

Cardiac Ejection Fraction Determination using an Ultrasound Tutorial Among Medical Students, Emergency Medicine Residents, and Cardiac Fellows

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April 30th, 2011

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Null Hypothesis

- If medical students, EM residents, and Cardiac fellows are shown an online tutorial explaining how to estimate cardiac ejection fractions (EF), then ultrasound experience and level of training will have no effect on quiz scores

Background

• A 2008 study by Dean et al showed that about a third of all recent emergency medicine (EM) graduates did not feel confident in using an ultrasound machine at the bedside

•Our Objective: While ultrasound is now a required part of EM residency, if ultrasound is introduced earlier in the training process, during medical school, students will have more time to develop skills and will therefore be more confident using bedside ultrasound in emergency department

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Background

• Ultrasound utility is operator-dependent – the more time one invests, the more efficiently one can use ultrasound as a diagnostic tool

- •A 2008 study done by Rao et al at Wayne State University demonstrated that medical students are capable of learning the skills to use ultrasound in a meaningful way
- • Our Objective: If medical students have been shown to use ultrasound in a complex manner, and are taught how to use the ultrasound appropriately, they can invest more time into fine-tuning their skills than if they had started during their residency.

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Background

- In 2010, the American College of Emergency Physicians (ACEP) and the American Society of Echocardiography (ASE) recognized the utility of a focused cardiac ultrasound (FOCUS) in a symptomatic patient in the Emergency Department (ED)

  - Our Objective: To be able to teach students and residents how to assess cardiac EF as there is real practical value in determining cardiac EF, especially for unstable patients in the ED who require serial monitoring

American College of Emergency Physicians®
ADVANCING EMERGENCY CARE

ASE
American Society of Echocardiography
Heart & Circulation Ultrasound Specialists

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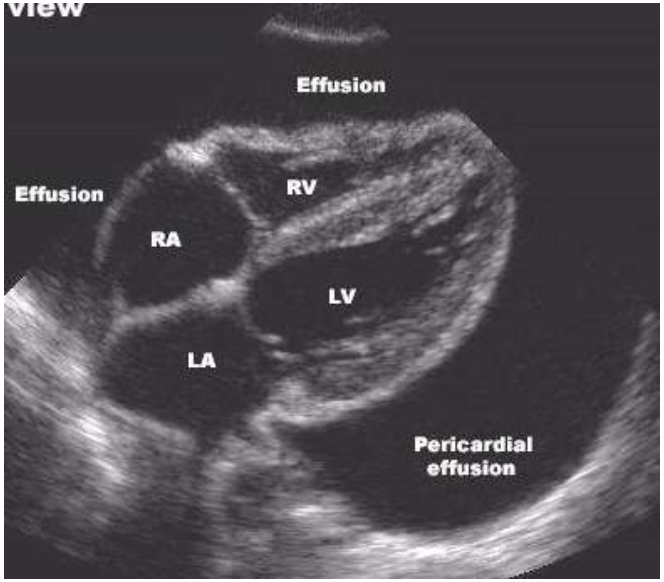
FOCUS in the ED

- Evaluate patients with cardiac, shock, or shortness of breath for the following:
  - Presence of a pericardial effusion
  - Assessment of global cardiac systolic function
  - Identification of right and left ventricular enlargement
  - Intravascular volume assessment
  - Guidance for pericardiocentesis
  - Confirmation of a transvenous pacing wire



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Materials and Methods

- Two former medical students from the class of 2009 at The Ohio State University College of Medicine, Jacqueline Kattner and Sheila Rajashekara, developed a 90-slide PowerPoint and a 50 question quiz
  - The worked closely with two cardiologists to obtain adequate clips
- During that time, the quiz was not distributed

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Layout of the Study

- Informed Consent
- A pre-tutorial questionnaire
- PowerPoint tutorial explaining how to estimate cardiac EF
- Quiz asking the participant to
  - Estimate overall functioning (no, mild, moderate, or severe dysfunction)
  - Then attempt to quantify the EF (10-19%, 20-29%, 30-39%, etc)
- Post-tutorial questionnaire

The study was estimate to take 90 minutes to complete

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Methods

- Pre-Tutorial Questionnaire
  - Self-described level of training
  - Hours spent ultrasounding
  - Hours spent watching online tutorials
  - Cardiac ultrasounds performed
  - Confidence for using ultrasound for diagnostic purposes
  - Confidence estimating cardiac EF
  - Level of training, age, and current specialty interest

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Methods

- Post-Tutorial Questionnaire
  - Confidence in estimating cardiac EF
  - Level of comfort assessing cardiac EF after seeing the tutorial
  - Utility of the tutorial as they go on in their careers
  - Willingness to go to the Clinical Skills Center to improve technique

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Methods

- The study surveys, tutorial, and quiz were on an electronic classroom interface, Carmen

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Sample

- An email invitation was sent out to
  - Four years of medical students
  - Medical students on leave of absence
  - Three years of EM residents
  - Three years of cardiology fellows
  - This came to approximately 900 invitations

