



Cardiac Surgical Unit–Advanced Life Support Training: An Evidence-Based Practice Implementation in a Cardiothoracic ICU

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BACKGROUND

Unit 3 South is a high-acuity cardiothoracic intensive care unit (CT-ICU) located at Brooke Army Medical Center (BAMC). A recent near-miss cardiac arrest event highlighted the need for a standardized, protocol-driven response to cardiac surgical emergencies. Cardiac Surgical Unit–Advanced Life Support (CSU-ALS) is an evidence-based resuscitation protocol recognized as the standard of care for cardiac arrest following open-heart surgery. As a teaching hospital with frequent staff turnover, BAMC faces ongoing challenges in maintaining consistent competency managing rare but high-risk cardiothoracic emergencies. Prior studies demonstrate CSU-ALS implementation improves team performance, reduces time to re-sternotomy, and enhances survival in cardiac surgical patients, supporting its adoption as a structured training framework.

PURPOSE / RATIONALE

- The purpose of this project was to certify providers and nursing staff in Cardiac Surgery Unit Advanced Life Support (CSU-ALS) and maintain an in-house certification course.
- The CSU-ALS certification teaches the CALS protocol.
- The CALS protocol was developed by The European Resuscitation Council (ERC) in 2009 and was adopted by the European Association for Cardio-Thoracic Surgery (EACTS) in 2010 and has been the standard of care throughout Europe.
- CALS was adopted by the United States in 2016. The American Heart Association (AHA) realized they did not have a standard of care for patients that arrest post open-heart surgery and implemented this protocol with the approval of the Society of Thoracic Surgeons (STS) and the American College of Cardiology Foundation (Dunning et al., 2017).
- CALS/CSU-ALS is the standard of care, and we believe that physicians and nurses will greatly benefit from further education and training for this specific patient population.
- Patient safety is our priority, and we believe that the benefit of this course will greatly outweigh the cost.

PICO QUESTION

Among nurses who receive CSU-ALS training are they more comfortable and proficient at taking care of open-heart patients as opposed to nurses who are not CSU-ALS trained?
Among nurses who are CSU-ALS certified, do they self-report being more comfortable and equipped to take care of open-heart patients as opposed to nurses who are not CSU-ALS certified and take care of open-heart patients?
For healthcare professionals in a CT-ICU (P), how does the implementation of CSU-ALS training (I) compared to no specialized training (C) influence self-reported knowledge, confidence, and preparedness in managing cardiac surgical emergencies (O)?

IMPLEMENTATION

The Provider course consisted of an Online Pre-coursework, Pre and Post Survey, and a Pre and Post Quiz on the content material. The content consisted of four sections (STS/EACTS Protocol for Resuscitation of open-heart patients, Management of Cardiac Surgical Emergencies, Emergency Care Practicums with scenario software / Epicardial Pacing, & Putting it all together), two hands-on practical scenarios, and one Emergency care practicums. The providers were also able to practice resternotomy and sterile technique using the new mannequin purchased with the grant. TSNRP Mini-EBP Grant Award The Grant award was for up to \$10,000. This included the certifications for a total of 18 providers, and Trainer certification for four providers, and the mannequin. The total process was over a four-day stretch.

Day one: the designated trainers and two additional providers were certified.

Day two: The trainers took the trainer course.

