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TITLE:

Setup and Execution of the Blindfolded Code Training Exercise

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KEYWORDS:

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SUMMARY:

The blindfolded code training exercise, which blindfolds the team leader in a code resuscitation simulation, is an advanced teaching technique to improve closed-loop communication, organizational skills, and critical thinking.

ABSTRACT:

Miscommunication is the most common cause of preventable patient harm in medicine. Currently, there is limited knowledge of innovative techniques to improve resident physician communication and leadership strategies in high-acuity situations. The blindfolded code training exercise removes visual stimuli from the team leader, forcing the team leader to effectively utilize closed-loop communication. The simple act of blindfolding the team leader creates a learning environment where the leader must utilize a conceptual framework and critical thinking strategies to organize the team and manage the resuscitation. An advantage to this teaching technique is that it does not require any special simulation equipment, making it a low-cost approach. The blindfolded code training exercise can be applied to the management of any critically ill patient where the primary objective is to focus on developing communication skills in acute resuscitations. The purpose of the description of the blindfolded code training exercise is to provide guidance on how to perform this innovative teaching technique to force effective closed-loop communication.

INTRODUCTION:

The blindfolded code training exercise was developed to improve closed-loop communication, the utilization of a conceptual framework to organize the management of a resuscitation, and

critical thinking skills. Previous scholars reported that communication, role clarity, and teamwork were enhanced by blindfolding physicians during simulated resuscitations[1]. Resident physicians, especially in critical care specialties, are frequently placed in high-acuity situations. In order to appropriately manage these high-risk cases, resident physicians require training in both leadership strategies and communication in high-risk environments[2,3]. Simulation is commonly used and is effective in teaching crisis resource management principles and communication skills[4].

Currently, there is limited knowledge of innovative techniques to improve resident physician communication and leadership strategies in high-acuity situations. Ineffective communication may continue despite correct management and leadership observed in the simulation lab. A previous study highlights that the blindfolded code training exercise, when compared to typical code training, is more challenging and forces learners to use critical thinking skills and closed-loop communication. Learners felt the exercise solidified leadership skills and challenged them to maintain mental organization without visual cues[5].

In preparation for the blindfolded code training exercise, the faculty provides a demonstration explaining how this advanced approach is performed, to decrease learner intimidation by the exercise. Once the demonstration is finished, the team leader is blindfolded. The team leader must use closed-loop communication and give explicit orders to the resuscitation team with a request to have all orders repeated back. The team cannot independently initiate any procedure or management without clear direction from the team leader. Team members can only execute orders from the team leader that are explicitly directed to them by name. If the team leader does not identify a specific person to perform the action, it is not performed. For example, if the team leader states, “Start compressions” without directing it to a specific team member, the order is not completed. All members of the team stand motionless. If a team member is given an order by the leader but is not requested to repeat the order as confirmation, the order can be executed but the team leader is not given verbal feedback at the completion of the order. This should prompt the team leader to ask that subsequent orders are to be repeated back, as the leader does not have visual stimuli to confirm order completion.

If the team leader asks team members to repeat the orders back, team members must reply to the team leader using closed-loop communication. This alerts the team leader when the order is received and completed. For example, if team leader Dr. Jones asks John to “Give 1 mg of epinephrine intravenously”, John will reply “I will get 1 mg of epinephrine. Dr. Jones, 1 mg of epinephrine has been administered intravenously”. The team leader can ask questions about the monitor. However, team members can only describe the appearance of the cardiac rhythm in layman’s terms (**Table 1**). For example, ventricular tachycardia would be described as a wide complex regular rhythm at the rate displayed on the monitor. Team members cannot use medical terms when describing the cardiac monitor, such as ventricular tachycardia or pulseless electrical activity. Lastly, faculty will verbally clarify all physical exam findings if the code team leader directs a team member to perform a physical exam.

By removing visual stimuli, the blindfolded code training exercise forces the team leader to

maintain mental organization and use closed-loop communication to effectively manage a resuscitation. The purpose of the description of the blindfolded code training exercise is to provide guidance on how to perform this innovative teaching technique to force closed-loop communication.

PROTOCOL:

All methods described here were exempt from review by the Summa Institutional Review Board.