- Exclusion Criteria
  - None

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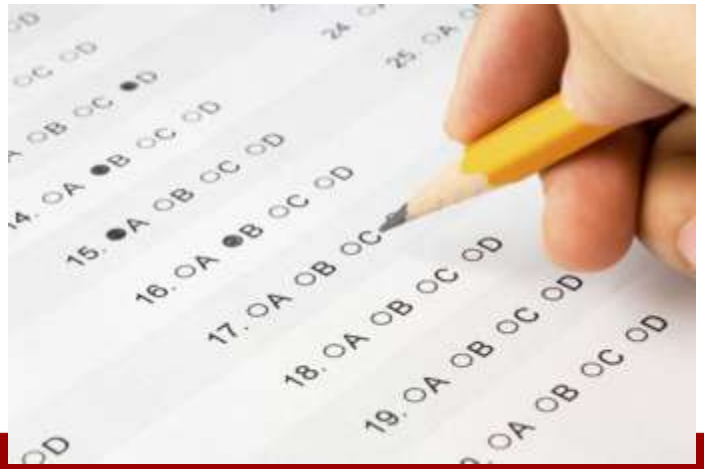
Results so far...

- After about a month after the first email invitation, we have…
  - 32 pre-tutorial questionnaires completed
  - 21 quizzes completed
  - 16 post-tutorial questionnaires completed



