HIGH FIDELITY CONTRAST REACTION SIMULATION TRAINING

A Single Department's Experience in Training all Faculty, Fellows, and Residents to Improve Patient Care and Satisfy PQI requirements

Yale School of Medicine, Department of Radiology and Biomedical Imaging

D Asch, MD; KE Pfeifer, MD; J Cavallo, MD; L Kappus, MEd; J Arango, MPH; J Kirsch, MD; J Pahade, MD

BACKGROUND & PURPOSE

- Contrast reactions are one of the few medical emergencies that radiologists must be prepared to manage
  - Severe reactions are relatively rare (0.005-0.01% of all injections)
  - Most radiologists have limited experience treating these patients
  - Knowledge of treatment algorithms is poor
  - Significant risk in event of a reaction – potentially fatal patient outcomes

11

Slide 2

11 condense all the prior studies stuff into one slide
Jay Pahade, 10/21/2015

BACKGROUND & PURPOSE

- *Prior studies have shown that we are not prepared…*
  - Most recent single center study of radiology attending physicians, fellows, residents and found[1]:
    - 50% correctly identified the proper dose of IM epinephrine for anaphylaxis
    - 29% knew the proper dose/rate of administration of IV epinephrine for anaphylaxis
  - 2009 survey of radiologists[2]: 91% chose epinephrine as the initial drug of choice in a contrast-related reaction.
    - 41% gave the correct administration route and dose
    - 11% knew what concentrations were available to them and what equipment was needed
    - 17% of radiologists administered potentially fatal overdoses
  - England survey[3]:
    - 41/284 (14%) diverse MDs knew correct epinephrine dose

[1]Nandwana, et al. AJR. 2015; 205:90-94. 10.2214/AJR.14.13884
[2]Lightfoot CB, Abraham RJ, Mammen T, et al. Survey of radiologists' knowledge regarding the management of severe contrast material induced allergic reactions. Radiology 2009; 251:691–696.
[3]Droste et al. Anaphylaxis: lack of hospital doctors' knowledge of adrenaline (epinephrine) administration in adults could endanger patients' safety. Eur Ann Allergy Clin Immunol. 2012;44(3):122-7

BACKGROUND & PURPOSE

- High-fidelity simulation has arisen as an effective model to address this issue as it allows practice of high acuity but low frequency clinical events
- Our institution implemented a department-wide quality improvement program designed to increase patient safety and radiologist education on the recognition and management of contrast reactions
- The quality improvement project was developed using the PDSA (Plan – Do – Study – Act) cycle advocated by the American Board of Radiology (ABR).

METHODS-DESIGN

- Participants:
  - Mandatory for all radiology residents and fellows
  - Optional for faculty, but integrated into bonus eligibility to encourage completion
- Instructors:
  - Four radiology staff (3 faculty, 1 resident)
  - Completed an 8-hour course on simulation development and instruction

METHODS-TESTING

- Pretest
  - 20-question multiple-choice test assessing participants' knowledge of contrast reactions/management and departmental contrast policies (developed based on ACR contrast manual) Test questions
  - 10 questions assessing participants' demographics, ACLS/BLS status, and comfort level in responding to contrast reactions using a Likert scale Test Questions
  - Test completed prior to simulation training to allow assessment of knowledge prior to the intervention
- Posttest
  - Same test retaken at 1 month and 6 months after course to assess effectiveness of course and retention of knowledge
  - 1 month posttest was mandatory. Testing at 6 months was optional
- Testing was completed via participant-specific online links distributed by email via Qualtrics survey/testing software (Qualtrics ®, Provo, Utah).

METHODS-TRAINING

- Participants completed a 1-hour course in our institution's high-fidelity simulation lab
- Mixed groups of 8-10 participants including radiology nurse, with 2-3 people serving as "initial responders", while others watched via live video feed
- Three simulations were completed with predetermined end-points:
  - A moderate severity contrast reaction requiring use of IM epinephrine
  - A high severity, anaphylaxis-like, contrast reaction requiring use of IV epinephrine
  - A hypoglycemic event mimicking a contrast reaction requiring blood sugar assessment and administration of an ampule of D50 IV

METHODS-SIMULATION SET UP

- Simulation room mimics our department's recovery area
- During the simulation, participants were instructed to interact with the manikin (SimMan, Laerdal Medical, Wappingers Falls, NY) as if it were an actual patient.
- Manikin capabilities/features:
  - Can receive medications
  - Displays continuous real-time vital signs (which were easily changed during scenarios)
  - May manifest wheezing, crackles, tongue/laryngeal edema, and diaphoresis
  - Technician operating the manikin able to provide verbal responses to questions asked by responders via built in speakers and could hear/see participants via live video feed.