1. Preparation

1.1. Prepare the simulation lab prior to beginning the blindfolded code training exercise.

1.1.1. Prepare all supplies needed for code resuscitation, including an intravenous (IV) start kit, IV fluids, a code cart, a defibrillator with pads, a bag valve mask, a non-rebreather mask, a nasal cannula, a pulse oximeter, and intubating supplies (including a laryngoscope, an endotracheal tube, a stylet, a syringe, an end-tidal carbon dioxide monitor, and a cardiac monitor).

1.1.2. Place the human-patient simulator on an emergency department bed. Turn on the simulator and connect it to the wireless network. Set the simulator vitals to match the case scenario.

1.1.3. Provide a chair or stool and blindfold for the code team leader. Place the team leader 5 feet away from the foot of the bed, facing away from the team.

1.2. Print code resuscitation simulation scenarios for the faculty. Read the simulation scenarios prior to the start of the session.

1.3. Upload any necessary radiographic images and electrocardiograms for each patient scenario.

2. Blindfolded code training exercise

2.1. Review the rules of the exercise with the learners. Provide a demonstration for the learners of the blindfolded code training exercise.

2.2. Select a code team leader from the group of learners. Initially, start with more experienced learners as code team leaders.

2.3. Sit the code team leader down on a chair or stool at the foot of the bed, facing away from the patient. Blindfold the code team leader.

NOTE: The best resuscitation team configuration is one embedded nurse, three resident physicians, and one resident as code team leader.

2.4. Ensure that resuscitation team members verbally introduce themselves by role, name, and position in relation to the patient in the bed to the blindfolded code team leader prior to the start of the scenario.

NOTE: For example, "I am resident John at the head of the bed."

2.5. Start the scenario by reading the stem for the case scenario to the code team leader.

2.6. Run the case scenario for approximately 8–10 min. Change the patient vitals and cardiac rhythms in alignment with the case scenario outline.

3. Blindfolded code team debriefing

3.1. Debrief the code team at the conclusion of the case scenario for approximately 10 min.

NOTE: Focus on the utilization of closed-loop communication, the leader's effectiveness in leading the resuscitation, and the management decisions as they relate to the advanced cardiac life support (ACLS) or advanced trauma life support (ATLS) algorithms.

3.2. Select another code team leader and repeat the process at the conclusion of the debriefing.

REPRESENTATIVE RESULTS:

As noted in Ahmed et al., all residents (100%, 27/27) agreed/strongly agreed that knowledge obtained during the blindfolded code training exercise could be transferred to the clinical setting[5]. In addition, most residents strongly agreed that the blindfolded code training exercise was more challenging (81.5%, 22/27), allowed them to apply critical thinking skills (81.5%, 22/27), and improved use closed-loop communication (88.9%, 24/27) when compared to typical code training exercises (**Table 2**).

Qualitative themes identified from the resident surveys in Ahmed et al. included solidifying leadership skills and ACLS knowledge and improving closed-loop communication[5]. Residents felt that maintaining mental organization without visual cues was the most challenging part of this exercise.

FIGURE AND TABLE LEGENDS:

Figure 1: Blindfolded team leader and resuscitation team. Blindfolded team leader, seated and rear-facing, with the surrounding resuscitation team members and simulation manikin.

Table 1: Rhythm description. Acceptable layman's terms for specific cardiac rhythm descriptions. This table has been modified from research by Ahmed et al.[5].

Table 2: Survey results. Written survey responses from participants (*N* = 27). This table has been modified from research by Ahmed et al.[5].

DISCUSSION:

The blindfolded code exercise consists of several critical steps. First, the exercise requires an initial faculty demonstration to decrease the learners' intimidation and anxiety toward performing a resuscitation blindfolded. It also serves to give learners an example of a successful performance of the blindfolded resuscitation. Facing the code team leader away from the resuscitation team ensures that the leader is unable to visualize the scenario and forces them to give loud, clear orders (**Figure 1**). In addition, start senior residents as code team leaders, as this exercise requires leaders to maintain a conceptual framework to organize their management and multitask without visual stimuli. The team leader must give explicit orders in closed-loop fashion to successfully manage the resuscitation. Running the scenario for 8–10 min allows the leader to manage the case for four to five cycles of CPR. This provides ample opportunity to evaluate effective usage of closed-loop communication and adherence to resuscitation algorithms. Lastly, it is important to debrief the learners at the conclusion of each resuscitation. Debriefing is the most critical portion of a simulation and is the key to maximizing knowledge and skills gained during the exercise[6,7].

