Medical Error Recognition by Medical Students during Simulated Asystole: Teamwork and Assertiveness from Aviation

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Introduction

- Medical errors result in adverse clinical outcomes, and represent increased costs and additional care due to their consequences

- The US airline mishap rate decreased 74% from 1987 to 2006, in part, due to various teamwork methods - Crew Resource Management (CRM), checklists, briefings, and reporting-analysis (Morrison, 2013)

- **During this study, we sought to determine if teamwork training utilized by the aviation industry can reduce medical errors in first-year medical students treating simulated asystole**

Background

- Haffner et al. (2017) demonstrated that even a brief ten-minute CRM training in senior medical students can help to identify and correct improper chest compressions during a simulated cardiac arrest scenario

- In this study, we examined error recognition and intervention behavior during in a simulated CPR situation with first year medical students

- Study Design: Standard 'player' responses during the scenario

Methods

- Our certified instructor provided American Heart Association training in CPR techniques to first year medical student participants. We then divided students into a control group (n=10) and an intervention group (n=11).

- The intervention group participated in a 90-minute discussion on teamwork and error recognition modeled after crew resource management from aviation, with emphasis on assertiveness and error management communication styles

Methods (continued)

- Participants individually entered a simulated emergency room setting with a nurse and mannequin. Following one cycle of student CPR compressions, a simulated physician entered the room and intentionally performed compressions slowly. When questioned verbally, the physician complied and simulation stopped

- Observers counted the elapsed time (in seconds) for the subject to verbally correct the simulated physician's improper CPR technique

Quantitative Results

- The time (in seconds) in the intervention group was lower (9.56 +/- 2.47) as compared to the control group (15.86 +/- 11.19) (p=0.11)

- Additionally, the percentage of participants who intervened within a critical 10 second period of time increased from 30% to 42%

- During audiotaped debriefings respondents from both groups commented on the difficulty of speaking up while working with an unfamiliar senior supervising physician

Time in Seconds to Intervention
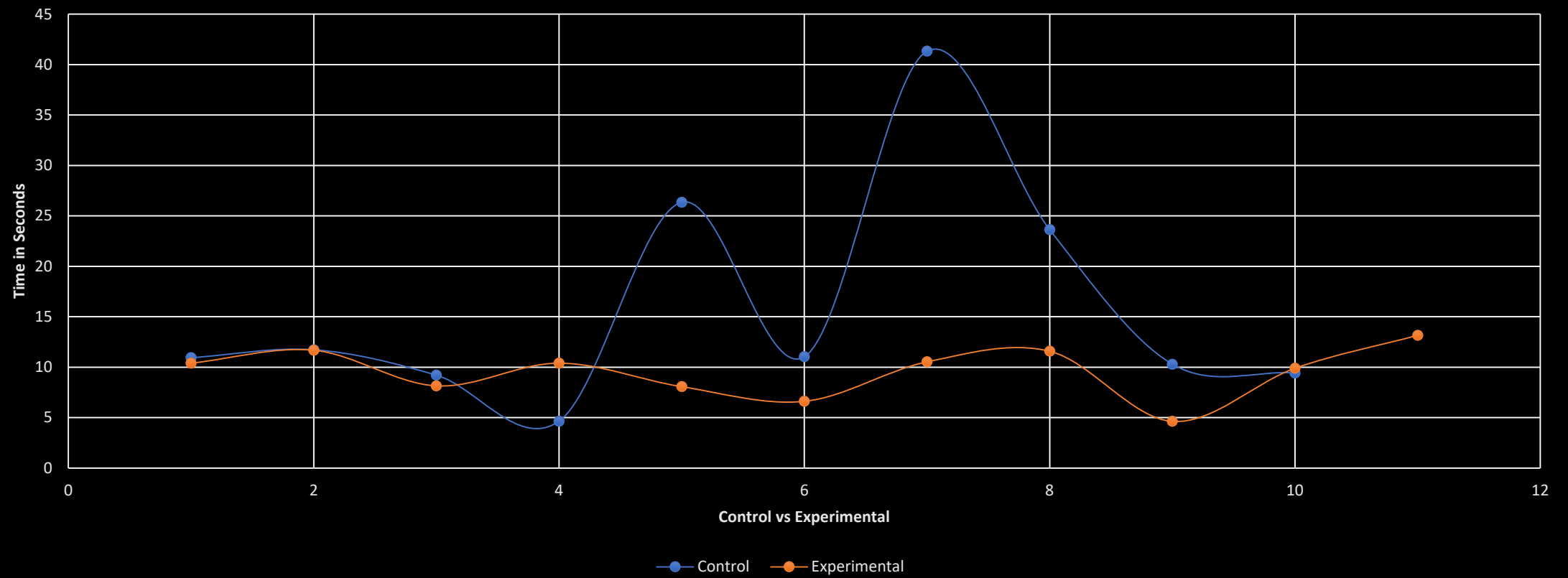
Intervention Group - Briefing Highlights