METHODS- CONTRAST REACTION KIT

- Modeled after ACR guidelines
- 1 standard kit across entire institution, including outpatient facilities
- Key components:
  - Albuterol nebulizer and MDI
  - 100 mg Hydrocortisone
  - 50 mg Diphenhydramine
  - 1 mg Atropine
  - 10 ml (1 mg) of 1:10,000 concentration epinephrine vial/bristojet
  - 1ml (1mg) vial of 1:1000 concentration epinephrine
- Actual kit used in simulation course
  - Allows participants to interact with the kit, learn medication locations, practice how to administer meds

SIMULATIONS MODELED TO PRACTICE KEY STEPS IN CONTRAST REACTION MANAGEMENT

11 core competencies on contrast reaction management.

#	Core competency
1	Oxygen: proper route and dose
2	Management of vasovagal reaction
3	Avoidance of diphenhydramine hydrochloride in the hypotensive patient
4	Avoidance of subcutaneous epinephrine in the hypotensive patient
5	Alternative route of epinephrine administration if no intravenous access
6	Correct dosing of epinephrine via different routes of administration
7	Management of a contrast reaction in the pediatric patient
8	Recognition and management of contrast reactions in the sedated patient
9	Management of bronchospasm
10	Management of upper airway/laryngeal edema
11	Code team activation

Wang et al. AJR 2011; 196:1288–1295

METHODS-SCENARIO 1

- Mild Contrast reaction progressing into a moderate contrast reaction:
  - Urticaria unresponsive to diphenhydramine with development of bronchospasm with wheezing, cough, and declining oxygen saturations
- Treatment Algorithm:
  - Obtain a past medical history
  - Place patient on monitor and obtain a vital signs
  - Recognize the scenario as a contrast reaction and administer 25-50 mg of diphenhydramine IV or PO
  - After no relief and progression of symptoms to diminished oxygen saturations, administer Albuterol nebulizer and 0.3 mg epinephrine 1:1000 IM
  - Know how to, and initiate hospital's code team

METHODS-SCENARIO 2

- Hypoglycemic event:
  - Diaphoresis, slight tachycardia with normal BP, altered mental state
- Treatment Algorithm:
  - Obtain past medical history from patient/technologist
  - Place patient on monitor and obtain vital signs
  - Recognize hemodynamic stability and possible contrast reaction mimic
  - Check finger stick glucose (Value=25)
  - Administer 1 amp of D50 IV push available in kit

METHODS-SCENARIO 3

- Severe contrast reaction:
  - Tongue and laryngeal edema, wheezing/coughing, hypotension, falling oxygen saturations, tachycardia, tachypnea, and declining consciousness
- Treatment Algorithm
  - Obtain a past medical history
  - Place on monitor and obtain vital signs
  - Recognize severe/"anaphylactic" contrast reaction
  - Administer oxygen via non-rebreather for hypoxia
  - Due to hypotension administer epinephrine 1:10,000, 0.1-0.3 mg via slow IV push +/- Albuterol nebulizer
  - Know how to, and initiate hospitals code team

METHODS-DEBRIEFING

- 3 D's of debriefing
  - Diffuse- Recap, vent, elicit reactions and emotions
  - Discover- Evaluate performance through reflection (what went well, what didn't)
  - Deepening- Connect simulation event to clinical practice
- 5-10 minute debriefing session followed each simulation
  - Events/actions of team discussed and appropriate treatment algorithms were reviewed.
  - Crucial part of simulation- allows reflection and re-enforces appropriate response and algorithm
- Prior studies have shown effectiveness in medicine
  - 2014 study* showed statistically significant improvement pretest to posttest in performance of technical and nontechnical skills

*Levett-Jones, T. and S. Lapkin, *A systematic review of the effectiveness of simulation debriefing in health professional education.* Nurse Educ Today, 2014. **34**(6): p. e58-63.

METHODS

- Analysis
  - Pretest, posttest (1 month after) and delayed posttest (6 months after) multiple choice test scores were compared with paired two-tail t-tests, and Likert scores were compared using the Wilcoxon signed rank test.