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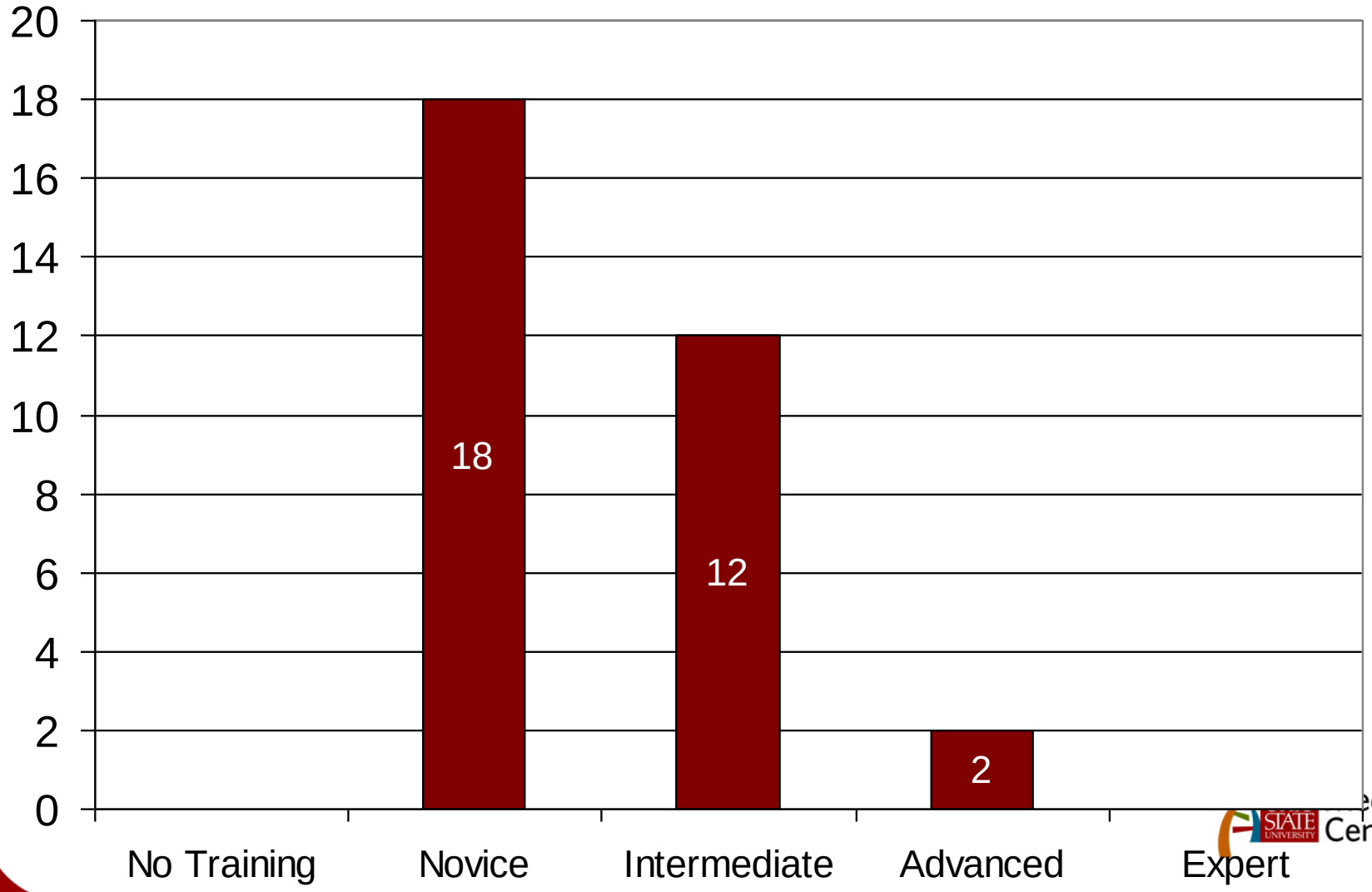
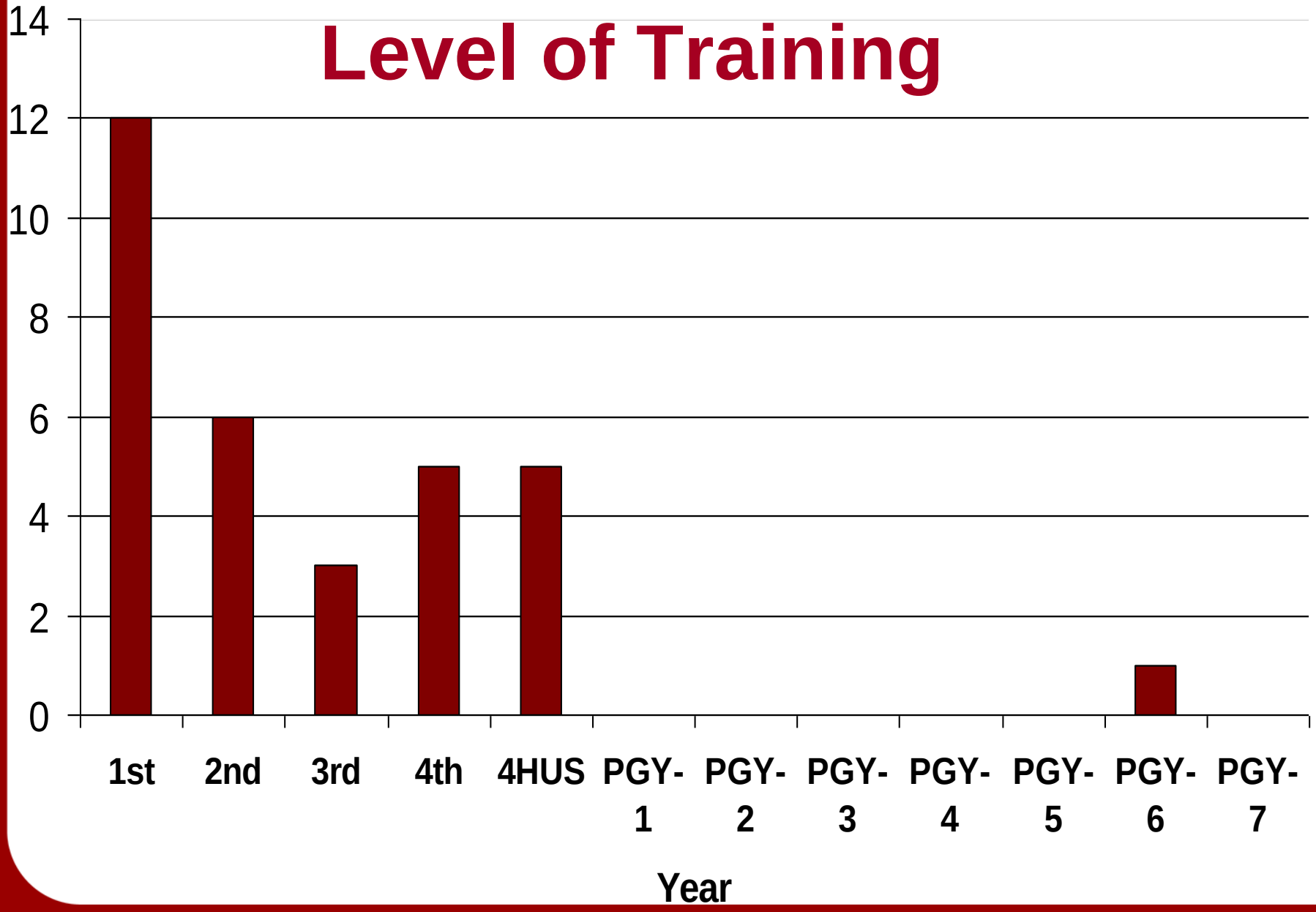
Level of Training (Self-Described)

