Abstract

BACKGROUND: Roosevelt Hospital in Guatemala City, Guatemala, is a public teaching hospital that treats a variety of chronic degenerative illnesses that are accompanied by cardiovascular complications. Quality Advanced Cardiovascular Life Support (ACLS) has been shown to save lives when appropriately administered. Previous research demonstrates that simulation education is effective when teaching resident physicians ACLS and improves patient outcomes.

METHODS: We investigated simulation education’s effect in teaching senior medical students ACLS in a resource-poor environment through written materials and simulated workshops translated into participants’ native language. Participants completed pre- and post-intervention simulated code scenarios graded against a global three-by-three score and an itemized checklist. Two evaluators graded each scenario. Students subjectively ranked their confidence with ACLS protocols pre- and post-intervention on Likert surveys.

RESULTS: Random effects linear model identified a statistically significant mean increase of 3.833 (p=0.0037) in global three-by-three scores and of 3.833 (p=0.0014) in total checklist scores after simulation education. Intra-rater and inter-rater scores correlated well for global scores (r=0.965, 95% lower bound 0.921 and r=0.914, 95% lower bound 0.715, respectively) and for total checklist scores (r=0.956, 95% lower bound 0.900 and r=0.896, 95% lower bound 0.666, respectively). Students felt more comfortable with ACLS protocols after simulation education, as seen in their Likert scale responses.

CONCLUSION: This study demonstrates that simulation education translated into participants’ native language is an effective medium for teaching medical students ACLS in a resource-poor environment.

Background

- Hospital Roosevelt in Guatemala City, Guatemala, is a public teaching hospital that treats an estimated 6,000 patients annually with a 10% mortality.
- The most commonly treated diseases at Hospital Roosevelt are Chronic Kidney Disease, Stroke, and GI Bleed, conditions prone to cardiovascular complications.
- Advanced Cardiovascular Life Support (ACLS) can save lives when administered appropriately.
- In Latin American medical education, senior medical students function as a combination of nurse, medical student, and intern, yet they are not ACLS-trained.
- Simulation education proves an effective medium of ACLS training.
- Simulation education has never been studied in a resource-poor environment, in a medical student population, nor in the Spanish language.

OBJECTIVE: To assess the efficacy of simulation education in a resource-poor environment when teaching senior medical students ACLS in their native language.

Methods

Study Design:

- Voluntary, prospective, before-and-after cohort study

Primary Outcome:

- Increase in global three-by-three score on simulated code scenarios

Secondary Outcome:

- Increase in total checklist score on simulated code scenarios
- Subjective increase in comfort level with ACLS protocols

Traditional Education:

- Documents based on the American Heart Association’s ACLS were written in Spanish and distributed to participants beforehand.

Simulation Education:

- In Spanish, a certified ACLS instructor taught the approach to an unstable patient, airway techniques, and ACLS algorithms using basic airway supplies, a Prestan CPR mannequin, and printed EKG rhythm strips.

Pre- and Post-Intervention Simulated Code Scenarios:

- In teams of two or three, participants managed either PEA (pre-intervention) or pulseless VT (post-intervention) using the above supplies. Students could verbalize use of a defibrillator. We recorded performances on a Sony Handycam HDR-CX220, and two ACLS-certified physicians graded each scenario against a global three-by-three score and an itemized checklist. Graders evaluated each code twice, at a one-month interval.

Subjective Measures:

- Participants completed Likert surveys that ranked their comfort with ACLS protocols before and after the simulation workshop.

Results

Table 1: Participant Demographics

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male– 10</th>
<th>Female– 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you plan to complete residency training?</td>
<td>Yes – 5</td>
<td>No – 8</td>
</tr>
<tr>
<td>Average Age (years)</td>
<td>24.23</td>
<td></td>
</tr>
<tr>
<td>Average number of unstable arrhythmias treated before participating in this study</td>
<td>0.046</td>
<td></td>
</tr>
</tbody>
</table>

Three-by-Three Global Score

Total Checklist Score

Inter-Rater

Intra-Rater

Table 2: Change in Mean Pre- and Post-Intervention Likert Scale Rankings

<table>
<thead>
<tr>
<th>Likert Scale Question (Rank 1-5)</th>
<th>Pre-Intervention Mean (SD)</th>
<th>Post-Intervention Mean (SD)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicate your familiarity with ACLS algorithms</td>
<td>2.586 (0.600)</td>
<td>3.769 (0.852)</td>
<td>0.0104</td>
</tr>
<tr>
<td>Rank your comfort with identifying heart rhythms</td>
<td>2.213 (0.439)</td>
<td>3.602 (0.751)</td>
<td>0.0018</td>
</tr>
<tr>
<td>Rank your comfort level leading a code</td>
<td>2.077 (0.494)</td>
<td>3.615 (0.609)</td>
<td>0.002</td>
</tr>
<tr>
<td>Rank your comfort level managing hemodynamically stable arrhythmias</td>
<td>1.923 (0.641)</td>
<td>3.749 (0.852)</td>
<td>0.004</td>
</tr>
<tr>
<td>Rank your comfort level managing hemodynamically unstable arrhythmias with a paddle</td>
<td>1.709 (0.429)</td>
<td>3.462 (0.750)</td>
<td>0.0015</td>
</tr>
<tr>
<td>Rank your comfort level managing pulseless cardiac arrest</td>
<td>2.077 (0.740)</td>
<td>4.077 (0.760)</td>
<td>0.0023</td>
</tr>
</tbody>
</table>

Discussion & Conclusions

- Low-fidelity simulation education, taught in Spanish in a resource-poor environment, significantly improved senior medical students’ overall performance of ACLS algorithms, as judged by three-by-three global scores.
- Simulation education also improved adherence to common interventions during a code scenario, as seen in increased total checklist scores.
- Participants ranked increased confidence in ACLS protocols after the intervention.
- Weaknesses of the study include:
  - Small sample size
  - Variable review of written materials prior to pre-intervention simulated code scenario. Analyzing the differences in scores should neutralize this.
  - Selection bias; participants may have found their ACLS skills weak.

Acknowledgements

1. Mejia, C.R. Roosevelt Hospital Internal Database. Internal Data. June 2013

References

1. Mejia, C.R. Roosevelt Hospital Internal Database. Internal Data. June 2013