RESULTS

- 151 out of 161 available participants completed the simulation with 1 faculty participant opting to have their results removed from data analysis
- 150 participants completed the pre and posttest
  - 102 (68%) males
  - 48 (32%) females
- Average age = 40 years (range 27-83)

Experience Level	Pretest and Posttest N (%)	Delayed Posttest N (%)
First year residents (PGY2)	12 (8)	9 (9)
Second year residents (PGY3)	14 (9)	8 (8)
Third year residents (PGY4)	13 (9)	4 (4)
Fourth year residents (PGY5)	13 (9)	10 (10)
Fellows	24 (16)	17 (16)
Faculty 0-5 years in practice	27 (18)	23 (22)
Faculty 6-10 years in practice	9 (6)	7 (7)
Faculty 11-15 years in practice	9 (6)	6 (6)
Faculty >15 years in practice	29 (19)	21 (20)
Total	150	105

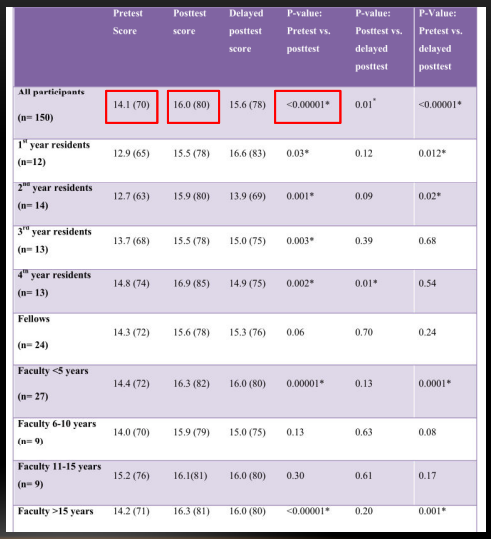
RESULTS

	Pretest Score	Posttest score	Delayed posttest score	P-value: Pretest vs. posttest	P-value: Posttest vs. delayed posttest	P-Value: Pretest vs. delayed posttest
All participants (n= 150)	14.1 (70)	16.0 (80)	15.6 (78)	<0.00001*	0.01*	<0.00001*
1st year residents (n=12)	12.9 (65)	15.5 (78)	16.6 (83)	0.03*	0.12	0.012*
2nd year residents (n= 14)	12.7 (63)	15.9 (80)	13.9 (69)	0.001*	0.09	0.02*
3rd year residents (n= 13)	13.7 (68)	15.5 (78)	15.0 (75)	0.003*	0.39	0.68
4th year residents (n= 13)	14.8 (74)	16.9 (85)	14.9 (75)	0.002*	0.01*	0.54
Fellows (n= 24)	14.3 (72)	15.6 (78)	15.3 (76)	0.06	0.70	0.24
Faculty <5 years (n= 27)	14.4 (72)	16.3 (82)	16.0 (80)	0.00001*	0.13	0.0001*
Faculty 6-10 years (n= 9)	14.0 (70)	15.9 (79)	15.0 (75)	0.13	0.63	0.08
Faculty 11-15 years (n= 9)	15.2 (76)	16.1(81)	16.0 (80)	0.30	0.61	0.17
Faculty >15 years (n=29)	14.2 (71)	16.3 (81)	16.0 (80)	<0.00001*	0.20	0.001*

Mean multiple choice test scores for all participants and by level of training. Numbers in () indicate % correct out of 20. * Indicates statistically significant results.

RESULTS

- Mean overall score on pretest was 14.1 / 20
- Score increased significantly to 16.0 on posttest (p<=0.00001)



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RESULTS

- The delayed posttest had 105 participants (69%)
- The ratio of residents, fellows, and faculty who participated in the delayed posttest (n=105) was not statistically different (p=0.93) from the pretest or posttest (n=150)
- Overall test scores increased from 14.1 pre-simulation to 15.6 on delayed posttest (p<0.00001)

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RESULTS

- Overall decrease in test scores across all subgroups when comparing the posttest with the delayed posttest (16.0 to 15.6, p=0.01)
- By subgroup analysis, only the 4th year residents demonstrated a significant decrease in test scores comparing the posttest with the delayed posttest

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RESULTS

- Comfort level in managing reactions demonstrated a significant positive increase ($p<0.001$) when comparing the pretest to the posttest (all Likert scale questions)
- Delayed posttest overall comfort level in managing reactions remained significantly improved from pre-simulation ($p<0.001$) but showed a significant decline ($p=0.03$) compared to the posttest

	Pretest comfort level	Posttest comfort level	Delayed posttest comfort level	P value: pretest vs. posttest	P value: post vs. delayed posttest	P value: pre vs. delayed posttest
Overall comfort in managing reactions	2.9	3.7	3.5	<0.001	0.03	<0.001
Managing mild reactions	3.7	4.4	4.3	<0.001	0.33	<0.001
Managing moderate reactions	3.0	3.9	3.7	<0.001	0.004	<0.001
Managing severe reactions	2.4	3.4	3.1	<0.001	0.03	<0.001
Comfort level differentiating a contrast reaction from another medical emergency	3.1	3.9	3.9	<0.001	0.36	<0.001
Comfort level differentiating a mild from a severe reaction	3.6	4.1	4.2	<0.001	0.4	<0.001

Mean comfort values in managing contrast reactions (1 being not comfortable at all and 5 being very comfortable).