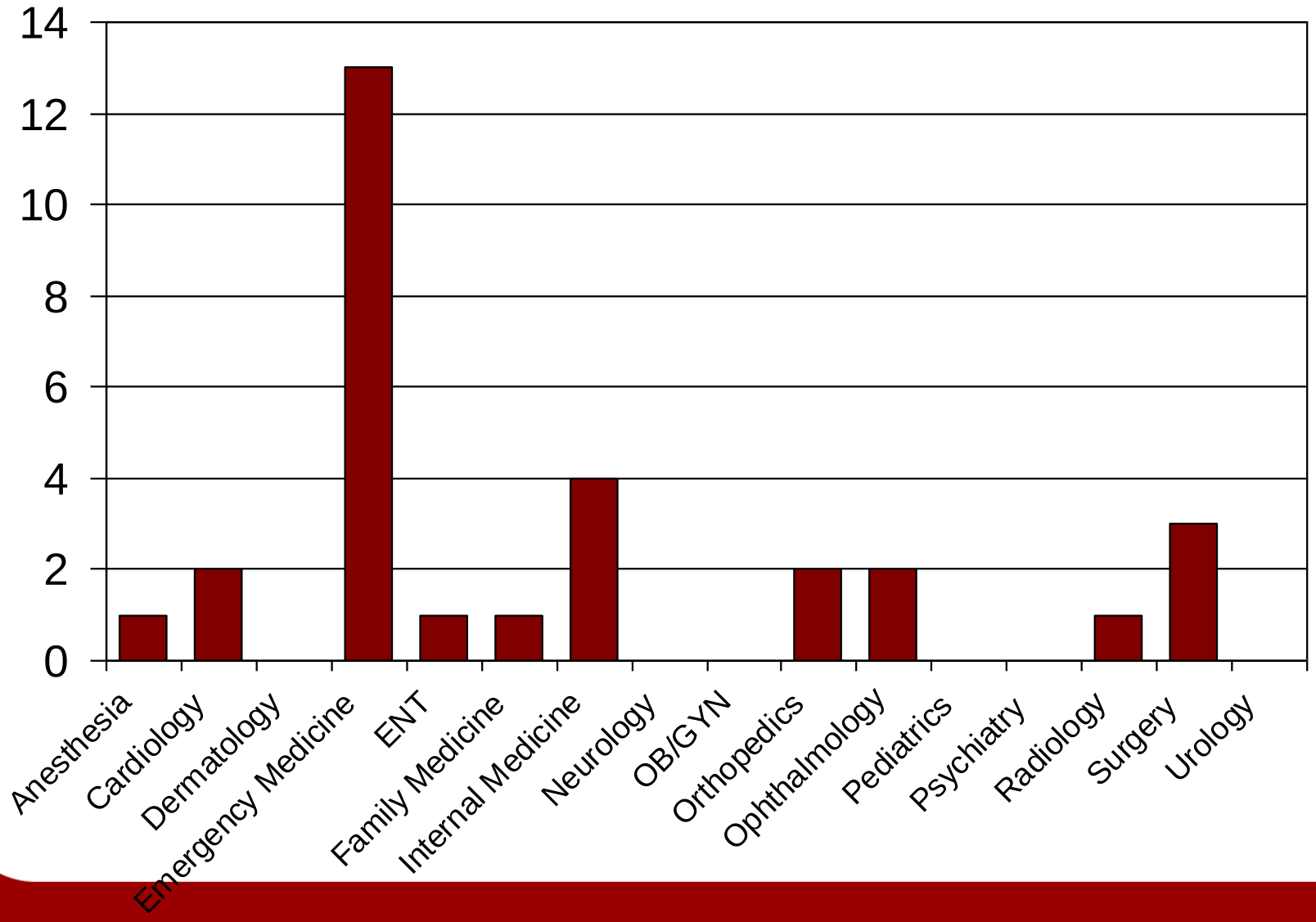


Level of Training (Self Described)

