

# “Am I Going to Glow in the Dark?”: An Analysis of the Overutilization of Diagnostic Medical Imaging

Radiography

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## Abstract

The drastic improvements in medicine in modern history have resulted in a gross overutilization of valuable medical resources. This includes but is not limited to diagnostic medical imaging.

This project was designed and executed to raise awareness for the overutilization of medical imaging and the negative consequences associated with unnecessary radiation. A literature review outlines the general overutilization of imaging as well as the importance of radiation protection and patient information. Additionally, processes and data from Lifespan's Shared Decision Making project are featured to demonstrate the practicality of implementing the necessary changes in order to reform our current healthcare system.

Although a seemingly minor issue in healthcare, overutilization of diagnostic imaging is an issue that falls into the scope of practice for a variety of healthcare professionals; radiologic technologists, emergency medicine physicians, radiologists, and all supporting emergency department staff. More importantly, this is an issue that can have a major impact on the future health and well being of our patients.

## Background

Diagnostic medical imaging is truly an indispensable medical resource. Medical imaging provides insight to providers as to what is happening inside the human body. However, all great things come at great costs. In addition to the incredible financial costs, associated with imaging, there is a trend of disregarding the risks and consequences of unnecessary radiation in order to be a more "efficient" facility.



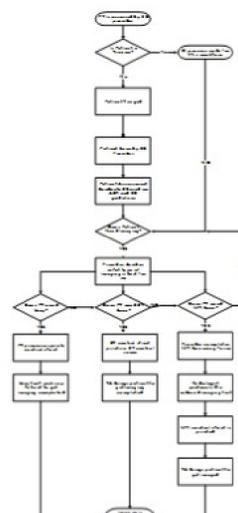
Short Term	Long Term
Nausea	Cancer
Diarrhea	Cataracts
Fatigue	Birth Defects
Hair loss	Permanent sterility
Temporary sterility	
Skin reddening	
Decreased blood cell count	

Table 1: Short term and long term side effects of radiation

## Objectives

- Why is overutilization of diagnostic medical imaging occurring?
- What are the implications of unnecessary radiation exposure?
- Document and report on Lifespan's Shared Decision Making project

## Methodology



Baseline workflow chart

Over the course of the project, a committee consisting of radiologists, emergency medicine physicians, administration, quality assurance staff and myself meet bi-weekly and discussed the topics featured here. Additionally, a team of analysts from Lifespan assisted in data collection.

Process Step	Potential Failure Mode	Potential Failure Effects	Severity	Potential Causes	Occurrence	Current Process Controls	Detection	SPC
ED providers assess the patient	Language Barrier Insufficient time to evaluate patient	Incorrect medical history Sub-optimal evaluation of severity of symptoms	7 5	Lack of interpreting services Volume surges	2 10	Interpreter services in all affiliates Oversight	5 9	70 450
ED provider orders diagnostic imaging tests	Ordering unnecessary tests Time delay Incidental findings requiring follow up Unnecessary financial charges Increased risk of errors	Over Radiation, contrast reactions Time delay Incidental findings requiring follow up Unnecessary financial charges Increased risk of errors	8 8 9	Overall pressures Patient surge Excess radiation Increased cost Resources maintained	8 8 5	Report on imaging utilization Data and individual case feedback	4 4 4	152 180 144
Imaging test is performed and interpreted	Imaging is performed incorrectly Wrong diagnosis Unnecessary radiation Repeat ED visit Additional imaging Delay in care Patient dissatisfaction	Wrong diagnosis Unnecessary radiation Repeat ED visit Additional imaging Delay in care Patient dissatisfaction	10 3 8 5 8 7	Lack of sub-specialized skills Interruptions Time constraints Poor imaging quality Provider fatigue Time constraints	4 6 6 2 2 6	Attending providers over read residents Daily equipment QA Max. work hours for residents	1 2 1 1 2 2	20 10 94 36 36 48

Failure Modes Effects Analysis (FMEA) chart determines potential failures at each process step, the effects, severity, causes, occurrence, and process controls.

