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Emed-Opoly: Echocardiography

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ABSTRACT:

Audience: Emergency medicine residents and clerkship students, critical care medicine fellows.

Introduction: Echocardiography is used frequently in the emergency department (ED). It is essential for diagnosing the critically ill hypotensive patient. Fast and accurate recognition of ultrasound images with limited clinical information can aid diagnosis and treatment.

Objectives: By the end of this session, the learner will be able to:

- 1) Recognize normal and abnormal left heart global function
- 2) Recognize normal and abnormal right heart global function
- 3) Recognize pericardial effusions and pericardial tamponade

Methods: Echocardiography questions were prepared from formal ultrasound images. We created a game board similar to Monopoly™ but replaced properties with unit beds (e.g. Ps 1). This was projected on a screen. Three teams alternated advancing to different ICU beds by rolling a die and answering a question presented on a separate screen. Answering correctly resulted in ICU bed ownership and a change of turn; answering incorrectly resulted in just a change of turn. All answer options were discussed in group format after each question. “Black Cloud/White Cloud” chance cards were interspersed within the questions. They provided additional critical care facts and gave or took away additional turns.

Topics: echocardiography, point of care ultrasound, heart failure, aortic stenosis, aortic regurgitation, left heart failure, right heart failure.



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Learner Audience:

Medical students, interns, junior residents, senior residents, fellows in emergency medicine and critical care

Time Required for Implementation:

Set Up: Less than 10 minutes to set up projectors

Instructor Preparation: 30 minutes to review the questions

Learners per instructor: Minimum 6 learners, maximum 24

Topics:

Echocardiography, point of care ultrasound, heart failure, aortic stenosis, aortic regurgitation, left heart failure, right heart failure.

Objectives:

By the end of this session, the learner will be able to:

1. Recognize normal and abnormal left heart global function
2. Recognize normal and abnormal right heart global function
3. Recognize pericardial effusions and pericardial tamponade

Linked objectives and methods:

Rationale

Protected time for learning is a requirement for all house staff in the United States, including fellows and residents. Games can serve as an engaging way to teach and improve retention with item recall.¹⁻⁴ Many games exist in the medical education literature but most are either laborious to create (eg, Jeopardy) or for a single topic (eg, Septris).

A prior publication uses a Monopoly™-based game in the emergency medicine resident and student setting, using text-based questions about pediatric fever.⁵ Here, we created a Monopoly™-based game with image- and video-based questions for medical students, residents, and fellows. We piloted this image- and video-based game on the topic of echocardiography during an intensive care unit lecture day with the following learners: medical students; residents from internal medicine, anesthesia, and emergency medicine; and critical care medicine fellows.

Question Creation

Images and videos were obtained from previously read and finalized transthoracic and transesophageal echocardiograms. For the purposes of the game, single images or video clips were selected that best represented the finding of interest for the question.

Recommended pre-reading for instructor:

Phillips A, et al. Emed-Opoly: Echocardiography. JETem 2017. 2(2):SG1-4.
<https://doi.org/10.21980/J8PC77>

- Noble V, Nelson BP. Cardiac ultrasound. In: Noble V, Nelson BP. *Manual of Emergency and Critical Care Ultrasound*. 2nd ed. New York, NY: Cambridge University Press; 2011:61-90.

Content:

- **Small group application exercise (sGAE):**
 - Please see the associated ppt with imbedded videos.
- **sGAE Answers:**
 - Answers and explanations are in the “notes” sections of each slide.

Equipment Needed:

- Two projectors
- Two computers
- Five standard six-sided game dice (purchase from any retail store.)
- Timer

Setup:

1. Set up two projectors in a classroom
2. One projector will display the “game board” (first PowerPoint, displayed in editing mode, rather than presentation mode)
3. The second projector will display the questions (second PowerPoint)
4. Timer (20 seconds)

Playing the Game:

1. Form three to five teams; each team chooses a game piece (wagon, bed pan, oxygen tank, etc). Game pieces have a red border around them, while ownership markers do not.
2. All game (red outlined) pieces should be placed at “Start/Triage.” (You will need to be in editing mode to move pieces.)
3. Teams go in any order of the instructor’s choosing.
4. At the start of a turn, a team member rolls the dice. The facilitator moves that team’s game piece counterclockwise that many spaces on the game board.
5. If a team lands on fish bowl, break room, nursing station, or start, play moves on to the next team. If a team lands on an “unowned” patient care room, the facilitator advances the PowerPoint presentation by one slide (flipping a “card”) and reads the card to the team.
6. The “card” is either a multiple-choice question (MCQ) or a “white cloud/black cloud” card (akin to a Chance card in Monopoly™).