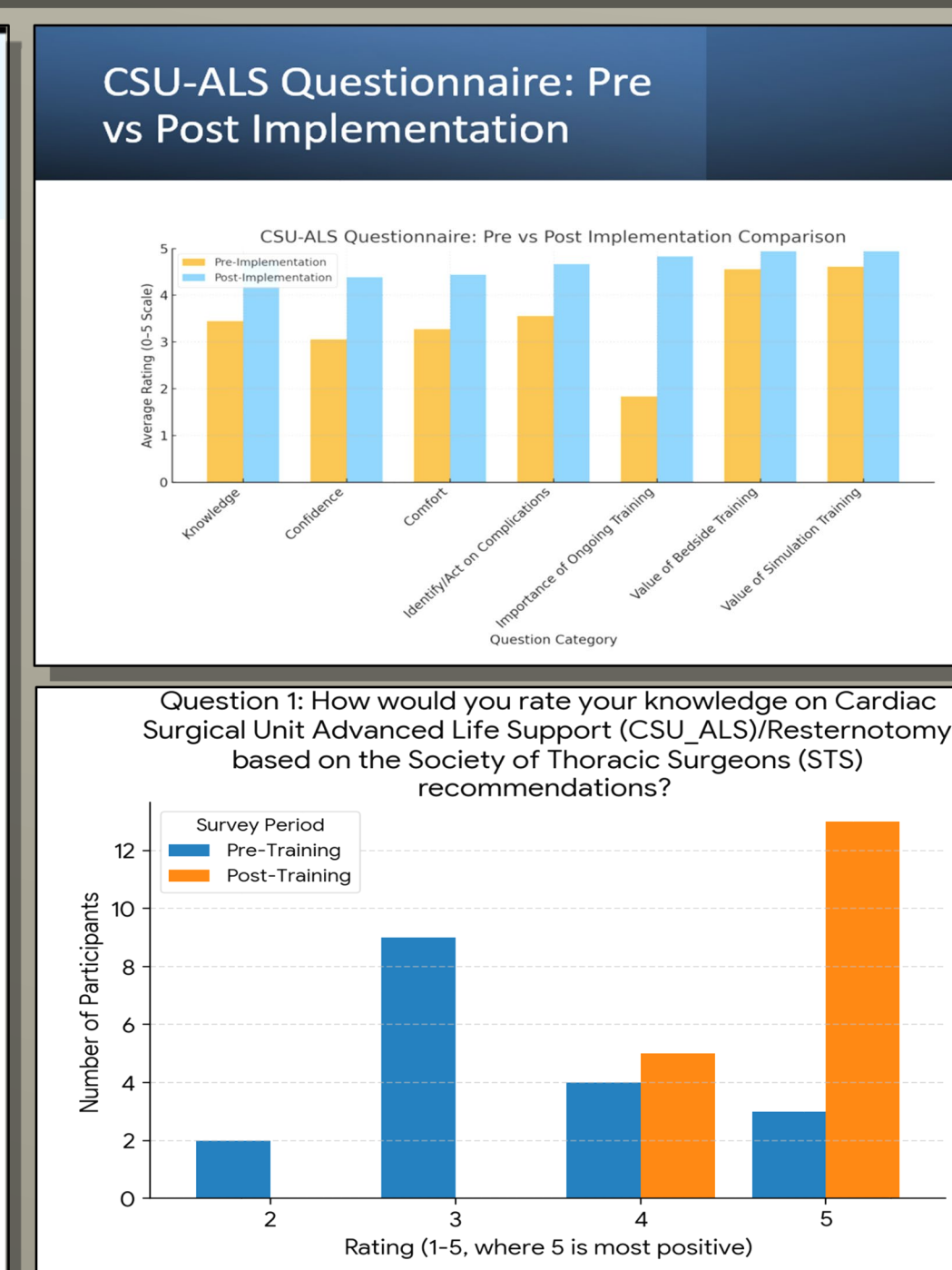
Day three: The trainers certified six providers and was proctored on the training process.

Day four: The trainers certified an additional six providers, continued to be proctored, and then signed off on becoming a trainer.