	NPT ED	RIH ED	TMH ED	Total
CT/MRI Headache	35%	55%	47%	48%
CT/MRI Low Back Pain	16%	32%	26%	28%

Potential X	Null hypothesis	Alternative hypothesis	Tools	Conclusions	Critical X?
1- Admitting/referring provider insistence on imaging	Referral patients and patients waiting to be admitted DOES NOT impact order for low back diagnosis and uncomplicated headache	Referral patients and patients waiting to be admitted DOES impact order for low back diagnosis and uncomplicated headache	Chart review of 80 patients Chi Squared Test	Low back chart and uncomplicated headache chart concluded Accept null hypothesis	No
2- Time constraints unable to be measure					No
3- Repeat visits for same complaint	Repeat ED visits for same complaint DOES NOT impact diagnostic ordering for low back pain or uncomplicated headache	Repeat ED visits for same complaint DOES impact diagnostic ordering for low back pain or uncomplicated headache	Chart review of 38 patients Chi Squared Test	Low back chart and uncomplicated headache chart concluded Accept null hypothesis	No
4- Past medical imaging history available	Having available past imaging history DOES NOT impact ordering new imaging	Having available past imaging history DOES impact ordering new imaging	Chart review of 30 patients Sample t test	Low back chart and uncomplicated headache chart concluded Reject null hypothesis	Yes

Data collection plan lists potential X's and determines which is the critical X

## Conclusions and Outcomes

Lifespan was able to reduce their low back pain image ordering from 40% to 23%; however, imaging orders for uncomplicated headache increased from 53% to 70%. It is to be noted outlying factors, such as the closing of a proximal hospital, were not taken into account at the conclusion of the project.

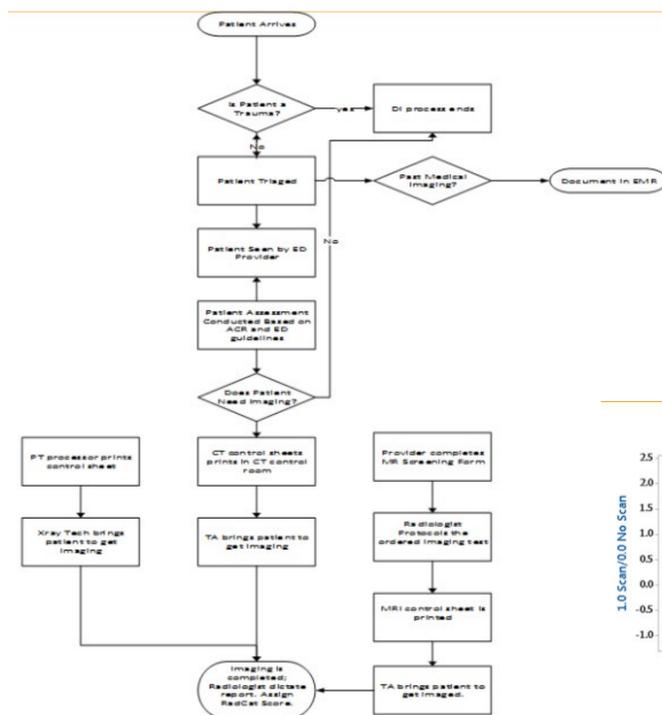
Despite an initial lack of support from the providers as well as administration, it became clear minor disturbances in workflow were necessary and acceptable in order to improve the quality of patient care. Through implementation of a user-friendly system and clear communication between leadership and staff, it is possible for the staff at Lifespan to continue to provide health with care.

## Future Directions

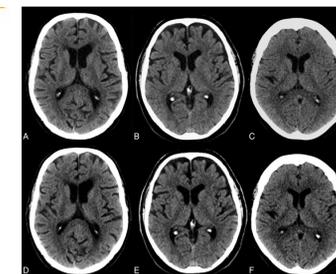
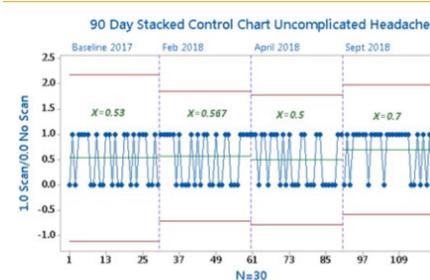
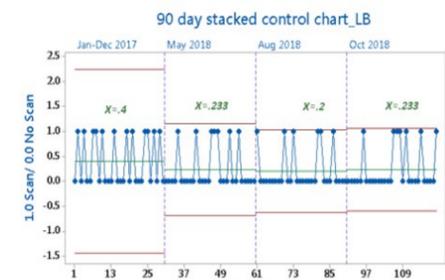
The following are new standards to be met in order to continue to provide quality healthcare at Lifespan

- Communicate expectations of providers to limit use of free text during image ordering
- New residents must be educated on PAMA regulations regarding imaging
- ED registration staff must ask and document any past imaging for the chief complaint
- Perform medical record audits to ensure compliance in accordance with regulations
- Integrate user friendly ordering system

## Results



Work flow chart after implemented rapid cycle changes



## Acknowledgements

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