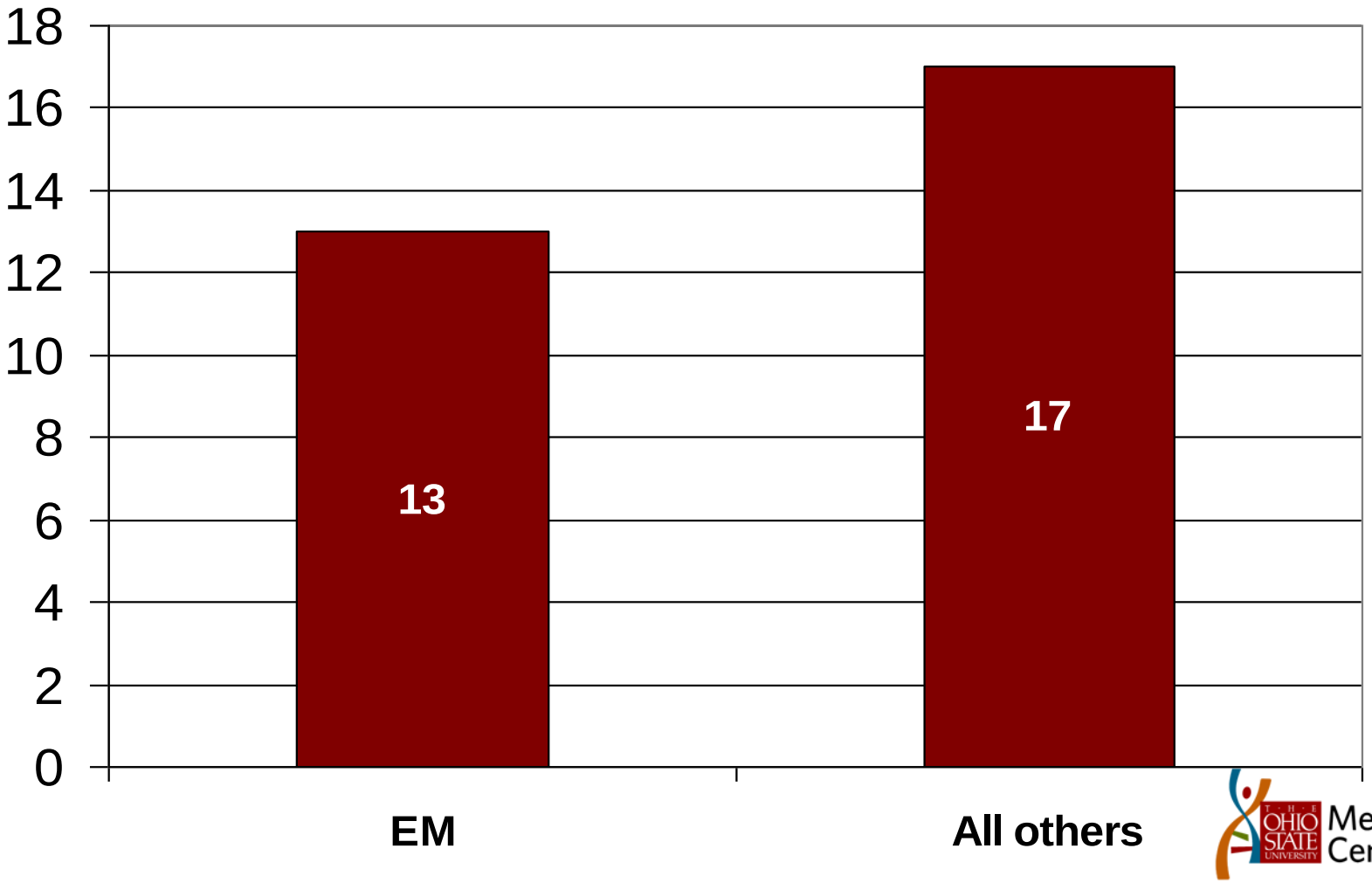
Level of Training



Specialty Interest



Specialty Interest



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Hours spent ultrasound vs Specialty Interest

