MISSION STATEMENT

Vision: To demonstrate Graduate Medical Education’s (GME) leadership role in driving a culture of continuous learning, which is essential in a high-reliability organization.

Mission: To improve care for our patients and the well-being of our clinical team members through implementation of system-aligned quality improvement projects within and across our GME programs, clinics, and service units.

PURPOSE

To retrospectively establish a fluoroscopic radiation exposure baseline in order to monitor prospective reduction techniques.

INTRODUCTION

• Swallow study evaluation
  – Fluoroscopic procedure where a patient drinks contrast while being assessed under real-time X-ray
  – Most frequent fluoroscopic procedure performed in the radiology department
  – Generally features a team consisting of a radiology resident who controls the radiation, a fluoroscopy technician who controls the positioning of the X-ray machine, and a speech pathologist who administers the contrast
  – Long-term exposure to ionizing radiation from fluoroscopic procedures can lead to side effects
  – Deterministic effect: Side effect that occurs above a threshold radiation dose and severity increases with increasing dose.
  – Stochastic effect: Side effect where risk increases above a certain dose but the severity does not.
  – Personal protective equipment recommended by Occupational Safety and Health Administration (OSHA)¹
    – Lead aprons/vests, thyroid shields, lead gloves, and safety goggles
    – Badge-type dosimeters

METHODS

• Implementations
  – Replaced or provided personal protective equipment per OSHA guidelines to all medical personnel involved in swallow study evaluations, such as purchasing a new leaded glove for speech pathology and lead glasses for the fluoroscopy technician
  – In conjunction with speech pathology, developed a standardized swallow study evaluation flowchart
• Swallow study details
  – Barium contrast is the agent of choice as its effects if aspirated are lesser than other contrast agents, such as gastrograffin
  – Patients trial different consistencies of thin liquids, nectar-thick liquids, honey-thick liquids, puree, barium pill, and crackers in order to evaluate risk of lingual penetration or aspiration
  – Aspiration increases the risk of developing pneumonia
  – Fluoroscopic procedure where a patient drinks contrast while being assessed under real-time X-ray machine, and a speech pathologist who administers the contrast
• Retrospective data analysis of swallow study evaluations completed during 2 months of fluoroscopy rotations
  – 5 radiology residents per class
  – Current PGY3 class data will be used to establish an exposure baseline
  – Current PGY2 class data will be used to evaluate efficacy of implemented reduction techniques
• Absorbed dose: Ionizing radiation absorbed per unit mass, measured in Grays (Gy)
  – X-ray machine records patient radiation exposure into patient’s chart
  – Patient radiation exposure can be used to estimate the radiology resident’s radiation exposure using the formula: Intensity = 1/distance²
  – Barium contrast is the agent of choice as its effects if aspirated are lesser than other contrast agents, such as gastrograffin
  – Aspiration increases the risk of developing pneumonia
  – Fluoroscopic procedure where a patient drinks contrast while being assessed under real-time X-ray machine, and a speech pathologist who administers the contrast

PRELIMINARY RESULTS

Swallow Study Flowchart

Patient Radiation Exposure Data

Resident Exposure Data prior to Implementations

Threshold Doses for Deterministic Effects²

GROUP FEEDBACK

BARRIERS

• Badge-type dosimeter readings might not be a reliable source to compare radiation exposure baselines
  – Badges need to be switched out monthly and are worn in sets of 2, 1 at the collar and 1 underneath the lead apron at waist level
  – Equipment shared among medical personnel may falsely elevate an individual’s badge readings
  – Extrapolating resident radiation exposure data from patient dosage recorded on C-arm X-ray machine may only be useful for assessing reduction techniques
    – Calculating radiation scattered from a given distance is not as accurate as direct measurements
  – A standardized swallow study evaluation flowchart may not always be adhered to
    – Speech pathologists and patients vary, so recommending a standardized protocol may only help to a certain extent

DISCUSSION

• Residents performed
  – 5 swallow studies/day, 100 swallow studies/4-week rotation, 3.1 hrs radiation exposure total
  – Median swallow evaluation time: 1.8 minutes
• Residents receive the dose equivalent of 3 CT scans per 4-week rotation
• Eye lenses have a deterministic threshold of 2-6 Gy
  – Residents absorb over 10% of the lower end of this threshold per rotation, which places them at a risk of developing cataracts if protective eyewear is not utilized
• Critical next steps
  – Complete retrospective analysis of PGY3 class data to establish a radiation exposure baseline
  – Continue to prospectively implement a standardized swallow study evaluation flowchart
  – Continue to encourage proper use and cleaning of shared radiation safety glasses and leaded glove among the speech pathologists and fluoroscopy technicians

REFERENCES

2. Mooney et al. Absorbed dose and deterministic effects to patients from interventional neuroradiology. The British Journal of Radiology. 10.1259/bjr.73.871.11089467JO.