RESULTS-FEEDBACK

- Simulation sessions were well received
  - 86% of participants asked for other forms of simulation within our radiology department.
  - 93% of the participants felt that the group size was adequate
  - 57% of participants felt that the simulation should be completed annually
- There was a significant increase in support of high fidelity simulation training as an effective learning tool for contrast reaction management after completing the simulation (4.0 to 4.5, $p<0.001$) that persisted at 6-month delayed posttest (4.0 vs. 4.5 $p<0.001$)

KEYS ISSUES TO IMPLEMENT A SIMILAR PRACTICE QUALITY IMPROVEMENT PROJECT AT YOUR INSTITUTION

- Institutional access
  - Work with your institution to gain access to simulation lab
    - These are now available at most academic centers
- Must get "buy in"
  - Support of departmental leadership is key to promote participation
- Participants
  - Train everyone
    - Can not just limit to residents- ALL residents, fellows, faculty
    - Include ancillary staff
      - Having nursing and technologist participate is key to mimic natural environment and work on team communication skills

KEYS ISSUES TO IMPLEMENT A SIMILAR PRACTICE QUALITY IMPROVEMENT PROJECT AT YOUR INSTITUTION

- Group size
  - Will vary on how many simulations you develop and size of your department
  - Try to mimic what typical size is for responding to an event in your department
  - We had to compromise slightly for our project due to size of our department and limited time available in our simulation lab

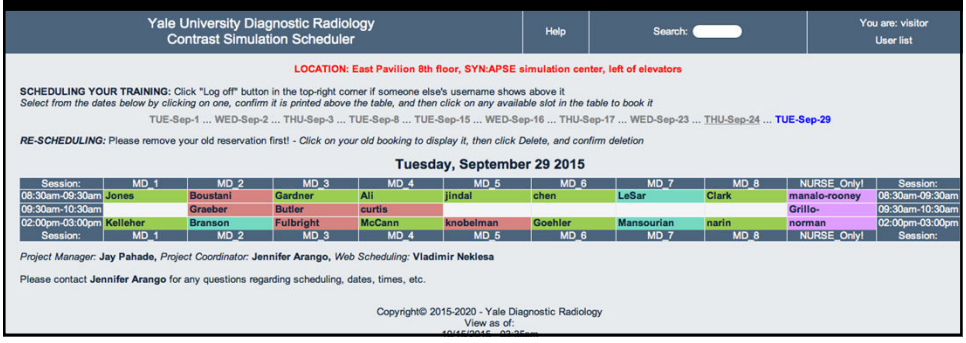
KEYS ISSUES TO IMPLEMENT A SIMILAR PRACTICE QUALITY IMPROVEMENT PROJECT AT YOUR INSTITUTION

- Simulation creation and content
  - A good session imparts stress/chaos
    - Needs to feel like real life
  - Actually administer medications
    - People may memorize a dose but having them actually draw up and give the medication is important as it is a leading source of error
  - Include mimickers of contrast reactions
    - Important to practice normal clinical assessment and recognize adverse events
    - Use different mimics each year

Contrast Reaction Mimics
- Hypoglycemia
- Acute Coronary Syndrome
- Seizure
- Drug (pain medication) overdose
- Nausea/Vomiting
- Stroke
- Air Embolism

KEYS ISSUES TO IMPLEMENT A SIMILAR PRACTICE QUALITY IMPROVEMENT PROJECT AT YOUR INSTITUTION

- Minimize disruption for participants-Length of course
  - Our course was designed to last one hour and occur during normal work hours
  - Made it much easier for everyone to attend and eliminated need to take time off
- Scheduling
  - Our IT dept. built online schedule site (below)
    - Allow users to pick date/time that works best



Yale University Diagnostic Radiology
Contrast Simulation Scheduler

Help | Search: | You are: visitor | User list

LOCATION: East Pavilion 8th floor, SYN:APSE simulation center, left of elevators

SCHEDULING YOUR TRAINING: Click "Log off" button in the top-right corner if someone else's username shows above it
Select from the dates below by clicking on one, confirm it is printed above the table, and then click on any available slot in the table to book it