	1-10 hrs	11-20 hrs	21+ hrs	Pearson chi-square test
Non-Em	10	4	3	0.049
EM	2	5	6	

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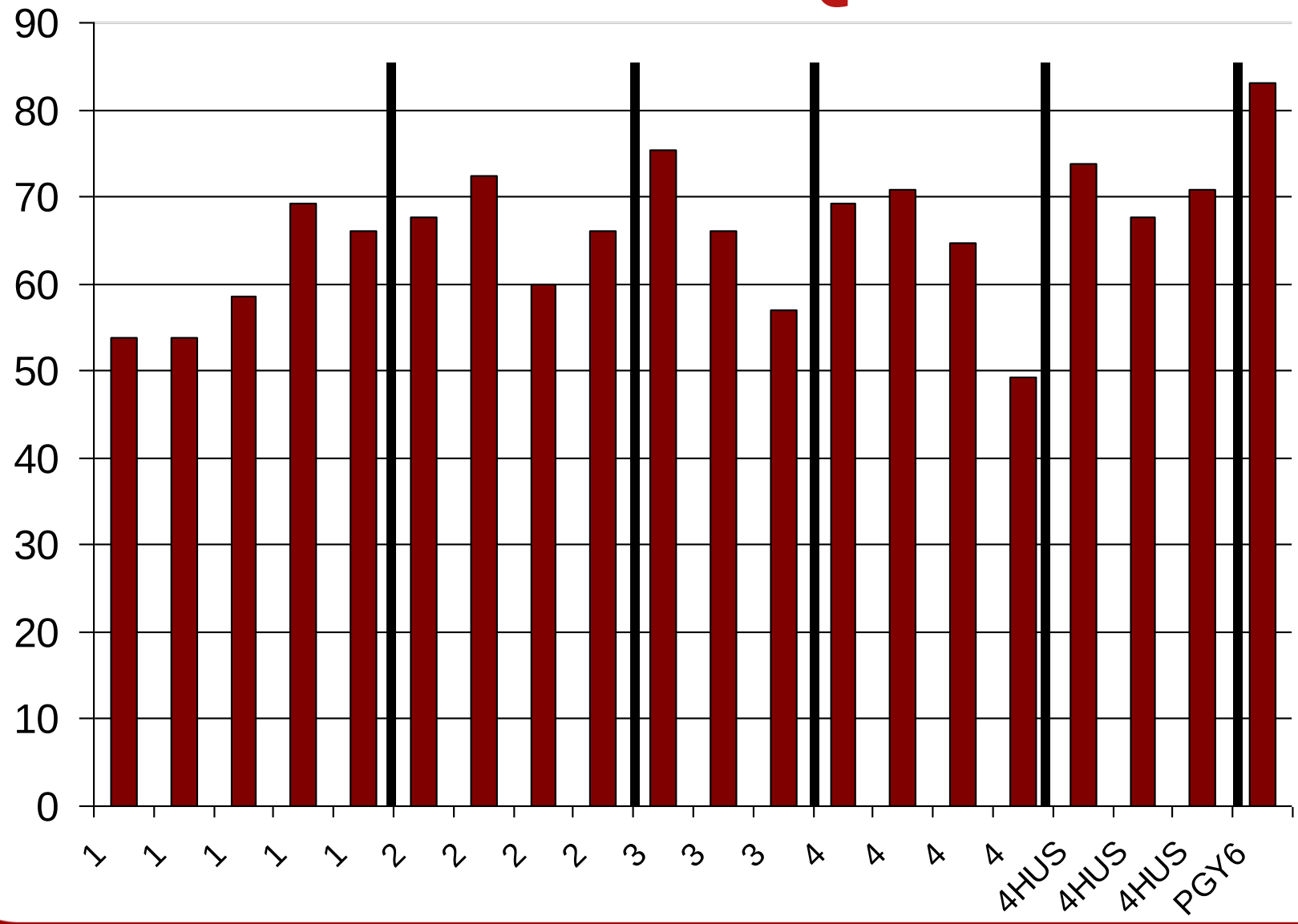
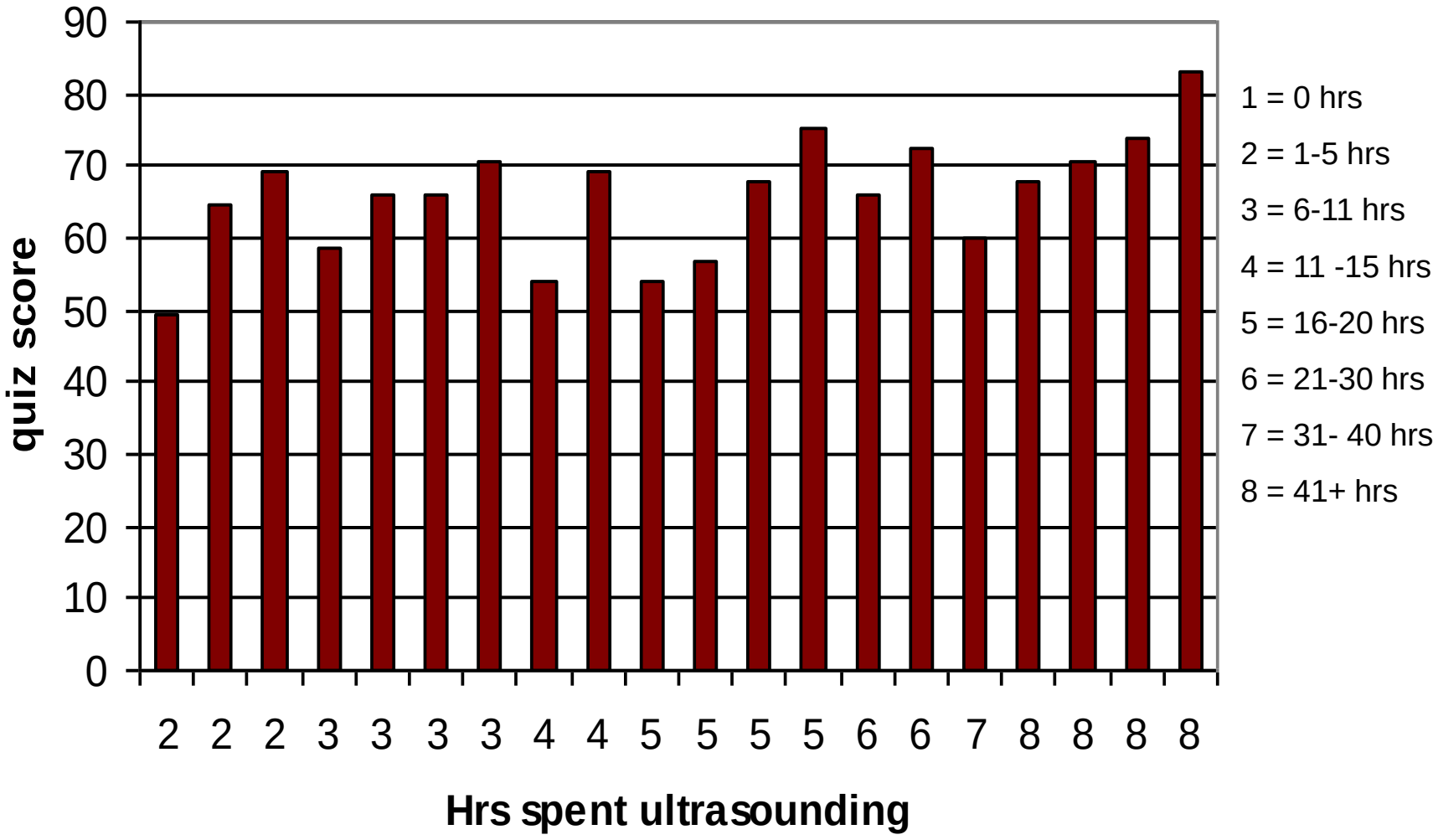
Year of School vs Quiz Score



