2017

Ability of Critical Care Medics to Confirm Endotracheal Tube Placement by Ultrasound

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UltraSound

Ability of Critical Care Medics to Confirm Endotracheal Tube Placement by US

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Introduction

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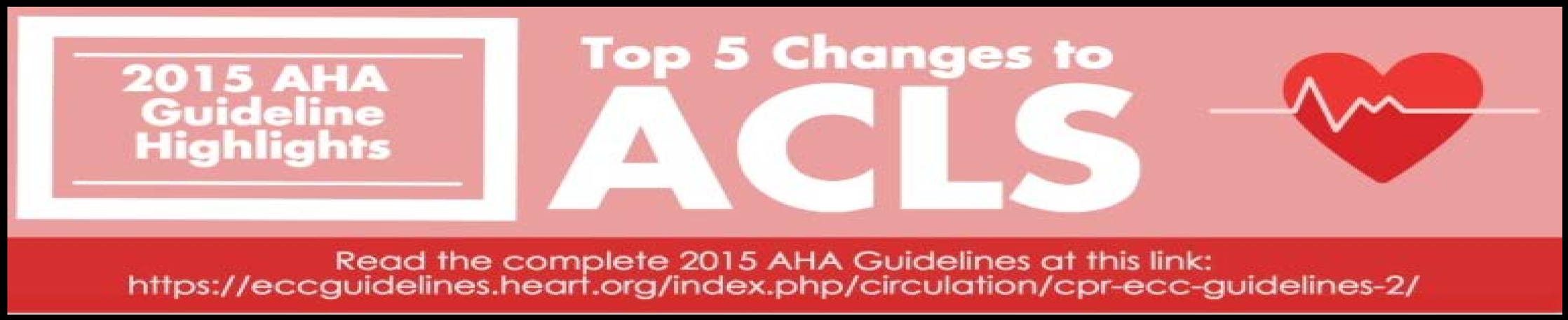

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Introduction

- There are several barriers to increasing the use of ultrasound for advanced airway confirmation in the pre-hospital setting. Two of the most obvious are:
  - the lack of available training opportunities &
  - paucity of in-vivo cases to attempt this technique

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Objectives

- We propose to investigate the effectiveness of training air medics in ultrasound to assess endotracheal tube placement using simulation based learning.
- On the job training is not feasible, as the instructor would have to be present at all times for when a learning situation arises
- By moving the skills part of the instruction to simulation, it provides a way to give the basic ultrasound skills needed to apply to real clinical situations
- Our hypothesis is that we can effectively instruct air medics to ultrasound the neck and thorax to evaluate endotracheal tube location using simulators and hands on instruction.

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METHODS

- Self selected critical care medics who routinely intubate in the field
- Lecture format supplemented by hands-on training to identify normal anatomy and teach pathology
- Immediately after training the medics were given 5 simulated case scenarios:
  - 2 normal endotracheal intubations
  - 1 esophageal intubation
  - 1 right main stem intubation
  - 1 malfunctioning tube
- Ability to correctly identify tube location, functionality & length of time to respond were measured
- Likert scale survey: applicability to the practice environment

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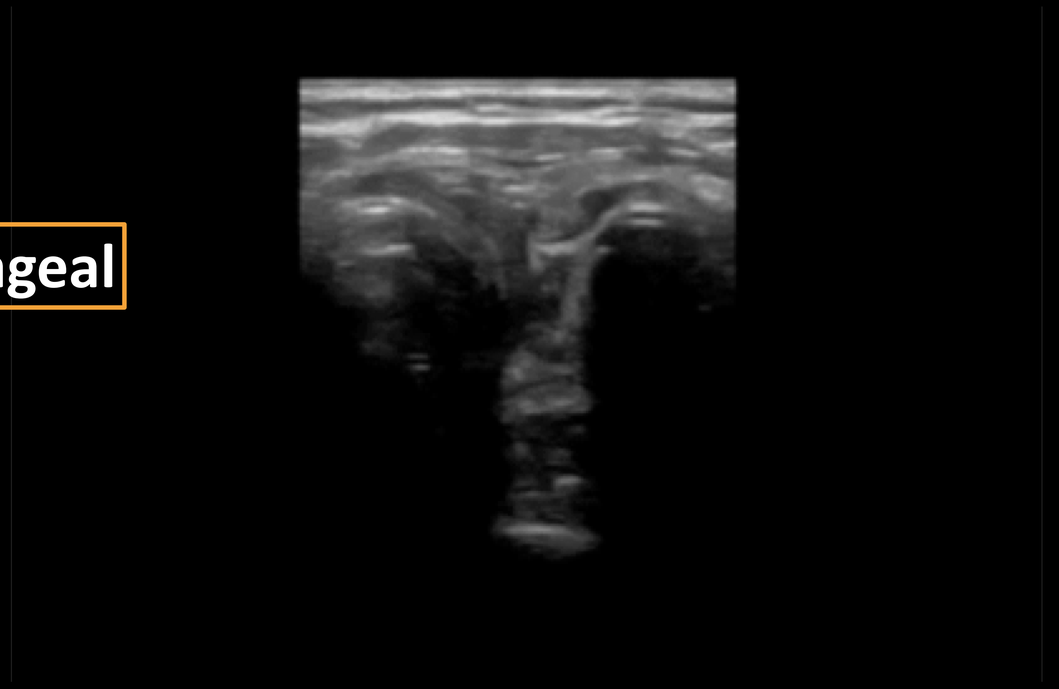
FIGURES

