Effectiveness of High-Fidelity Simulation on Radiology Trainees in the Diagnosis and Management of Adverse Contrast Reactions
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Background
• Cochran et al. (2009) reports a 0.7% incidence of adverse contrast media reactions for nonionic iodinated contrast.
• Although fairly uncommon, contrast reactions are potentially life-threatening events that require prompt recognition and management by radiologists.
• In the setting of a moderate to severe reaction, it is essential that the radiologist be capable of assisting in the diagnosis and management of a contrast reaction until the arrival of a code team.
• Most radiologists have little to no experience in managing serious contrast media reactions - an important and necessary expertise.
• In years past, two didactic lectures were provided to radiology residents highlighting key points such as diagnosis, determination of the severity, and management of a contrast reaction.
• However, Tubbs et al. (2009) suggests didactic lectures alone may not provide adequate training. Additionally, neither the effectiveness of the lectures nor the ability of residents to appropriately act when faced with a contrast reaction has been evaluated.

Purpose
• To equip all participants with the appropriate skills to recognize and manage contrast reactions effectively.
• To emphasize teamwork and crisis management, as well as identify potential barriers to efficiently manage a contrast reaction.

Materials/Methods
• U of C Simulation Center is a high-tech simulation center where emergency codes are routinely run on high-fidelity mannequins.
• A variety of contrast reaction scenarios with differing severity were developed based off the American College of Radiology’s Manual on Contrast Media (v9), focusing on recognizing the type of contrast reaction and providing the appropriate immediate management that is indicated.
• 34 radiology trainees (PGY2-6), 4 radiology technologists, and 4 radiology nurses participated in all 7 scenarios: panic attack, hypertensive crisis, laryngeal edema, cardiovascular shock, bronchospasm, urticaria, and contrast extravasation.
• Following each scenario, participants are debriefed immediately, in a nonjudgmental manner, to help identify areas in need of improvement.
• A pre- and post-simulation subjective survey and objective assessment are administered. The subjective survey evaluates comfort levels while the objective assessment evaluates medical knowledge.

Results
• When prompted "what I learned today will help improve patient outcomes," participants reported an average of 4.6 (1=strongly disagree, 5=strongly agree).
• Subjective evaluations for average comfort level (1=not comfortable, 5=very comfortable) of managing contrast reactions increased from 3.2 to 4.6 (p<0.001) following the simulations and average scores on the objective assessment increased from 74% to 85% (p<0.001).
• Results by PGY levels are displayed in chart format (left).
• Each participant was given a “Quick Card” – a pocket-sized reference card highlighting the management of various contrast reactions based on severity.
• “Quick Card” was posted in the radiology resident on-call room.

Next Steps
• We hope that the contrast media reaction simulations can be expanded to include not only radiology trainees, technologists and nurses, but all hospital staff who work with intravenous contrast agents.
• Specialists such as interventional cardiologists and gastroenterologists, as well as vascular surgeons, among others, would benefit from this valuable curriculum.
• After providing initial training, this course can be used for maintenance of skills and team-based dynamics; the CT technologist manager is submitting the course for approval as a continuing education program.
• Additional contrast media reactions scenarios are being drafted including pediatric cases.
• Prospective analysis on management of future contrast reactions in the radiology department may be performed.

Acknowledgements
We would like to acknowledge Marcie Lambrix MA and the rest of the University of Chicago Simulation Center Staff.