SYNTHESIS OF EVIDENCE

In 2013, Maccaroni et al. published the results of a 5-year evolving approach to resternotomy in patients who experienced cardiac arrest after cardiac surgery. The primary outcome measure was survival to hospital discharge. The secondary outcome measure was the trend in emergency resuscitative resternotomy. During the first 2 years (2008-2009), conventional resuscitation practices were implemented. During that period, senior nursing staff, trainee physicians, consultant surgeons, and anesthesiologists attended the Cardiac Surgery Advanced Life Support course. This training was then cascaded and adopted as routine practice. All ward staff completed the training and participated in ongoing simulation training. During the subsequent 3 years (2010-2012), protocol-based resuscitation procedures were employed. These procedures included immediate defibrillation with up to 3 stacked shocks, immediate cardiac pacing if wires were available, early resternotomy, implementation of the 6 key roles, and epinephrine use restricted to smaller doses if used at all. The result: survival to hospital discharge increased from 36.3% in the first 2 years to 63.8% in the subsequent 3 years, and the resternotomy rate dropped from 66.7% to 47.3%. The authors concluded that, with bringing practice in line with the guidelines and training, increased awareness had empowered staff members to better manage arrest and prearrest situations. Implementing the guidelines may have affected survival to hospital discharge and resternotomy rates because of improved management of cardiac arrests, prearrest, and clinical deterioration. In 2015, Ley et al. reported the significance of the organizational response to cardiac arrest after cardiac surgical procedures. A review of the literature revealed individual hospitals, not patient risk profiles or individual surgeons, were strongly associated with mortality. The authors studied the incidence and outcomes of cardiac arrest after cardiac surgical procedures at their medical center over an 8-year period where the ERC or CALS protocols were implemented. During the 4 years after implementation, the cardiac arrest rate fell from 3.4% (31 of 900 patients) to 2.9% (26 of 907 patients), and mortality fell from 64.5% to 34.6%. These results suggest that after training, hospital staff members were better able to recognize and correct prearrest clinical deterioration and were more successful in conducting resuscitations after cardiac arrest.

Feature	CSU-ALS (Post-Cardiac Surgery)	Traditional ALS
Primary Target	Post-Cardiac surgery (CVICU setting)	General medical/community arrest
Initial Action	1 min compression delay dependent on situation	Compressions first (CPR)
Pacing	Immediate pacing for bradycardia/asthote	Follows algorithm (often later)
Chest Compressions	Delayed or avoided if possible (can cause injury)	Immediate and continuous
Epinephrine	Reduced dosage/not recommended	High, standard doses
Key intervention	Emergency Sternotomy (within 1-5 Mins is target)	Advanced Airway/Medication
Target Etiology	Reversible causes (Tamponade, bleeding)	Non-specific/medical causes
Team Structure	6 key roles that are fluid throughout	Physician/Nurse/Anillary led