Endotr

Esophageal



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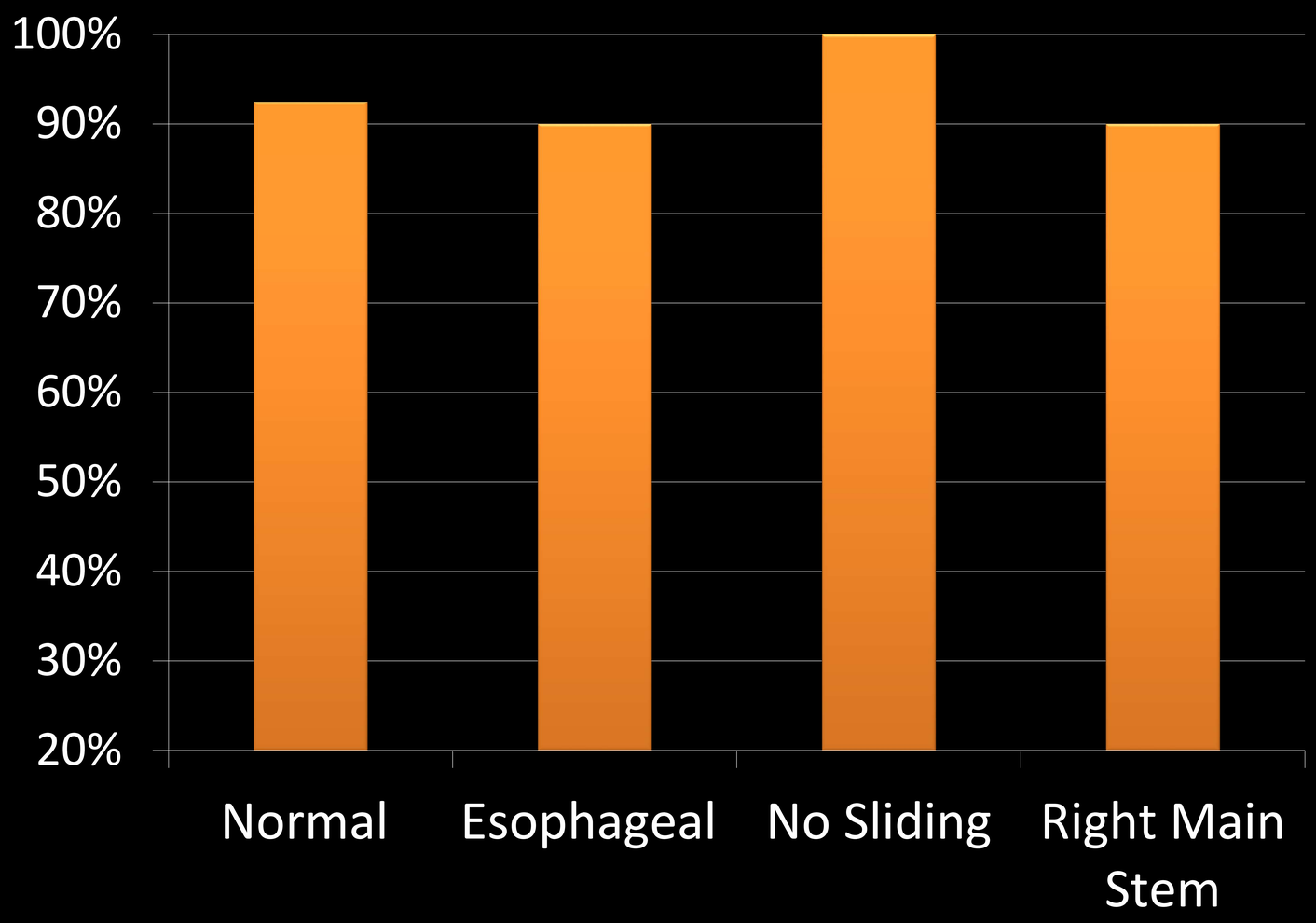
Identification of Tube Location
% Correct