TUE-Sep-1 ... WED-Sep-2 ... THU-Sep-3 ... TUE-Sep-8 ... TUE-Sep-15 ... WED-Sep-16 ... THU-Sep-17 ... WED-Sep-23 ... THU-Sep-24 ... TUE-Sep-29

RE-SCHEDULING: Please remove your old reservation first! - *Click on your old booking to display it, then click Delete, and confirm deletion*

Tuesday, September 29 2015

Session:	MD_1	MD_2	MD_3	MD_4	MD_5	MD_6	MD_7	MD_8	NURSE_Only!	Session:
08:30am-09:30am	Jones	Boustani	Gardner	Ali	jindal	chen	LeSar	Clark	manalo-rooney	08:30am-09:30am
09:30am-10:30am		Graeber	Butler	curtis					Grillo-	09:30am-10:30am
02:00pm-03:00pm	Kelleher	Branson	Fulbright	McCann	knobelman	Goehler	Mansourian	narin	norman	02:00pm-03:00pm
Session:	MD_1	MD_2	MD_3	MD_4	MD_5	MD_6	MD_7	MD_8	NURSE_Only!	Session:

Project Manager: **Jay Pahade,** *Project Coordinator:* **Jennifer Arango,** *Web Scheduling:* **Vladimir Neklesa**

Please contact **Jennifer Arango** for any questions regarding scheduling, dates, times, etc.

View as of:

KEYS ISSUES TO IMPLEMENT A SIMILAR PRACTICE QUALITY IMPROVEMENT PROJECT AT YOUR INSTITUTION

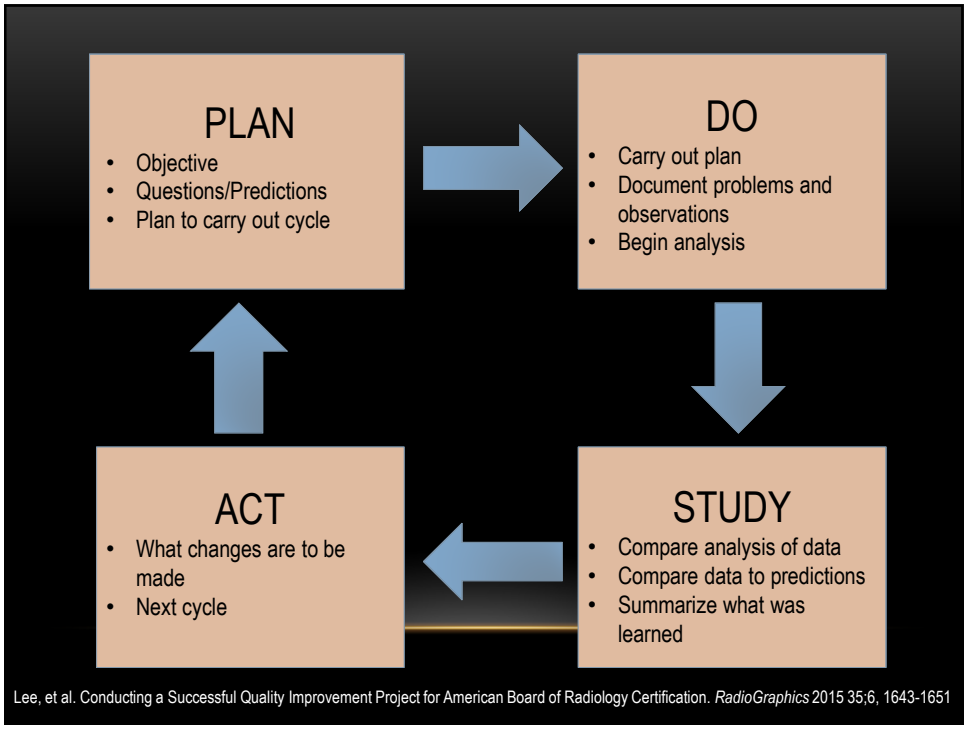
- Frequency of training
  - Is annual training adequate?
  - Our study showed decline in test scores and comfort levels at 6 months
    - Prior study with small sample of showed decay in knowledge and comfort in managing contrast reactions at 6-9 months*
  - We have now added in-situ simulation training 6 months after the course to refresh knowledge, skills and improve comfort treating reactions

*Trout, A.T., R.H. Cohan, J.H. Ellis, et al., *Teaching management of contrast reactions: does it work and how often do we need to refresh?* Acad Radiol, 2012. **19**(4): p. 498-504.