This innovative teaching technique can be applied to the management of any critically ill patient, with a primary focus on developing high-risk communication skills. During high-acuity trauma resuscitations, effective communication is critical to optimal management[8]. Removing visual stimuli forces learners to use closed-loop communication strategies and methodically approach the resuscitation, focusing on the execution of the primary survey without prematurely progressing to the secondary survey. Scholars have demonstrated that teams have fewer errors, fewer delays in diagnosis, and better patient outcomes when systematically following ATLS protocol[9–12].

There are only a few limitations of the blindfolded code training exercise as it does not require any special simulation equipment, setup, or added costs. The exercise can be performed in situ or in a simulation lab. However, this exercise is typically limited to more experienced learners from acute care specialties, as novice participants may become overwhelmed without the ability to use visual prompts during resuscitation management.

Presently, there is a paucity of literature on innovative techniques to improve resident physician communication and leadership strategies in high-acuity situations. This novel teaching technique provides a nontraditional approach to force closed-loop communication. Future directions for this study include utilizing validated assessment tools to evaluate closed-loop communication, crisis resource management strategies, and resuscitation performance when comparing blindfolded leaders to nonblindfolded leaders in the management of critically ill patients.

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DISCLOSURES:

The authors have nothing to disclose.

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Figure

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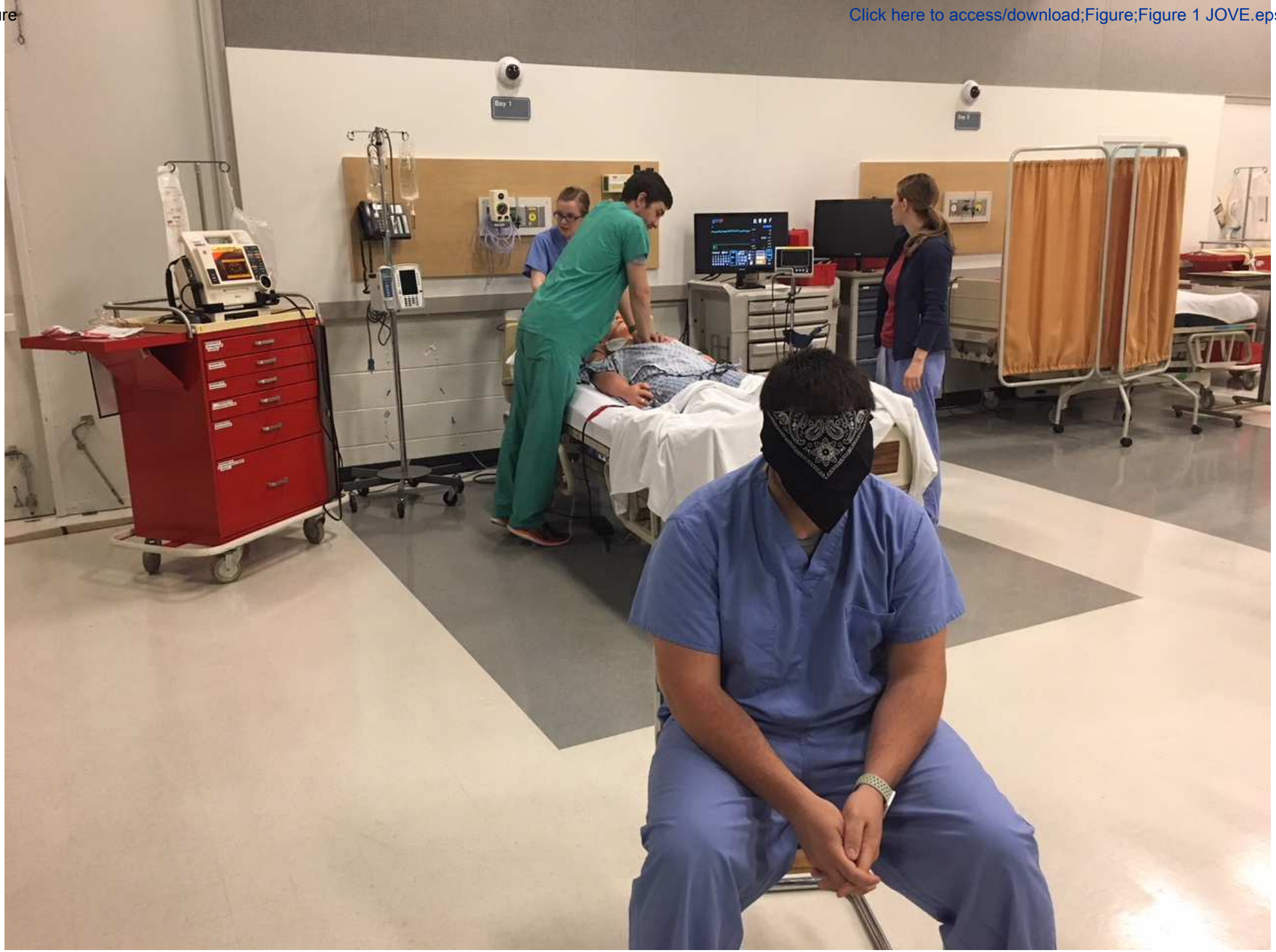