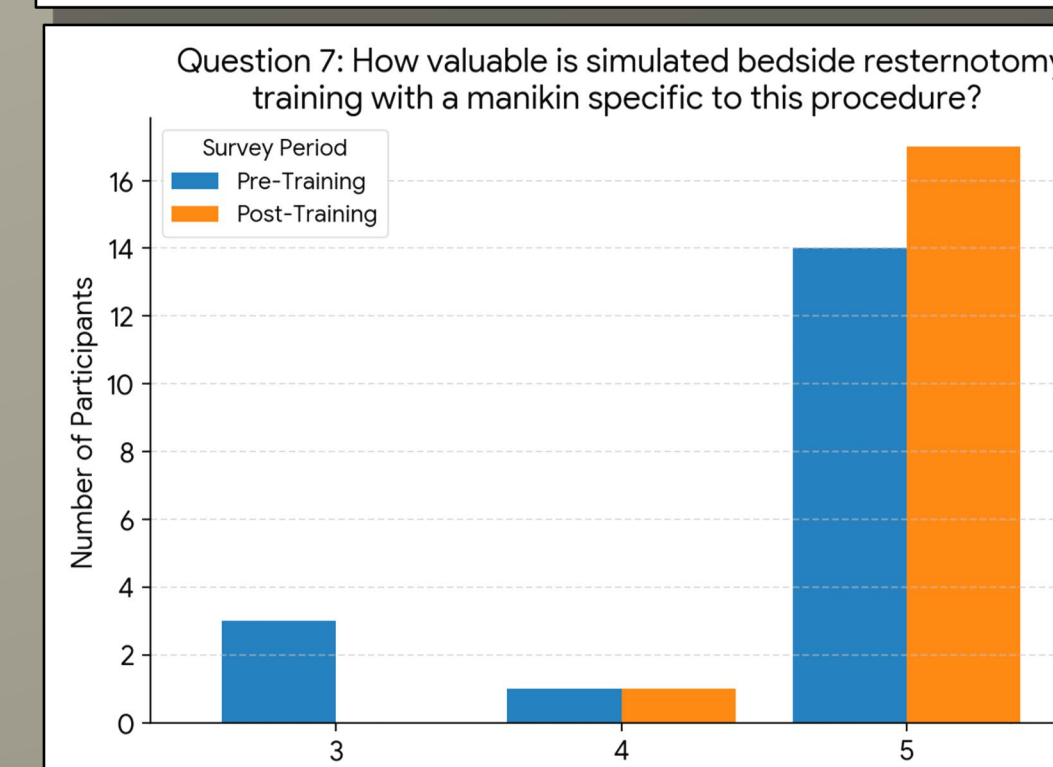
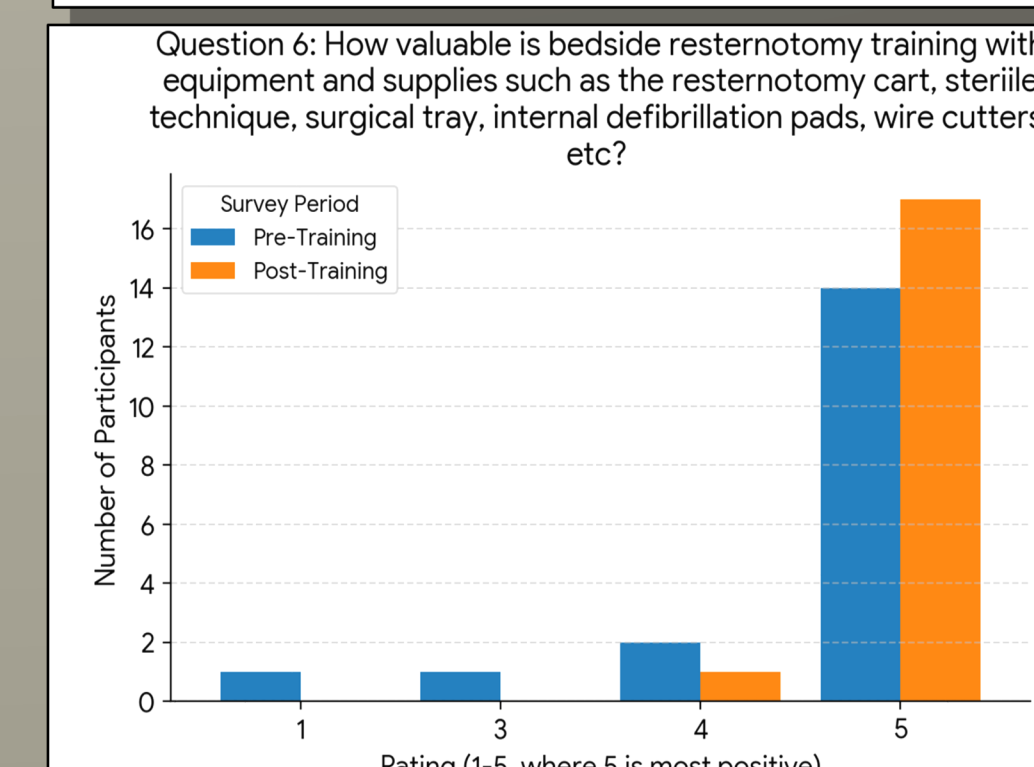