HOW TO IMPLEMENT PRACTICE QUALITY IMPROVEMENT PROJECT

- Until recently, the ABR emphasized that projects should be completed via the PDSA (Plan – Do – Study – Act) cycle
  - 3 phases:
    - Phase 1: baseline PDSA cycle
      - Plan: identify area needing improvement and a measure to assess need; develop a target and plan
      - Do: set plan in motion, collect data
      - Study: compare results with desired goal, explore deficiencies
      - Act: develop improvement plan for next cycle
    - Phase 2: Implementing improvement plan
    - Phase 3: Post-improvement plan cycle (cycle 2)
  - Cycle can be used continuously to reach goal

Lee, et al. Conducting a Successful Quality Improvement Project for American Board of Radiology Certification. *RadioGraphics* 2015 35;6, 1643-1651



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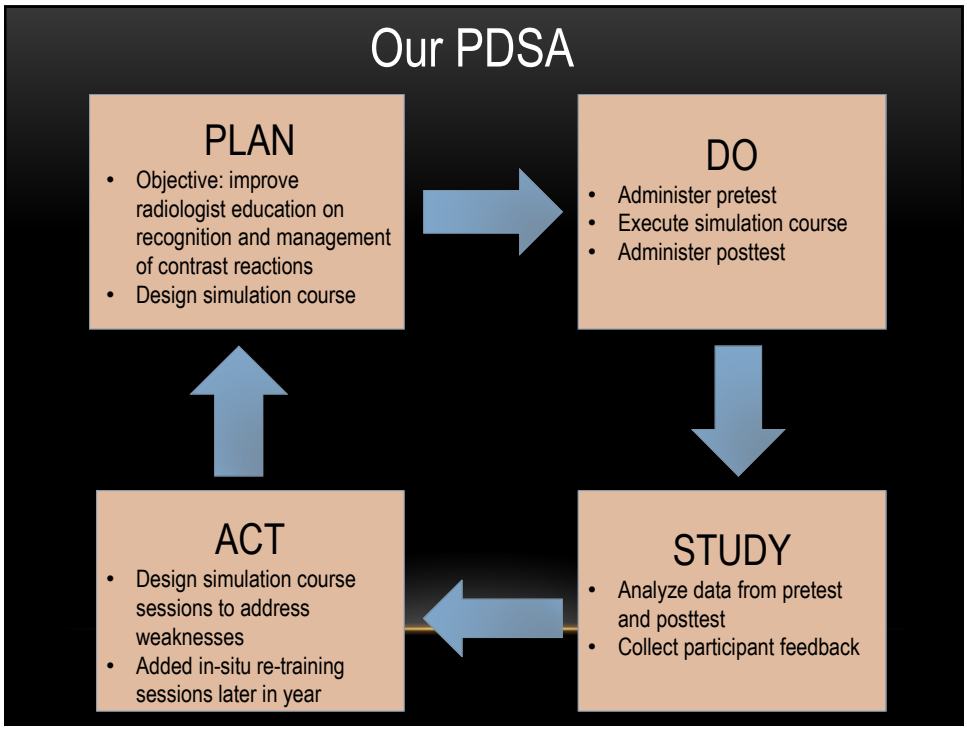

RECENT ABR CHANGES TO PQI PROJECTS

- Recent changes implemented in September 2015
- While designing PQI projects with PDSA approach is still recommend recent changes by the American Board of Radiology have greatly diversified activities a radiologists can complete to meet PQI requirements as part of the MOC cycle
- We recommend all interested parties review recent commentary for more information and consult the American Board of Radiology website
  - Donnelly, LF. Invited Commentary: Changes to the ABR policy on Requirements fir Diplomates to Meet MOC Part 4-PQI projects and Activities, Lee, et al. *RadioGraphics* 2015 35;6, 1652-54.
  - ABR website: http://www.theabr.org/moc-ro-pqi-guidelines

CONCLUSION

- High-fidelity simulation is an effective tool to improve radiologists' knowledge and comfort in managing contrast reactions
- Training has now become an ongoing quality improvement project in our department, with all residents, fellows and faculty participating in the course annually
- As comfort level declined at 6 months, in-situ simulation training in various locations within our actual department has been incorporated to allow knowledge refreshment 6 months after the simulation course
- Development of a high-fidelity simulation project to improve education on contrast reaction management is a high-yield initiative that also allows completion of a departmental wide PQI project

KNOWLEDGE-BASED TEST QUESTIONS

There are 20 multiple-choice questions which are designed to test your knowledge on contrast reactions, contrast policy, and contrast reaction mimics. Please answer to the best of your ability without using any additional reference material.