- Effective Communication
  - Passivity: Eight-year old boy elective ear drum surgery; bleeding during perfusion
  - Assertiveness: Not just speaking up, but doing so with impact [CUS, SBAR, Two-Challenge, DESC]
  - Arrogance/Ineptitude: Eastern 401, Tenerife, United 173, Air Florida
- Leape (2015)
  - Patient harm is the result of bad _____, not bad _____
  - Barriers to safe care: Dysfunction, Culture of Disrespect, Misguided Autonomy
- CRM, Checklists, Briefings, Reporting-Analysis (Just Culture)
- Role playing to **intervene** when wrong dose/site being used
  - CUS
  - SBAR

Errors

Inadvertent action:
slip, lapse, mistake

Manage through changes:

- Processes
- Procedures
- Training
- Design
- Environment

Support

At-Risk Behavior

A choice:
risk not recognized;
risk believed justified

Manage through:

- Removing incentives for at-risk behaviors
- Creating incentives for healthy behaviors
- Increasing situational awareness

Coach

Reckless Choice

Deliberate action:
Deliberate and willful choice

Manage through:

- Remedial action
- Punitive action

Sanction

Do you 'CUS?'

- I'm CONCERNED
- This is UNSAFE
- This is STUPID! (or I'm SCARED!)

- Use touch
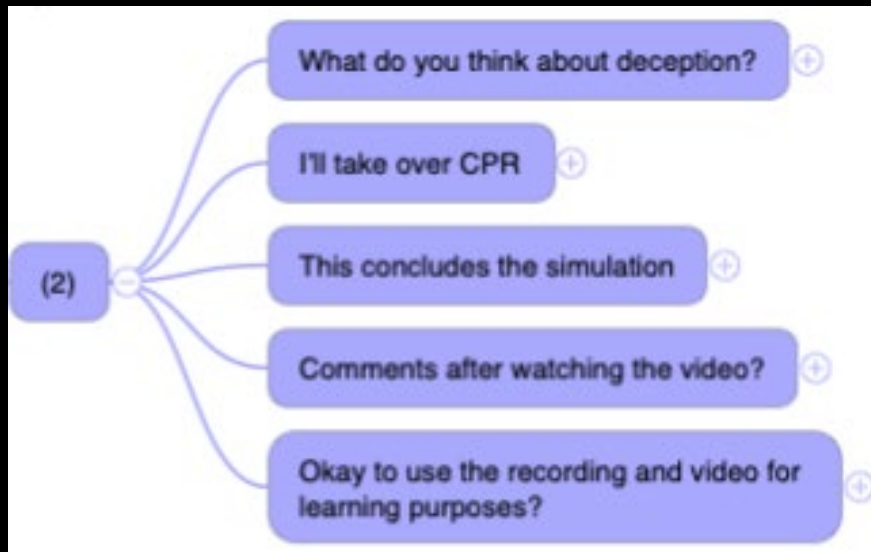- Raise your voice slightly without being uncivil

SBAR

- Situation
- Background
- Assessment
- Request/Recommendation

Qualitative Results

- Mind mapping and nVivo software to analyze qualitative data
- 21 interview transcripts – Aggregated into thematic clusters

Thematic Clusters - Representative Quotes

- **Stress**
  - "I was more surprised ata how long it took me to respond; it was just hard to focus under a lot of pressure."
 - "It took me a lot longer to tell him that we need to do it a little faster."
- **Real-Life**
  - "I don't know in a real-life situation what I should do, to be honest. I know what the right thing is, but I don't know how to do it."
  - "I knew what I was doing was not effective, but I still was reluctant to do it."
- **Speak Up**
  - "We can speak up, even with people in authority. Here's how to do it. The method for how we speak up is extremely valuable."
 - "I should have spoken up sooner."

All but two spoke up - eventually
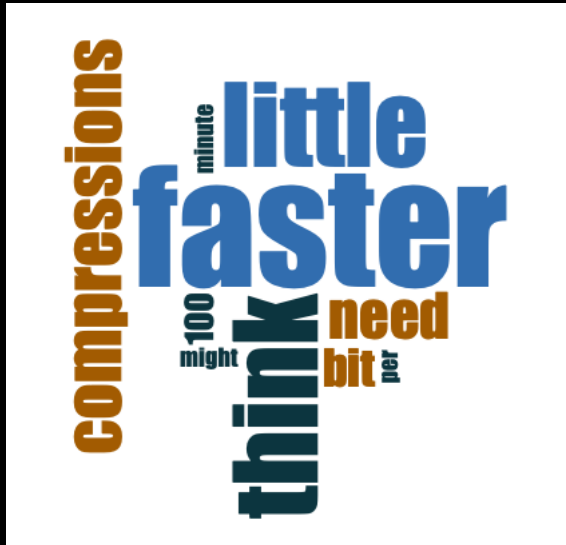
- I think we need to go a bit faster
- You might try doing compressions a little faster
- If I may, I believe the proper chest compression rate is 100 beats per minute
- Extra assertiveness:
  - And if you could count out loud…
  - Would you mind counting out loud?

