ENHANCING PATIENT SAFETY:
The Effect of Performance Improvement Process on Bedside Fluoroscopy Time in Pediatric Burn Patients

INTRODUCTION
Nutrition support is essential in the care of burn patients. Early in the course of treatment, post-pyloric feeding tube placement permits initiation of enteral nutrition, minimizes risk of aspiration, and may also attenuate hypermetabolism.

PURPOSE
Fluoroscopy aids in post-pyloric feeding tube placement (Figure 1). Because fluoroscopic insertion of enteral feeding tubes has the inherent risk of radiation exposure, a study (conducted in 3 phases) was undertaken to measure fluoroscopy-associated radiation exposure during bedside feeding tube placement in pediatric burn patients, with the intent to take appropriate action to improve hospital protocols that minimize radiation exposure.

METHODS
Over a 19-year period, radiation doses were measured before and after performance improvement (PI) radiation safety initiatives (Figure 2). This PI plan included mandatory training and competency testing for all surgical house officers, measurement of established maximum institutional midline dosage for each procedure, limitation of radiation exposure to 5 minutes (5 mGy, midline dose) and development of standardized policies and protocols for feeding tube placement.

- **PHASE 1** Retrospectively determined fluoroscopy time required for enteral tube placement.
- **PHASE 2** Utilized thermoluminescent chips to measure the amount of radiation during 10 fluoroscopy procedures to establish an acceptable midline radiation dose.
- **PHASE 3** Evaluated fluoroscopy times following implementation of improved safety processes.

RESULTS

**PHASE 1:** There were 357 procedures and mean fluoroscopy time was 4.1 minutes. The mean fluoroscopy time per procedure was 4.1 ± 0.32 minutes (range: 0.1 – 25 minutes).

**PHASE 2:** We established our institution’s acceptable midline dose as 7.4 mGy per patient per month. One minute of fluoroscopy results in a midline dose of 1 mGy.

**PHASE 3:** There were 1804 procedures and the mean fluoroscopy time was reduced to 2.3 minutes (range: 0.1 – 35 minutes). When compared with Phase 1 data, implementation of new safety processes demonstrated a significant (p<0.001) reduction in radiation exposure time (Figure 3). The number of procedures exceeding 5 minutes decreased from 23.5% (in Phase 1) to 12.03% following the process improvement changes (Figure 4).

Figure 2. C-Arm Feeding Tube Fluoroscopic Procedure

Figure 4. Percentage of fluoroscopy procedures for feeding tube placement exceeding 5 minutes before and after process improvement initiative

CONCLUSION
Mean radiation exposure was significantly reduced following implementation of standardized policies and development of a clinical protocol for bedside fluoroscopy. With proper processes, fluoroscopy procedures result in minimal radiation exposure for patients and staff. Our study is important because we discovered that a comprehensive performance improvement plan, which included resident/staff education and the use of thresholds for fluoroscopy time, was effective in reducing both fluoroscopic radiation exposure time (Figure 3) and, also, exposure time greater than 5 minutes has consistently decreased (Figure 4) for enteral tube feeding insertions.

REFERENCE