1. Which of the following is a symptom of a moderate severity contrast reaction?
   a. Itching
   b. Hives
   c. Mild Hypotension
   d. Nausea/Vomiting

2. Which of the following is considered an allergic like reaction to iodinated IV contrast administration?
   a. Hypoglycemia
   b. Flushing
   c. Bronchospasm
   d. Nausea

3. Which of the following is considered a physiologic response to IV contrast administration?
   a. Hypotension
   b. Hypoglycemia
   c. Sensation of warmth
   d. Chest Pain

4. What is the most likely sequela of contrast related urticarial reactions?
   a. Typically do not require medical treatment
   b. Most require treatment with anti-histamine such as Benadryl
   c. Most require treatment with epinephrine IM
   d. Most require treatment with epinephrine IV

5. What is the estimated frequency of severe contrast reactions with low-osmolar IV iodinated contrast media?
   a. 1 per 1,000
   b. 1 per 10,000
   c. 1 per 100,000
   d. 1 per 500,000

6. Which of the following is true regarding contrast reactions to IV iodinated contrast?
   a. Low-osmolar contrast agents are associated with higher adverse reaction rates than iso-osmolar contrast agents.
   b. Patients with mild contrast reactions are at high risk of developing severe reactions on subsequent exposure.
   c. Ionic agents have lower risk of allergic-like reaction than non-ionic agents.
   d. Reactions may progress from mild to severe rapidly.

7. What is the treatment of choice for severe contrast reactions?
   a. IV Epinephrine
   b. IV Atropine
   c. Bolus of IV fluids
   d. All of the above treatments may appropriate treatment for different severe contrast reactions

8. Initial manifestation of a delayed contrast reaction has been reported to occur up to how many days after IV contrast administration?
   a. 1 day
   b. 2 days
   c. 7 days
   d. 30 days

9. What is the best first line medication for treatment of symptomatic urticaria?
   a. Diphenhydramine 50-100mg PO
   b. Diphenhydramine 25-50mg PO
   c. Epinephrine (1:10,000) 0.1 mg Subcutaneously
   d. Epinephrine (1:10,000) 0.3mg Subcutaneously

10. Which of the following is an appropriate initial management step to a patient who is hypotensive after receiving IV contrast
    a. Elevate the legs (60) degrees or more in the Trendelenburg position
    b. Place the patient on a monitor including pulse oximeter, cardiac rhythm, and blood pressure
    c. Administer IV epinephrine (1:10,000) slowly 0.1-0.3mg
    d. All of the above are appropriate

11. Which of the following is the most rapid treatment for a patient who becomes hypoglycemic in the department?
    a. 0.5-1 amp of IV 0.5% dextrose (D50)
    b. A glass of orange juice
    c. 1 mg IM glucagon
    d. Sugar packet

KNOWLEDGE-BASED TEST QUESTIONS

12. You have a patient whose blood pressure is 80/40 and whose heart rate is 40 after receiving IV contrast. You have placed the patient on a monitor, placed the patient in trendelenburg position, and administered oxygen via a non-rebreather, and alerted the code team. What is the next best step?
    a. Epinephrine (1:1,000) 0.1 mg IV administered slowly
    b. Atropine 0.6 mg IV slowly
    c. Epinephrine (1:10,000) 0.1 mg IV administered slowly
    d. Atropine 0.6 mg subcutaneously

13. In a patient experiencing flash pulmonary edema following the administration of IV contrast which of the following is NOT an appropriate intervention?
    a. IV epinephrine (1:10,000) 0.1-0.3 mg
    b. Oxygen via mask 6-10 Liters/min
    c. Morphine 2-4 mg IV
    d. Lasix 40 mg IV push
    e. Call the rapid response team

14. You are called to evaluate an adult patient in the department whose blood pressure has rapidly risen to 200/150 (from 120/80), heart rate of 95 and new symptoms of headache. You have placed the patient on the monitor, administered oxygen, and called the rapid response team. What is the most appropriate treatment for this patient?
    a. 100 cc bolus of lactated ringers solution
    b. Beta and alpha blocker such as Labetalol 20 mg IV
    c. Atropine 1mg IV slowly
    d. Diuretic such as Lasix 10mg IV

15. In a patient with acute bronchospasm after receiving IV contrast who is otherwise stable, what is most appropriate initial treatment?
    a. ~~A~~lbuterol via inhalation 2-3 puffs or nebulizer
    b. 100mg IV Solucortef
    c. 50mg PO diphenhydramine
    d. Epinephrine (1:10,000) IV 0.3 mg