Use the video and recording?

- Everybody said yes
- Even a couple who had challenges speaking up
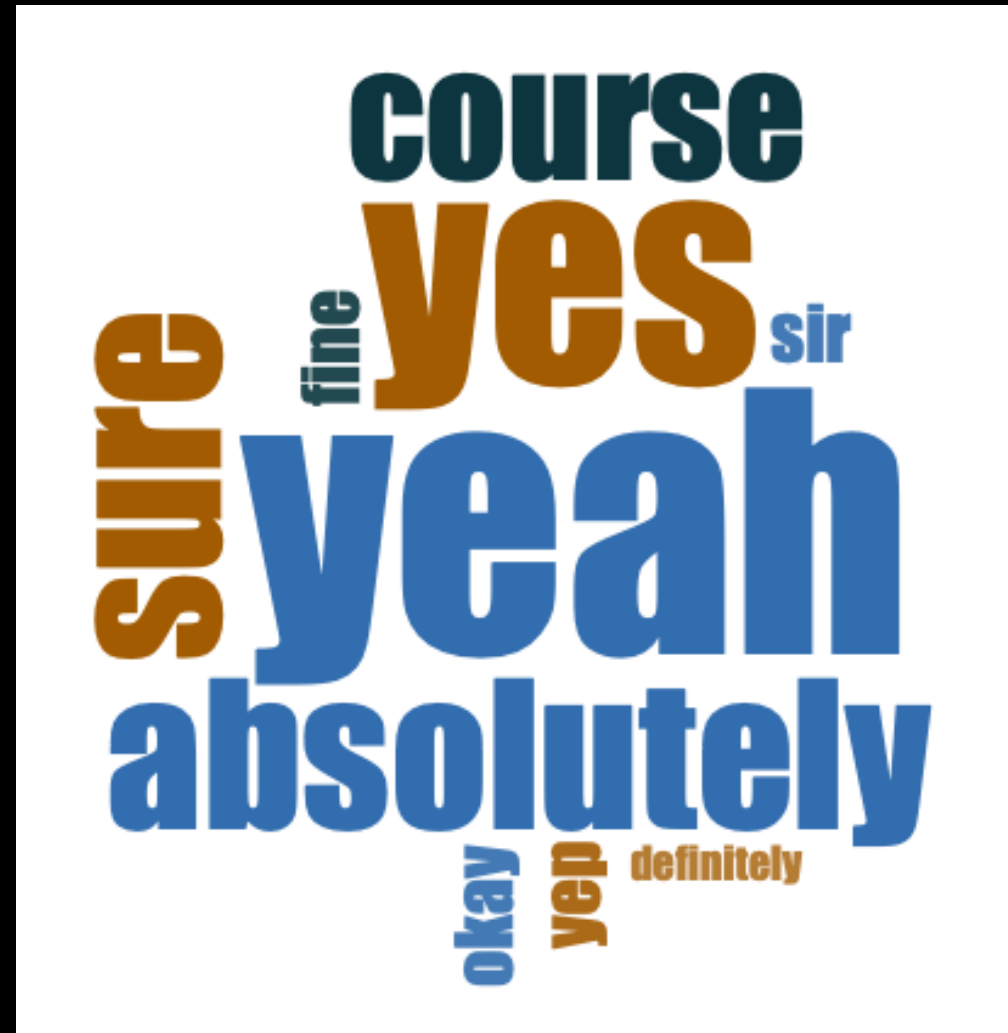
Conclusion

- Individuals who received teamwork training prior to the simulation responded quicker to incorrect CPR technique, thereby decreasing the amount of ineffective chest compressions from 15.86 to 9.56 seconds (p=0.11)

- More participants in the intervention group notified the physician of the error within a critical 10 second time frame (42% vs 30%)

- Themes from learning exercise
  - Stress
  - Real-Life
  - Speaking Up

- Move from teaching correct CPR to didactic teamwork methods during simulated high-stress intervention scenarios

Discussion

- CPR is the most important factor in preventing death after cardiopulmonary arrest

- This study reinforces the conclusions of other studies that have shown the effectiveness of leadership training in high intensity medical scenarios

- This study also illustrates the association between desirable clinical outcomes and enhanced communication between healthcare providers

- Mixed analysis methods yielded rich outcomes

Discussion – How does this apply?

- Overall goal – Reduce adverse clinical outcomes
- Current medical school curriculum promotes student independence with little leadership and team-building classes/lectures
- Implementing classes or lectures that emphasize leadership, teamwork, and error recognition can equip student doctors to communicate and respond during high-intensity simulation
  - More aggression or arrogance from simulated physician to elicit response?
  - Study method effectiveness
- Reviewer Comments: Interprofessional context to enhance depth
- Future research is needed to determine if implementing teamwork and error recognition programs during medical school will be beneficial in clerkships, residency, and clinical practice

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