

Simulation based training in Management of Contrast Reaction at Henry Ford

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Simulation is “an imitation of a situation or process”. It is used in the development and testing processes in many industries including aviation, safety engineering, nuclear energy, video games, etc. Simulation based training is very rapidly becoming an integral part of education in healthcare.

The Henry Ford Health System Center for Simulation, Education and Research has planned and implemented a variety of courses for a broad scope of learners. Such examples of courses are Ultrasound guided central line placement, Fundamentals of Laparoscopic Surgery, Institutional curriculum, Departmental OSCEs (Objective Structured Clinical Examination), Fundamentals of Internal Medicine, Contrast Reaction Simulation for Radiology staff, residents and technicians, Advanced Cardiovascular Life Support, Advanced Trauma Life Support, Activities of Daily Living, Critical Care Medicine and Critical Care Nursing courses. The Center is utilized for teaching and evaluating the six core competencies of physician practice – patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism and system-based practice. Participants in these courses can include staff physicians, nurses, medical students, residents, and physician assistants from different fields of medicine.

Radiology at Henry Ford is actively involved in training the residents at the Simulation Center. A curriculum has been developed to utilize various aspects of simulation. These include-

1. Contrast reaction management
2. Ultrasound and CT guided interventional procedures
3. Lumbar puncture module
4. Vascular simulators for angio-interventional procedures

Simulation based training in Management of Contrast Reactions -

Reactions to intravenous contrast media are uncommon, but can be potentially life threatening. These reactions need to be recognized and managed immediately by radiology residents and staff who are often the first responders before the arrival of the Rapid Response Team. Due to the infrequency of these reactions, regular training is required to maintain familiarity in the management of these acute contrast reactions.

At Henry Ford, all the radiology residents undergo structured, periodic training at the Simulation Center to learn and maintain skills in the management of acute contrast reactions. The training is imparted by a staff radiologist actively involved in creating and updating protocols for the prevention and management of contrast reaction for the department. A staff nurse at the Simulation Center with understanding of the operation of the software helps conduct this program. The training closely follows all guidelines set by The Manual on Contrast Media by The American College of Radiology. The course includes –

1. Pre-Test: This is a 10-question test that assesses baseline knowledge and skills about the topic. The residents must complete this appraisal before proceeding to the remainder of the curriculum.

2. Didactic instruction: This instruction is imparted using a presentation in a lecture room (or via video conferencing) by a staff radiologist. Pocket cards for quick reference are distributed to all participants. These are also made available as pdf document on individual handheld devices.
3. Introduction to the simulated 'patient' and his/her surroundings: The training room is set to represent a computed tomography (CT) scanning room. The patient is a computerized high fidelity manikin designed for use in teamwork training scenarios. The manikin has many characteristics –
 - a. Pre-recorded speech and other vocal sounds
 - b. Various heart, lung and bowel sounds perceived on auscultation
 - c. Palpable pulses with feedback to a computerized program
 - d. Features to emulate tongue edema, laryngeal edema and pharyngeal obstruction
 - e. Monitor displaying various vital signs synchronized with the patient
 - f. Software that allows input of various clinical modules and scenarios
4. Enacting different clinical scenarios using the high fidelity simulated patient: One resident is designated as the leader for managing the event and creates a quick 'radiology code team'. He/she delegates assignments to different members of the team. All the instructions and steps in management are spoken out loudly for the staff nurse to hear so that he/she can advance the scenario. The participants have access to all resuscitation equipment found in the CT suite and to all medications in the radiology crash cart.
5. Debriefing: Feedback is provided by the instructor regarding the appropriateness of actions taken by the 'radiology code team'. Scenarios can be videotaped for the participants to review.
6. Post- Test: This is a 10-question test given after completion of the instructional segment. This is used in conjunction with the pre-test to measure the effectiveness of the program.

This simulation based training provides the residents practical experience in the management of these potentially life threatening events in a safe and non-punitive environment, without compromising patient safety. The high fidelity simulators create a more realistic scenario and foster team based training. This helps residents practice competencies such as leadership and communication skills. This periodic training including both didactic instructions and high fidelity simulation maintains their skills in contrast reaction management. The residents are able to achieve favorable outcomes confidently when faced with actual clinical situations.

References:

1. American College of Radiology, ACR Committee on Drugs and Contrast Media. ACR Manual on Contrast Media. January 2020
2. Robertson, H., Paige, J. and Bok, L., 2012. *Simulation in Radiology*