16. You are called to evaluate a patient who has feelings of mild laryngeal edema after receiving IV contrast. You have alerted the code team, placed the patient on a monitor, as well as administered oxygen. The most appropriate next step is?
    a. Atropine 1 mg IV
    b. Benadryl 50 mg IV
    c. Epinephrine (1:1000) 0.1-0.3 mg SC/IM
    d. Place the patient in trendelenburg position

17. A 20 year old patient undergoing a CT with IV contrast begins to have a seizure. You are called to the room and after administering oxygen, placing the patient on a monitor, and turning patient on their side, what is the next best step?
    a. Ativan 2 mg IV push
    b. Fentanyl 1 mcg IV push
    c. Phenytoin 50 mg/min infusion
    d. Narcan 1 mg IV push

18. Per our departmental policy, which of the following does not require premedication prior to receiving iodinated contrast?
    a. Shell-fish allergy of urticaria
    b. Shell-fish allergy of anaphylaxis
    c. History of a prior moderate iodinated contrast reaction
    d. History of anaphylaxis to gadolinium

19. The most appropriate treatment for widely disseminated and rapidly progressing urticarial reaction in an adult not responsive to 50mg IV Benadryl is:
    a. No further treatment needed
    b. Additional 50mg IV Benadryl
    c. Epinephrine (1:1000) 0.1-0.3 mg Subcutaneously/IM
    d. Epinephrine (1:10,000) 0.1-0.3 mg IV

20. You are asked to evaluate a patient whose blood pressure after receiving IV contrast has fallen to 80/40, heart rate of 150 bpm, and has diffuse wheezing with tongue swelling. You have placed the patient on a monitor, elevated the legs and asked for oxygen and IV fluids. The code team has arrived and is managing the airway. What is the next best step?
    a. Epinephrine (1:10,000) 0.1-0.3 mg IV administered slowly
    b. Epinephrine (1:1,000) 0.1-0.3 mg IM
    c. Epinephrine (1:1,000) 0.1-0.3 mg IV administered slowly
    d. Epinephrine (1:10,000) 0.1-0.3 mg IM

Click to return

COMFORT-BASED TEST QUESTIONS AND DEMOGRAPHICS

This set of questions asks about your background and general comfort level in responding to contrast reactions.

1. Please list your age:

2. What is your sex?
   a. Male
   b. Female

3. What is your level of training
   a. First year radiology resident
   b. Second year radiology resident
   c. Third year radiology resident
   d. Fourth year radiology resident
   e. Fellow
   f. Faculty attending (0-5 years experience)
   g. Faculty attending (6-10 years experience)
   h. Faculty attending (11-15 years experience)
   i. Faculty attending (>15 years experience)

4. Please rate the following statement (1 not very comfortable to 5 very comfortable):
   a. I feel comfortable managing contrast reactions on my own
      1. 1
      2. 2
      3. 3
      4. 4
      5. 5

5. Please rate the following statement (1 not very comfortable to 5 very comfortable):
   a. I feel comfortable differentiating a contrast reaction from another medical emergency.
      1. 1
      2. 2
      3. 3
      4. 4
      5. 5

6. Please rate the following statement (1 not very comfortable to 5 very comfortable):
   a. I feel comfortable differentiating a mild from a severe contrast reaction.
      1. 1
      2. 2
      3. 3
      4. 4
      5. 5

7. Please rate the following statement (1 not very comfortable to 5 very comfortable):
   a. I feel comfortable diagnosing and managing mild contrast reactions.
      1. 1
      2. 2
      3. 3
      4. 4
      5. 5

8. Please rate the following statement (1 not very comfortable to 5 very comfortable):
   a. I feel comfortable diagnosing and managing moderate contrast reactions.
      1. 1
      2. 2
      3. 3
      4. 4
      5. 5

9. Please rate the following statement (1 not very comfortable to 5 very comfortable):
   a. I feel comfortable diagnosing and managing severe contrast reactions.
      1. 1
      2. 2
      3. 3
      4. 4
      5. 5

10. Please rate the following statement (1 not very comfortable to 5 very comfortable):
    a. I feel that simulation sessions are an effective teaching tool to learn how to manage contrast reactions.
       1. 1
       2. 2
       3. 3
       4. 4
       5. 5

    b. I felt that the size of the simulation group was ideal to foster a learning environment.
       1. Group was too small
       2. Group was too big
       3. Group size was adequate

    c. I would like to see other forms of simulation utilized in the radiology department
       1. Yes
       2. No

    d. How often would you like to complete this simulation?
       1. Never again
       2. Once a year
       3. Twice a year
       4. Every other year

Click to return