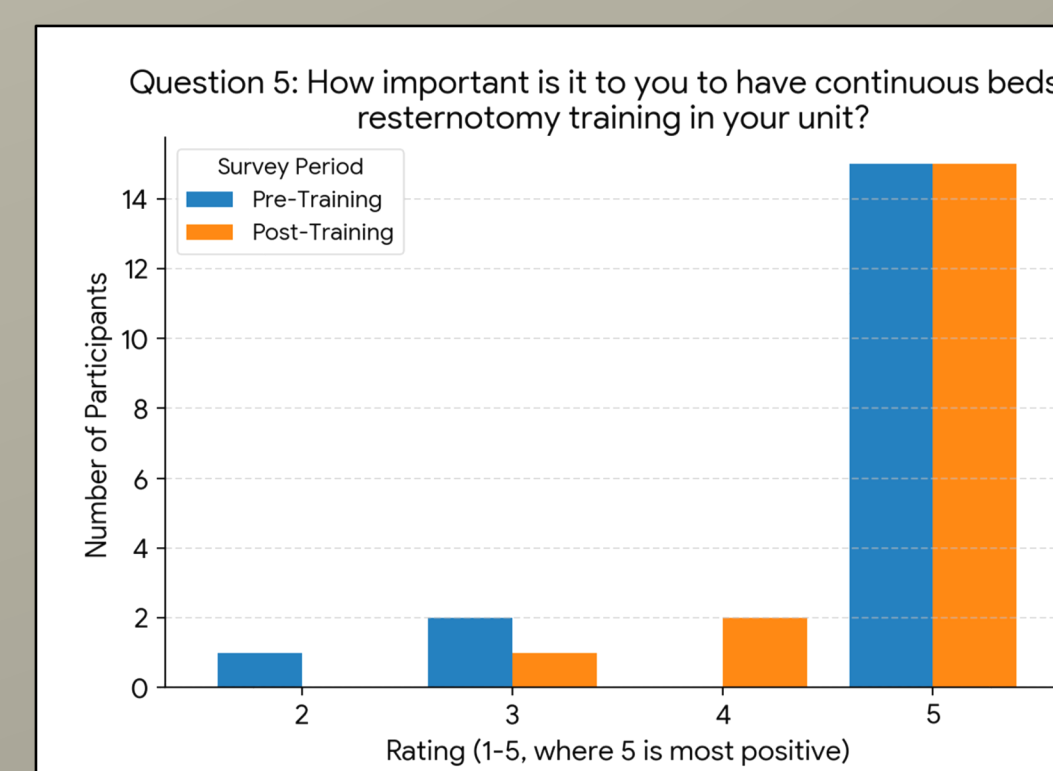