Figure 1.

Table

Electrical Rhythm	Verbal description
Ventricular fibrillation	Irregular rhythm without discernable P, QRS, or T waves; varying amplitude
Ventricular tachycardia	Wide complex regular rhythm, rate >120
Torsades de Pointes	Regular wide-complex tachycardic rhythm with varying amplitude of QRS complexes, described as “twisting” morphology
Asystole	Flat line
Normal Sinus Rhythm	Regular, narrow complex rhythm with P waves before every QRS complex, rate 60-100
2nd degree heart block- Type 1 Mobitz (Wenckebach)	Progressively lengthening PR intervals with dropped QRS complex after P wave.
2nd degree heart block- Type 2 Mobitz	Consistent PR interval with intermittent dropped QRS complexes after P wave.
3rd degree heart block	Complete A-V dissociation with constant P-P and R-R intervals, ventricular rate 20-40
Atrial fibrillation with rapid ventricular response	Irregularly irregular narrow complex rhythm without P waves, rate >100
Pulseless electrical activity (PEA)	Regular, narrow complex rhythm with P waves before every QRS complex, rate 60-100, only mention pulse if asked by team leader to palpate

Table

Survey Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	1	2	3	4	5
Faculty clearly communicated the objectives and expected outcomes to the participants of the simulation training exercises	0% (0)	0% (0)	0% (0)	7.4% (2)	92.6% (25)
Faculty support a safe learning environment that advocates active learning	0% (0)	0% (0)	0% (0)	11.1% (3)	88.9% (24)
Faculty modeled professional integrity during the individual scenario	0% (0)	0% (0)	0% (0)	11.1% (3)	88.9% (24)
Faculty provided constructive feedback and discussion after the simulation scenarios	0% (0)	0% (0)	0% (0)	11.1% (3)	88.9% (24)
Faculty in the room made an effort to make the exercise less intimidating	0% (0)	0% (0)	14.8% (4)	25.9% (7)	59.2% (16)
The knowledge gained through the blindfolded code training can be transferred to the clinical setting	0% (0)	0% (0)	0% (0)	11.1% (3)	88.9% (24)
I felt the blindfolded code training exercise was more challenging than typical code training exercises	0% (0)	0% (0)	3.7% (1)	14.8% (4)	81.5% (22)
The blindfolded code training allowed me to use the critical thinking skills I have acquired throughout residency	0% (0)	0% (0)	0% (0)	18.5% (5)	81.5% (22)
The blindfold code training made me better utilize closed loop communication in comparison to typical code training to ensure task performance and/or completion	0% (0)	0% (0)	0% (0)	11.1% (3)	88.9% (24)
I felt confident in my ability to perform a code blindfolded	0% (0)	11.1% (3)	18.5% (5)	48.1% (13)	22.2% (6)
The blindfolded training exercises allowed me to demonstrate my leadership ability to direct the healthcare team during a resuscitation	0% (0)	0% (0)	3.7% (1)	29.6% (8)	66.7% (18)

Name of Material/ Equipment	Company	Catalog Number	Comments/Description
Bag valve mask			
Blindfold			
Blood pressure cuff			
Cardiac monitor			
Chair			
Code Cart			ACLS medications
Defibrillator with pads			
Emergency department bed			
End-tidal carbon dioxde monitor			
Human-patient simulator			
Intubation Kit			endotracheal tube, laryngoscope, stylet, 10 mL syringe, endotracheal tube holder
IV fluids			1 L normal saline or lactated ringer's
IV start kit			tourniquet, tape, tegaderm, IV catheter
Nasal cannula			
Non-rebreather mask			
Pulse oximeter			
Step stool			
Stethoscope			

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Editorial comments:

Changes to be made by the author(s) regarding the manuscript:

1. Please take this opportunity to thoroughly proofread the manuscript to ensure that there are no spelling or grammar issues.

