices that provide gadolinium enhanced MRIs.
- This draft, as well as emergency equipment was introduced to the practice one month prior to the simulation event.
- Two high fidelity insitu simulation scenarios were developed to test system responses to mild and severe contrast reactions.
- An HFMEA (Healthcare Failure Mode and Effects Analysis) scorecard was used to categorize and prioritize LST detected.
- Testing occurred on two consecutive evenings with mitigation solutions from Day 1 incorporated in the Day 2 session.
- Upon conclusion of the event, results were shared with the practice.



RESULTS

- 18 interprofessional staff members participated in systems testing over the two days.
- In total 20 LST were identified.
- 8 of the identified LST were scored critical.
- 67% of the LST were identified in the areas of care coordination equipment and devices.



CONCLUSIONS

In situ simulation, used in collaboration with HFMEA methodology proved an effective means to systems test emergency response equipment and protocols prior to “go live” for gadolinium enhanced MRIs in an ambulatory setting.

Failure Modes Effects and Analysis

Frequent (4)	Occasional (3)	Uncommon (2)	Remote (1)
Likely to occur immediately or within a short period	Probably will occur may happen several times in 1 to 2 years	Possible to occur may happen sometime in 2 to 5 years	Unlikely to occur may happen sometime in 5 to 30 years

	Impact on Patient	Impact on Clinical Staff
Catastrophic (4) Failure would cause death or injury	Injury resulting in escalation in level of care, surgical procedure, permanent disability, or death	Injury resulting in permanent loss of function, requiring hospitalization, permanent or prolonged loss of ability to perform current duties
Major (3) Failure causes high degree of dissatisfaction	Non-life threatening delay in care or injury requiring medical attention without escalation in level of care, surgical procedure, permanent disability, or death	Injury requiring medical attention, resulting in temporary loss of function or missed work time
Moderate (2) Failure overcome with process improvement, minor performance loss exists	Significant negative impact on patient/family experience; varies from stated goals for patient/family experience	Reliability a source of work-related stress and anxiety for staff, introduces inefficiency that impacts frequently performed tasks, otherwise seen as negatively affecting wellness
Minor (1) Failure not noticeable to patient and would not affect delivery of the service	No significant negative impact on patient/family experience	Minor nuisance that is not a significant source of stress or anxiety for the majority of staff who encounter the problem

Hazard Score Calculation

Probability (P)	Severity (S)			
	Catastrophic (4)	Major (3)	Moderate (2)	Minor (1)
Frequent (4)	16	12	8	4
Occasional (3)	12	9	6	3
Uncommon (2)	8	6	4	2
Remote (1)	4	3	2	1

Changes to Practice

Pairing in situ simulation with Healthcare Failure Modes and Effect Analysis (HFMEA) has been shown to be synergistic- uncovering more LST than either modality alone.



Another less tangible benefit identified in the post session debrief was the opportunity for new teams (MRI technologists and Sports Medicine staff) to meet, clarify roles and responsibilities, and train together to enhance patient safety.

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Comments in Evaluations

“Take aways”

- Importance of Epi pen hold for 10 seconds
- Importance of organizing roles and organization of response
- Value of the “warm hand off” (knowing which provider and technician were on call for the day)
- If epinephrine is used, 911 should be called
- Speaking clearly with eye contact in an emergency- ” I need you” to do....
- Laminate and prominently display phone numbers that are rarely used (response pager #s)
- Familiarity with supplies

Practice and System changes to date:

- Phone and pager numbers posted in zone 3
- Pagers moved to MRI tech room for daily staff pick up to facilitate warm hand off
- Laminated response cards updated and in the treatment box
- IM needles added to treatment box
- 2 locations for additional epi pens identified
- AED ordered
- Color coded algorithm created and will be shared with other ambulatory practices
- **Process initiated to include RN on emergency response team for additional assistance**
- **RN training will occur on May 3^d**