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7. If the “card” is a MCQ, the team must answer the question within 20 seconds. If the team answers correctly, the facilitator places one of that team’s ownership markers on the “room.” That team now “runs” that room. If the team answers the question incorrectly, the next team rolls the die and the game moves onward.
8. If the card is a “white cloud/black cloud” card, the team should follow the instructions on that slide “card.” White cloud/black cloud cards can be customized to specifics of an institution, such as mentioning the program director, chair, or coordinator, in clean fun. See the slides for examples.
9. If the room on which a team lands is currently owned by another team, there is a “code” (challenge) between the two teams. For a code, a question (the next slide in the queue) is read to both teams simultaneously. The first team to answer the question correctly wins the room. If a team answers incorrectly during a code, the other team automatically receives the room. If a cloud card is drawn when there is a code, the cloud card is bypassed and another card is drawn for a question.

Results and tips for successful implementation:

Learner Opinions

All 12 ICU fellows, residents, and students in attendance participated. Forty-two percent preferred the game over traditional lecture while 33% had no preference. Sixty-seven percent reported the game pace was appropriate, while 17% (1 person) each reported the game was too fast or too slow.

Question Analysis

Initial overall mean score (SD) was 0.74 (0.09) for the 30 items. The initial Cronbach’s α was 0.469 and mean (SD) IDC was 0.115 (0.318). After removing 7 poorly performing questions, the mean (SD) score was .83 (0.12); Cronbach’s α was 0.719; and mean (SD) IDC was 0.23 (0.28) without any negative values. We removed additional questions that did not clearly have one single correct answer in order to reduce the deck to the number of questions more reasonably expected to be needed during the game. The final omnibus mean (standard deviation, SD) score was 0.83 (0.12), Cronbach’s α = .663, and mean item discrimination correlation (SD) 0.22 (.28) with no negative values.

Reflections

Our results demonstrated that house officers of different levels and backgrounds enjoyed the Monopoly™-based game similarly to the trial with only emergency medicine residents.⁵ We also demonstrated that reasonable question metrics can be achieved with image- and video-based questions.

One challenge encountered was matching the speed of the game with instructional needs of the group. We planned on encountering 30 echocardiogram images, but by 30 minutes into the instructional time, we had only completed 8 questions because most questions required 3-4 minutes of group discussion. Rather than rush the group, we took this opportunity to provide essentially just-in-time teaching as each group answered the questions.

Another challenge was selecting representative images and video clips. Although all images and video clips were taken from formal echocardiograms and evaluated by two ultrasound expert authors, other ultrasound experts who reviewed the images outside of the complete image set from which the images were drawn sometimes had different diagnostic opinions for the individual clips. Those images were eliminated for the final version, but it markedly reduced the yield of final questions. We recommend that authors creating questions that use images or video clips ask other experts who are not involved in writing the questions to take the questions prior to using them in the classroom. The simple act of being a part of writing the question and drawing from a set of images and clips may impact interpretation of the image or video clip. Additionally, the pilot audience included learners outside of the ED, but should remain applicable to any of the specialties included since bedside echocardiography is central to training residents in emergency medicine, internal medicine, and anesthesiology and critical care fellows.

Practical Considerations for Educators:

- Answer explanations are given in the Notes section of the Card Deck.
- We strongly recommend that the faculty facilitator review the supplemental reading and Notes section of the Card Deck prior to the session because learners’ questions tend to stray far from the precise learning points of each slide.
- Give each team its own die so time is not wasted giving the die to the next team to roll. A large die made of an old box provides additional entertainment and prevents cheating (since everyone can see the number). If you have a box without equal sides, consider placing the larger numbers on the larger surfaces so the “weighted” die lands on higher numbers more often to progress the teams faster on the board.
- If a team interrupts the person reading the question, the reader should stop reading the question and require the team to answer with the fraction of the question already read. Otherwise teams immediately try to answer as soon as the reader speaks.



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- It is best if you can have two projectors: one for the game board and one for questions. If you have the questions on the screen, omit the previous practical consideration. If you cannot have the questions on a screen, consider using a separate laptop or tablet so the leader can read questions and still maneuver the room well. The game board should be set up in editing mode, and the question deck PowerPoint should be set up in presenter view so that the facilitator can see the explanations and answers.
- After the answer is confirmed or rejected, re-state the correct answer and provide some instruction as to *why* it is the correct answer and confirm that every team understood the answer (see notes in PowerPoint). Asking the audience for questions after a game question was completed produced several very good clarifying questions.
- Assign one person to move the game pieces and ownership markers and someone else to lead the game (ask questions). We also invited a high-level faculty member to be the judge (as to whether answers were acceptable), which involved her and was entertaining to the participants.
- Allow no more than 20 seconds for a team to answer a question to aid with game speed.
- Consider randomly assigning teams rather than having upper level and lower level residents compete against each other. It is helpful to divide up learners amongst the teams as well. This was found to promote good interactions between learners of different levels.
- One hour is the minimum to get through most of the material. However, allocating 1.5 hours is preferable.

Pearls:

- Global left ventricular function should be evaluated in all 4 views, but emphasized in the parasternal short view.
- Consider using tricuspid annular plan systolic excursion (TAPSE) in additional gestalt to estimate right ventricular function.
- Use color Doppler to evaluate aortic stenosis and regurgitation.

References/suggestions for further reading:

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