MANAGEMENT OF ADVERSE CONTRAST REACTIONS: A SIMULATION-BASED PERFORMANCE EVALUATION OF RADIOLOGY RESIDENTS

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DISCLOSURES

Timothy Russell: None
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Aaron Kirkpatrick: None
Adverse contrast reactions occur rarely in daily practice, with rate estimated at 0.2-0.7%\textsuperscript{1-3}.

Due to this lack of clinical exposure, radiology residents and staff often feel underprepared in their management\textsuperscript{4-6}.

Adverse contrast reactions also involve scenarios that extend beyond advanced cardiac life support training (ACLS), where there are significant initial treatment differences, notably bronchospasm and laryngeal edema\textsuperscript{1}.

New this year, we proposed the integration of simulation training (using mannequins), in addition to traditional didactic lectures, in an effort to improve resident and staff education regarding potential adverse contrast reactions.
GOALS

To improve resident knowledge and confidence regarding the diagnosis and management of adverse contrast reactions

To provide a safe environment for the practice of these skills through the use of simulated patients
Materials and Methods

- Four simulated adverse contrast reaction scenarios were developed using the American College of Radiology’s *Manual on Contrast Media*:
  - Hypotension with bradycardia
  - Laryngeal edema
  - Bronchospasm
  - Hypotension with tachycardia
- Three additional scenarios were developed for the purposes of discussion only: hypertensive crisis, pulmonary edema, and seizure
Example Clinical Scenario

Simulation Lab Clinical Scenario: Dyspnea

38 year old male has just completed his CT scan with intravenous contrast. He complains of shortness of breath. He is very anxious and agitated. His oxygen saturation is 89%.

Check patient vitals and give oxygen by mask 6-10L

Directed clinical assessment: Auscultate the lungs

Wheezing = bronchospasm

Administer Albuterol 90 mcg/puff
2 Puffs, can repeat x2

If not responding to Albuterol

Strongly consider calling a code
Administer Epinephrine (Instructors review Epinephrine dosing)

Stridor = Laryngeal Edema

Note the key initial treatment steps in the clinical management of dyspnea due to bronchospasm or laryngeal edema, which varies from standard ACLS scenarios.

(1) Auscultation is key in the initial diagnosis
(2) When confronted with dyspnea due to wheezing, inhaled albuterol is first line treatment, followed by close clinical assessment
(3) If there is concern for laryngeal edema, Epinephrine needs to be administered immediately and a “code” should be called
Materials and Methods

- Following a didactic lecture, residents underwent the four simulated scenarios at our institution’s Simulation Center, using programmable mannequins.
- After each clinical scenario there was an immediate group debriefing and discussion to emphasize key management concepts.
- A written test was administered prior to and following the simulation training. Qualitative comments were encouraged on the post-test.
What is the most important step in the evaluation of a patient who has had an apparent contrast reaction AND is found to be hypotensive?

a. Auscultate the lungs
b. Check a pulse
c. Check pulse oximetry
d. Manually inspect the airway
e. Call a code and start ACLS

Answer b. Check a pulse

A patient has a CT scan with contrast. After being removed from the CT gantry, the tech notices facial edema. The patient is asymptomatic. What is the best initial treatment?

a. Epinephrine
b. Atropine
c. IV fluid bolus
d. Benadryl
e. Intubation

Answer a. Epinephrine
19 residents participated in the simulation training

Mean score on the pre-test was 2.6/5.0 (52% correct)

Mean score on the post-test was 4.2/5.0 (84% correct)

The difference in mean scores on the pre- and post-test was statistically significant, with p-value < 0.005
The most commonly incorrectly answered question on the pre-test was subsequently the most correctly answered question on the post-test

- Question #4: A clinically-based question in which you should first auscultate the lungs in a patient with an adverse contrast reaction and dyspnea

- Qualitatively, the simulation lab was well received by the residents and staff
  
  - 18 of 19 residents (95%) indicated that they, “Feel better prepared to treat acute contrast reactions.”
Simulation training is essential for the education of radiology residents in the management of adverse contrast reactions.

Simulation training emphasizes key clinical aspects of adverse contrast reactions that are not easily learned through traditional didactic lectures and not completely covered through ACLS certification.

Our quality improvement project demonstrates a statistically significant educational benefit from simulation training, as well as subjective improvement in contrast reaction clinical skills.

Based on these results, our radiology residency plans to integrate simulation training as part of our annual educational curriculum.
1) ACR Manual on Contrast Media, Version 9. ACR Committee on Drugs and Contrast Media, 2013