Thank you for the comment, the manuscript was thoroughly proofread and the spelling and grammar issues have been addressed.

2. Please obtain explicit copyright permission to reuse any figures/tables from a previous publication. Explicit permission can be expressed in the form of a letter from the editor or a link to the editorial policy that allows re-prints. Please upload this information as a .doc or .docx file to your Editorial Manager account. The Figure/Table must be cited appropriately in the Figure Legend, i.e. “This figure/table has been modified from [citation].”

Thank you for the comments, the table citations were corrected. The Clinical Teacher editorial policy for reuse is “If you wish to reuse your own article (or an amended version of it) in a new publication of which you are the author, editor or co-editor, prior permission is not required (with the usual acknowledgements).” This policy has been uploaded as a .docx file to my account.

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3. Please revise the title to avoid the use of colon.

The title has been revised to avoid the use of a colon.

4. Please provide an email address for each author.

Email addresses for each author added to title page.

5. Keywords: Please provide at least 6 keywords or phrases.

Added a sixth keyword/phrase.

6. Please revise the protocol text to avoid the use of any personal pronouns (e.g., "we", "you", "our" etc.).

The protocol has been revised to avoid the use of any personal pronouns.

7. Please revise the protocol to contain only action items that direct the reader to do something (e.g., “Do this,” “Ensure that,” etc.). The actions should be described in the imperative tense in complete sentences wherever possible. Avoid usage of phrases such as “could be,” “should be,” and “would be” throughout the Protocol. Any text that cannot be written in the imperative tense may be added as a “Note.” Please include all safety procedures and use of hoods, etc. However, notes should be used sparingly and actions should be described in the imperative tense wherever possible. Please move the discussion about the protocol to the Discussion.

Thank you for the suggestion, the manuscript protocol was revised to contain action items and avoid the use of phrases such as “could be”, “should be” or “would be”. The discussion about the protocol was moved to the Discussion.

8. 2.1-2.4: Please consider moving the training exercise rules to the Introduction section.
Thank you for the suggestion, the rules have been moved to the Introduction section.

9. 3.4-3.7, 4.1, 4.2: Please write the text in the imperative tense. Any text that cannot be written in the imperative tense may be added as a “Note.”
The text was changed to the imperative tense.

10. Please number the tables in the sequence in which you refer to them in the manuscript text.
The table numbers were changed to reflect the sequence in which they are referred to in the text.

11. Reference 11: Please provide the volume and page numbers.
Reference 11 edited to include online first publication date, no volume or page numbers available at this time.

12. References: Please do not abbreviate journal titles.
Thank you for the comment, journal titles no longer abbreviated.

13. Table of Materials: Please sort the items in alphabetical order according to the Name of Material/Equipment.
Table of materials items placed in alphabetical order.

Minor Concerns:
Dear authors,
1. Did medical students attend the same undergraduate or clinical residency period?
The cited study and data reflect emergency medicine residents training at one health system, no medical students provided data for this study. However, this training can be used to teach medical students.

2. How did you select the participants? Personal invitation, online?
The participants were all emergency medicine residents within one residency, who were provided the opportunity to voluntarily participate in this innovative education session. The invitation was sent via email.

3. I did not notice citation of ethical authorization of the work.
A statement of ethical authorization of the work is at the top of the protocol section of manuscript.

4. Were the scales used already built and validated?
The survey was internally developed by content experts in emergency medicine and simulation. The survey was non-validated.

Minor Concerns:

One minor concern, however. The introduction would benefit from further unpacking of (1) the rationale for the study, and (2) previous research that supports use of this innovative technique/approach to improving communication. Why was this particular approach chosen? Why do we think it is effective and worth using? What evidence is there to support this?
Also, some minor typos in text.
Thank you for your comments. The rationale for the study and previous research were expanded in the introduction. An additional reference was added. This particular technique was chosen as it focuses on enhancing leadership, closed loop communication, organizational skills and critical thinking during resuscitations. Without visual stimuli, resident physicians must focus on clearly communicating with the team. We think it is effective based on data from our previous study. Unfortunately, there is very limited data to support this specific technique. Currently, we are working on two additional manuscripts to support this technique with objective data.

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