Average time for Diagnosis:

18.3s for normal
28.9s for esophageal
19.5s for pneumothorax
22.6s for right main stem

Likert Scale:

All 20 medics 'agreed' or 'strongly agreed' that this simulation was useful for their practice, and that simulation provided a realistic view of potential pathology encountered during ETT placement

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DISCUSSION

- Prior studies have examined the ability of providers to use ultrasound to confirm ETT placement, in both static and dynamic fashions, on a variety of models including operative cases and cadavers.
- This study is the first to introduce an instructional and testing protocol that examines the ability of medics to diagnose common errors associated with endotracheal tube placement in a simulated environment, including esophageal intubation, right main stem intubation, and equipment malfunction
- Our results show that after a brief didactic session, all participants identified esophageal intubations with 100% accuracy, and other pathologies to a slightly lesser degree.
- We showed good results with just a brief one-hour teaching session. We expect that the accuracy would increase with longer sessions or multiple sequential sessions.

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LIMITATIONS

- The simulated nature of this study is the main limitation, as it is not yet demonstrated if these new skills are now translatable to patient encounters.
- Given that endotracheal intubation is one of the most potentially hazardous procedures performed by pre-hospital providers, we felt it is appropriate to first train and assess retention in the simulated environment.

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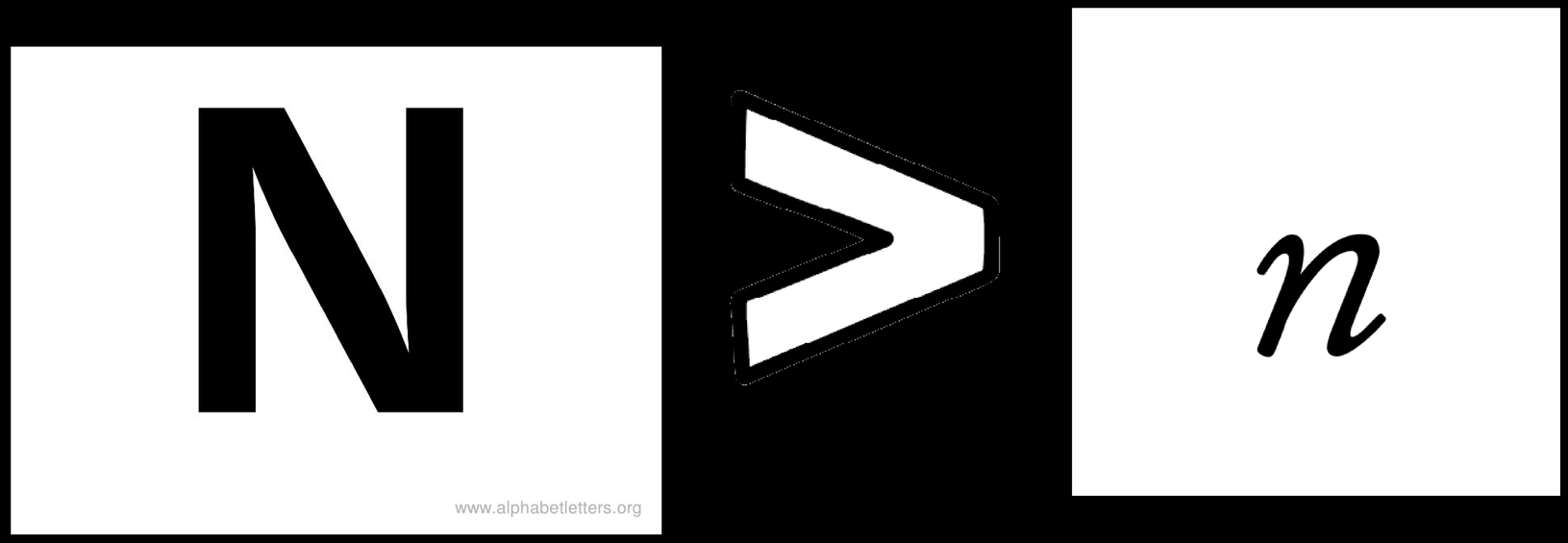
LIMITATIONS

- A second limitation is the small amount of cases presented due to time constraints. While the images presented were all chosen for their quality, it may be more difficult to interpret on images that have more variability.



