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# CAN A HYBRID SIMULATOR MITIGATE THE UNEVENNESS OF DIAGNOSTIC RADIOLOGY TRAINING EXPERIENCE IN THE MANAGEMENT OF IODINATED RADIOLOGIC CONTRAST MEDIA REACTION?



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## BACKGROUND

Radiologic contrast mediated (RCM) reactions are rare, but potentially life-threatening. Therefore, when an IV contrast allergy reaction does occur, prompt diagnosis and correct treatment are crucial for survival of the patient. Radiologists need to be prepared to treat contrast reactions, particularly if one occurs at an outpatient imaging center where access to support services is limited. Consequently, there is considerable interest in the use of simulators to train radiologists in this critical competency. One of the main benefits of simulation is the ability to reproduce low-frequency, high-impact clinical events for residents and thereby standardize otherwise uneven training experiences.

## METHODS

In this study, eleven radiology residents (6 PGY-2, 2 PGY-4, 3 PGY-5) were evaluated during a simulated severe contrast reaction on a hybrid simulator. The individual simulator sessions were reviewed, noting whether or not the individual residents performed critical actions and the amount of time needed to implement the specific action. Some of the critical actions which were noted included administering epinephrine, benadryl, albuterol, oxygen, and IV fluids, monitoring heart and lung sounds, pulse, pulse oximetry, EKG leads, and intubating the patient. Positive points were assigned if the resident carried out a critical action and points were subtracted if not.

**Table 1.** Critical actions evaluated, the points assigned to them, and the percent of residents who successfully performed each one.

Action	Points	% performed
Call for help	2	72.73%
Monitor vitals	2	100%
Administer epinephrine	2	100%
Administer benadryl	2	90.91%
Monitor pulse ox	2	100%
Monitor cardiac	2	100%
Recognize need to intubate	2	100%
Administer O2 (20% nasal, 80% mask)	1	90.91%
Talk to patient	1	100%
Administer anesthesia prior intubate	1	45.46%
Administer paralytic prior intubate	1	73.73%
Inflate balloon	1	81.82%
Bag after intubate	1	100%
Intubate correctly	1	63.64%
Intubate on first try	1	72.73%
Administer fluids	0.5	36.36%
Monitor pulse	0.5	81.82%
Monitor heart & lung sounds	0.5	100%
Administer albuterol	0.5	36.36%
Repeat epinephrine or benadryl	0.5	100%
Monitor blood pressure	0.5	54.55%
Monitor heart & lung after intubate	0.5	72.73%
Know doses without chart	0.5	36.36%
Bag prior to intubate	0.5	27.27%
Stop contrast	0.25	0%
Recognize IV in place	0.25	100%
Ask about allergies/prior reactions	0.25	100%

## RESULTS

There was no statistically significant difference in percent points received as a function of junior versus senior resident status ( $t = 0.971$ ,  $p = 0.3568$ ), although the junior residents (mean = 71.10%) performed higher than the seniors (mean = 62.75%). There was also no statistically significant difference as a function of type of intern year served ( $F = 0.655$ ,  $p = 0.5454$ ), although the medicine prelim residents received slightly higher (mean = 73.85%) scores than the transitional (mean = 64.40%) and surgery (mean = 61.47%) residents. This data clearly demonstrate a gap in training in the management of these reactions among the resident participants in the study.



**Table 2.** Percent received by the residents, whether they were junior or senior, and the type of intern year they had.

Percent Points Received	Junior or Senior Resident	Intern Year Type
45.87	Junior	Transitional
45.87	Senior	Surgery
55.05	Senior	Transitional
61.47	Senior	Transitional
65.14	Junior	Medicine prelim
66.97	Senior	Medicine prelim
74.31	Junior	Transitional
77.06	Junior	Surgery
78.90	Junior	Medicine prelim
84.40	Senior	Medicine prelim
85.32	Junior	Transitional

## CONCLUSION

The use of a patient simulator to train radiology residents in the management of contrast reactions is a logical step and one that promises to correct the unevenness of training experiences. We believe that practical training with use of hybrid simulators should be considered a preferred method to standardize the experience of trainees and ensure the attainment of specific milestones, such as competency in the management of severe life-threatening iodinated contrast reactions.

**Table 3.** Average (minutes.seconds), standard deviation (SD) and range of time into the simulation critical actions were performed.

Action	Average	SD	Range
Time to recognize IV in place	1.13	1.22	0.13 - 4.35
Administer benadryl	1.27	1.17	0.13 - 3.42
Monitor heart & lung sounds	1.43	2.15	0.04 - 6.53
Administer epinephrine	2.28	2.09	0.41 - 6.41
Monitor pulse	2.36	1.34	1.27 - 4.52
Administer O2 (20% nasal, 80% mask)	3.39	2.19	0.23 - 7.59
Administer albuterol	4.24	3.06	1.57 - 7.38
Monitor pulse ox	4.56	4.20	0.25 - 14.13
Monitor cardiac	5.04	4.13	0.25 - 14.13
Administer fluids	6.20	4.43	1.23 - 11.59
Administer anesthesia prior intubate	7.19	3.02	3.10 - 10.15
Administer paralytic prior intubate	8.16	3.09	3.10 - 11.11
Start intubation	8.38	2.47	3.09 - 11.20
Call for help	9.18	3.56	5.36 - 14.13
<b>Total simulation time</b>	<b>11.53</b>	<b>3.24</b>	<b>5.46 - 15.15</b>

## REFERENCES:

- Confino-Cohen, R., Goldberg A. Safe Administration of contrast media: what do physicians know? *Annals of Allergy Asthma Immunology* Aug 2004; 93 (2): 166-170.  
 Gardi T, Christiansen UC, Jacobsen J et al. How do anesthesiologists treat malignant hyperthermia in a full-scale anesthesia simulator? *Acta Anaesthesiologica Scandinavica* Sep 2001; 45 (8) 1032-1035.