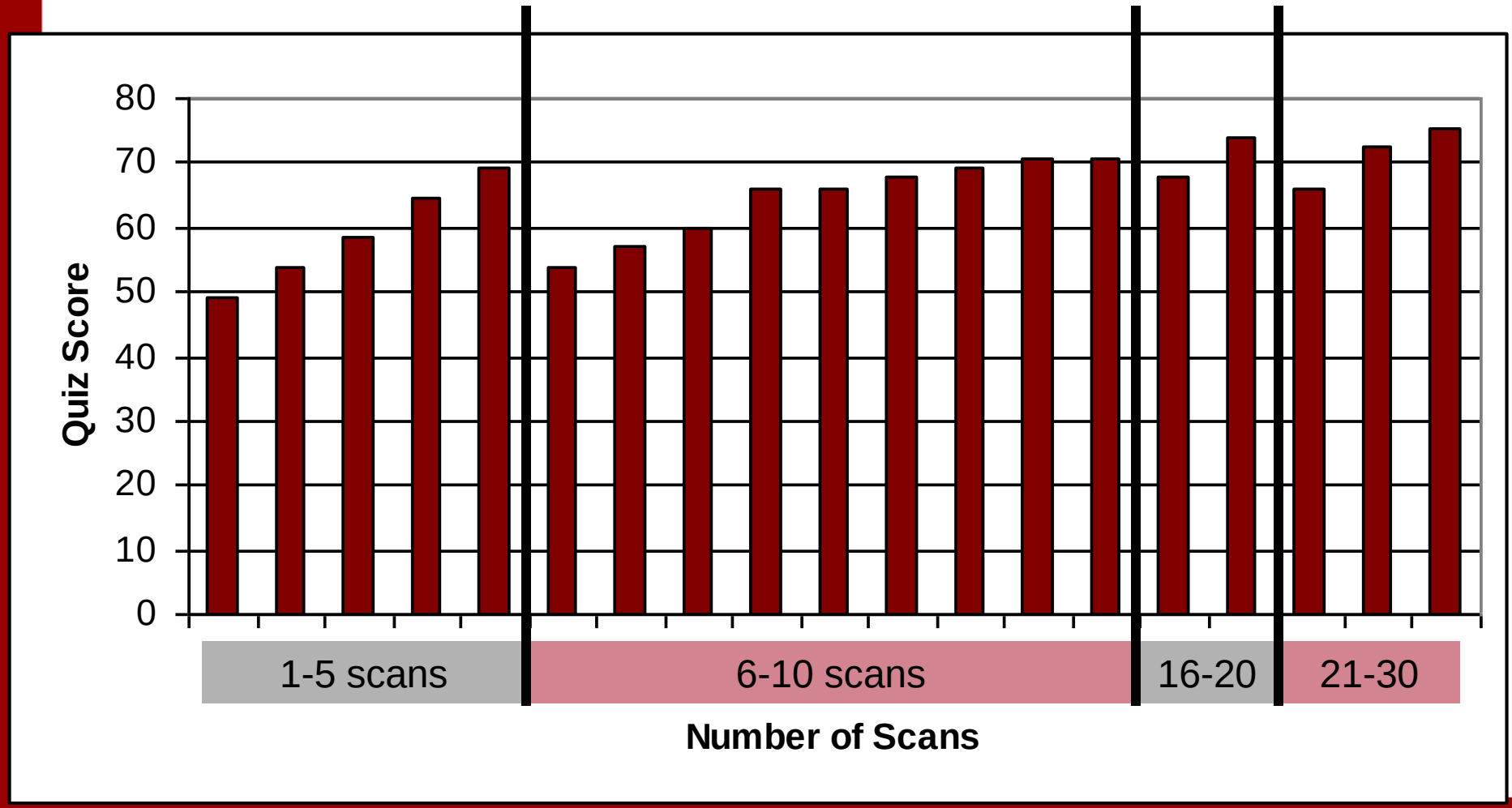
Hours Ultrasounding vs Quiz Score



Hours Ultrasounding vs Quiz Score

- When we correlated hours ultrasounding vs quiz score
  - Pearson Correlation = 0.406
  - Significance = 0.106

of Cardiac Ultrasounds vs Quiz Score



of Cardiac Ultrasounds vs Quiz Score

- When we correlated the data between these two variables, we found a
  - Pearson Correlation of 0.630
  - Significance of 0.007