- While the images presented were all chosen for their quality, it may be more difficult to interpret on images that have more variability
  - This is a limitation for all point of care ultrasound providers and as this method of endotracheal tube confirmation gets implemented quality assurance programs and continued training will be required.

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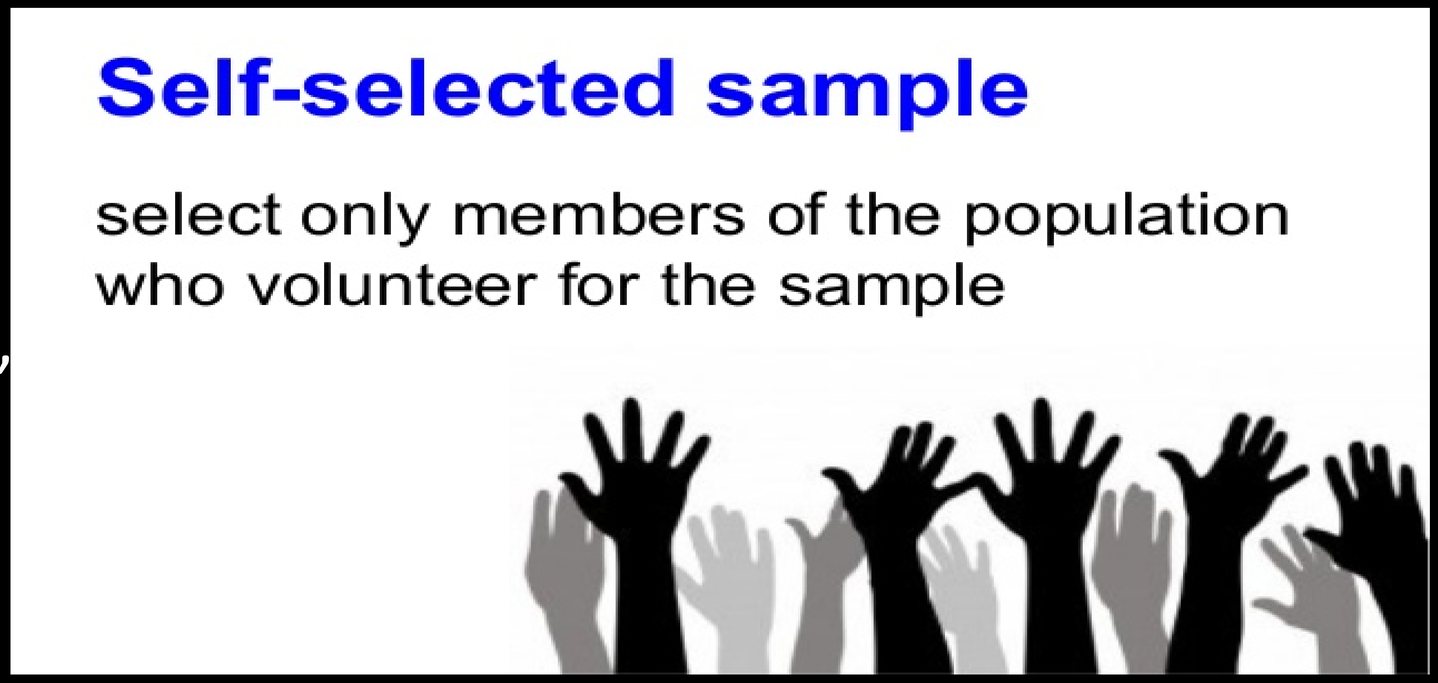
APPLICABILITY

- This was not a random sample and threatens the external validity of this trial.

“Nonprobability sampling”



- Perhaps could consider a pre-test to assess knowledge of ultrasound prior to study, although none had any formal training
- Could have the medics perform intubation in Sim center, followed by confirmation for more realistic model
- This however is an easy training program that is inexpensive and transferable to any instutition

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CONCLUSIONS

- The use of ultrasound to confirm ETT tube placement can be effectively taught to critical care medics using a short simulation-based training session
- Likely Increased diagnostic accuracy with longer training sessions
- Further studies on implementation into patient care scenarios are needed, especially if this is to become a commonly practiced approach to advanced airway confirmation under ACLS protocols

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FUTURE WORK

- Our VCU Life Evac team is currently using US machine in flight
- We are collecting data and images on studies performed in the field
- Further training and education?
- Questions?

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