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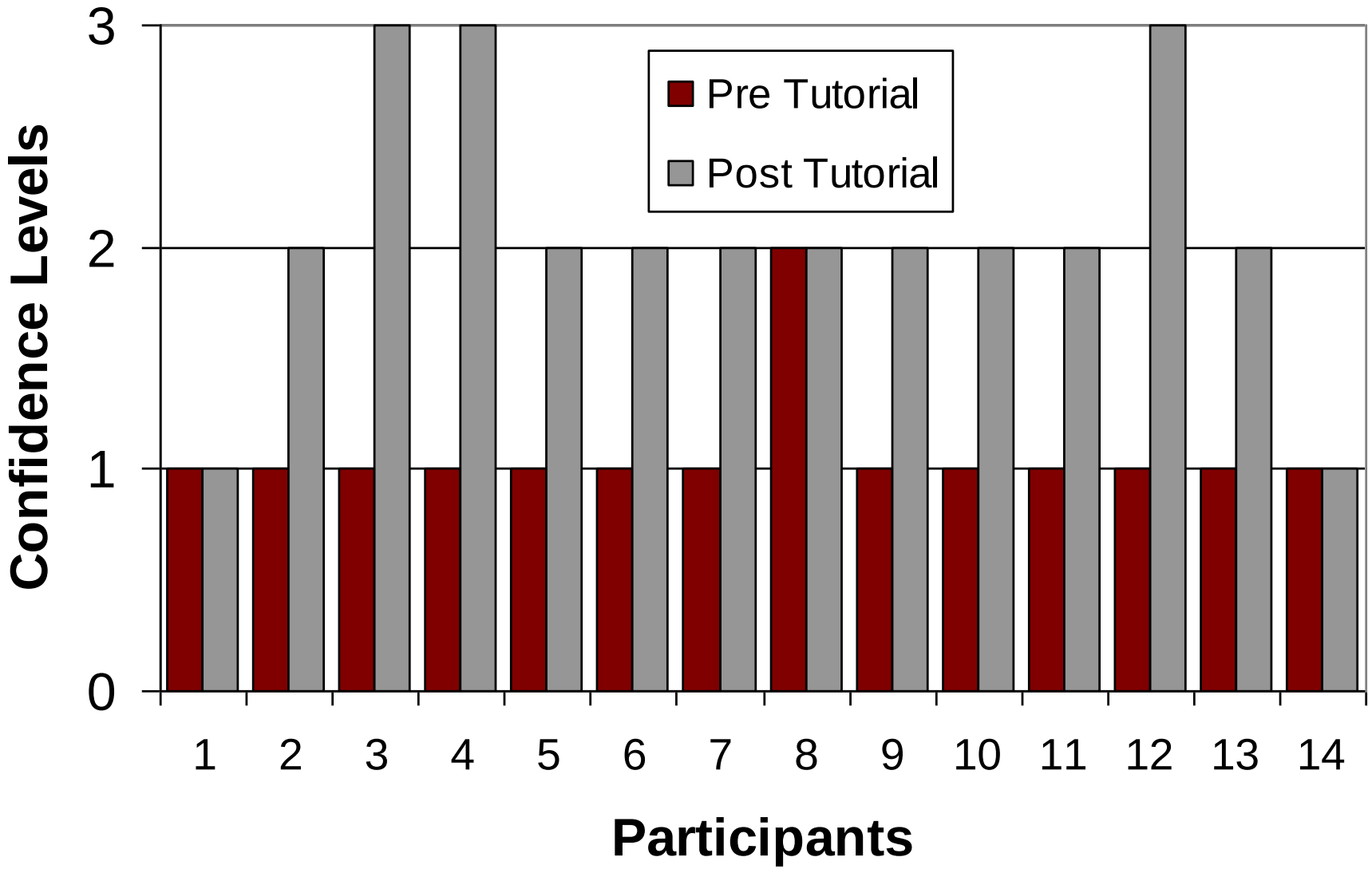
Pre- vs Post-Tutorial Confidence Levels



Pre- vs Post-Tutorial Confidence Levels T- Test

	Mean Score	Std Deviation	P value
Pre Tutorial	1.08	0.289	0.001
Post Tutorial	2.00	0.603	

- This demonstrates that confidence levels increase after this tutorial

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Other Correlations

	Pre Question 2 How many hours of u/s have you had 1 = 0 hrs, 2 = 1-10 hrs, 3 = 11-20, 4 = 21 +
Pre-Question 1 Describe your level of training. 1 = No training, 2 = Novice, 3 = Intermediate, 4 = Advanced, 5 = Expert	Pearson Correlation = 0.709 Significance <0.001
Pre- Question 3 How many hours have you spent watching online tutorials regarding ultrasound 1 = 0 hrs, 2 = 1-10 hrs, 3 = 11-20, 4 = 21 +	Pearson Correlation = 0.664 Significance <0.001

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Conclusions So Far

- It appears that number of focused cardiac ultrasounds are what correlate with ability to estimate EF
- It does NOT appear that hours of ultrasound training, level of training correlate with quiz score
- Participants who spent time on their own watching online tutorials and who physically performed many ultrasounds were shown to have a strong correlation with how they described their own expertise

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Limitations

- The study is not yet completed
- Our sample is small
- Many participants are not following the study through till the end
  - 13/32 haven't completed the quiz and/or post-tutorial questionnaire
- We also have a sample bias as all of the participants have some ultrasound background

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Limitations

- We are in the process of recruiting more residents
- Some students have technical difficulties when using a Mac Computer and others have reported difficulties when trying to stream the videos
- We have not yet done a question analysis to see which questions are useful and which ones are not
- The time commitment is fairly large for a voluntary study

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Where we hope to go from here…

- We hope that this study will demonstrate that medical students can qualitatively assess cardiac ejection fraction
  - Possible integration into the first/second year medical curriculum
  - Integration into 3rd/4th year EM/Cardiology clerkships
- Construct a study asking students to OBTAIN cardiac ultrasounds and estimate EF

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Questions?

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Acknowledgements

- Dr. David Bahner, The Ohio State University
- Dr. Rollin Nagel, The Ohio State University
- Larry Hurbutise, The Ohio State University

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