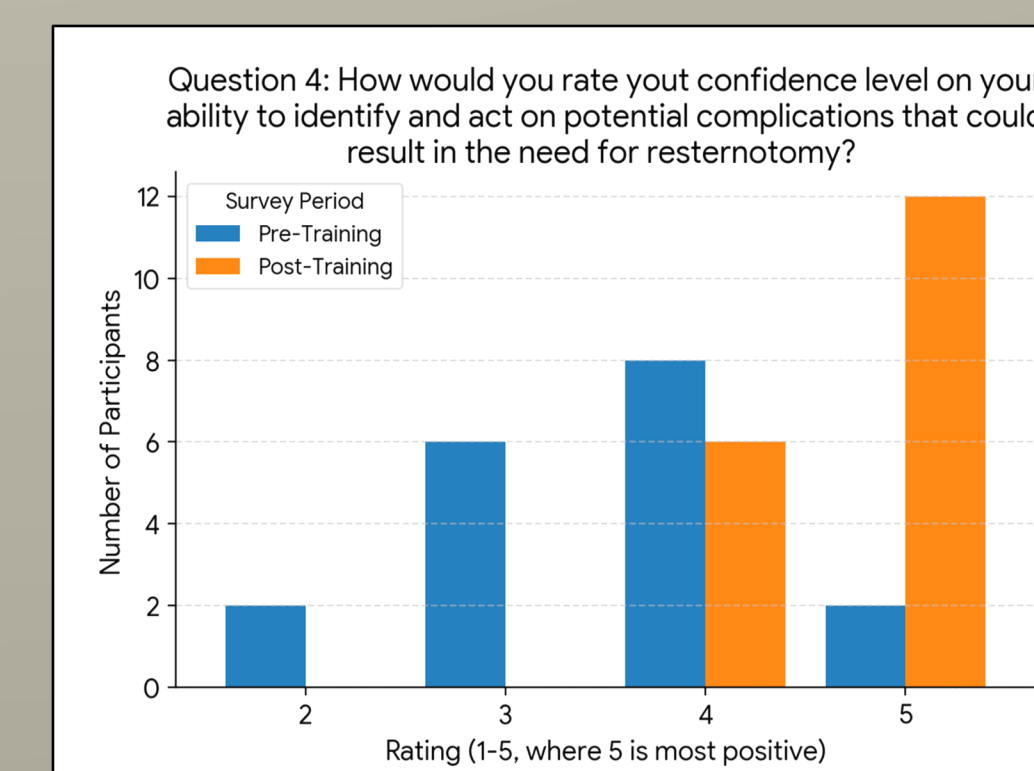
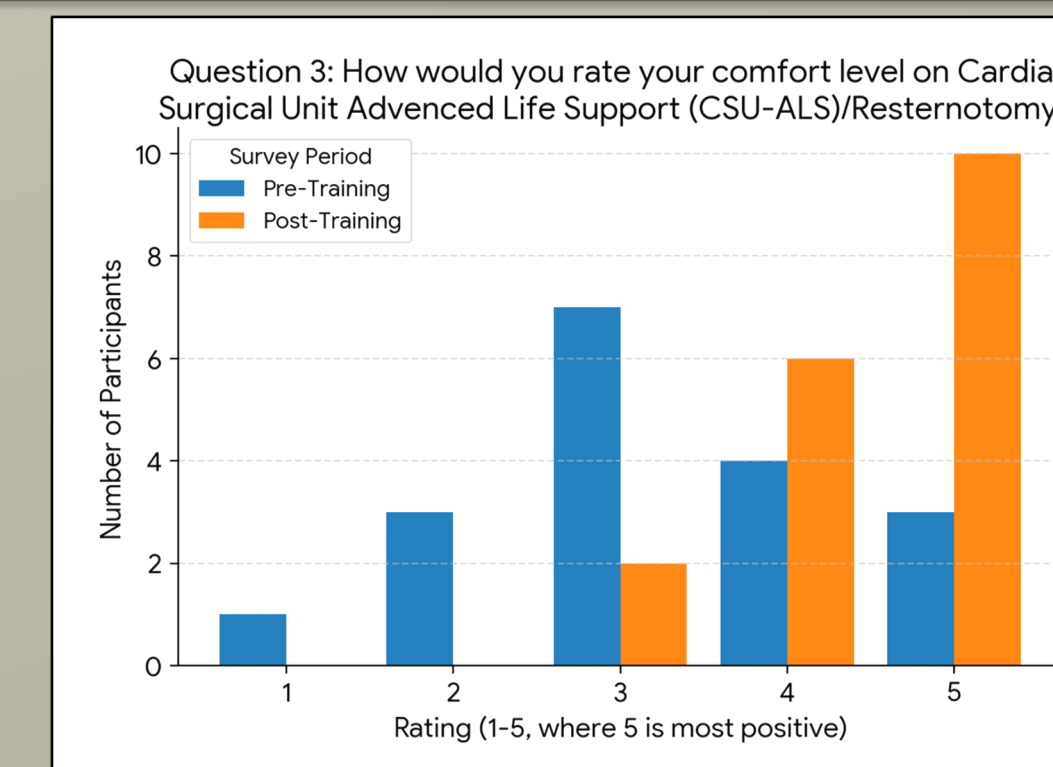
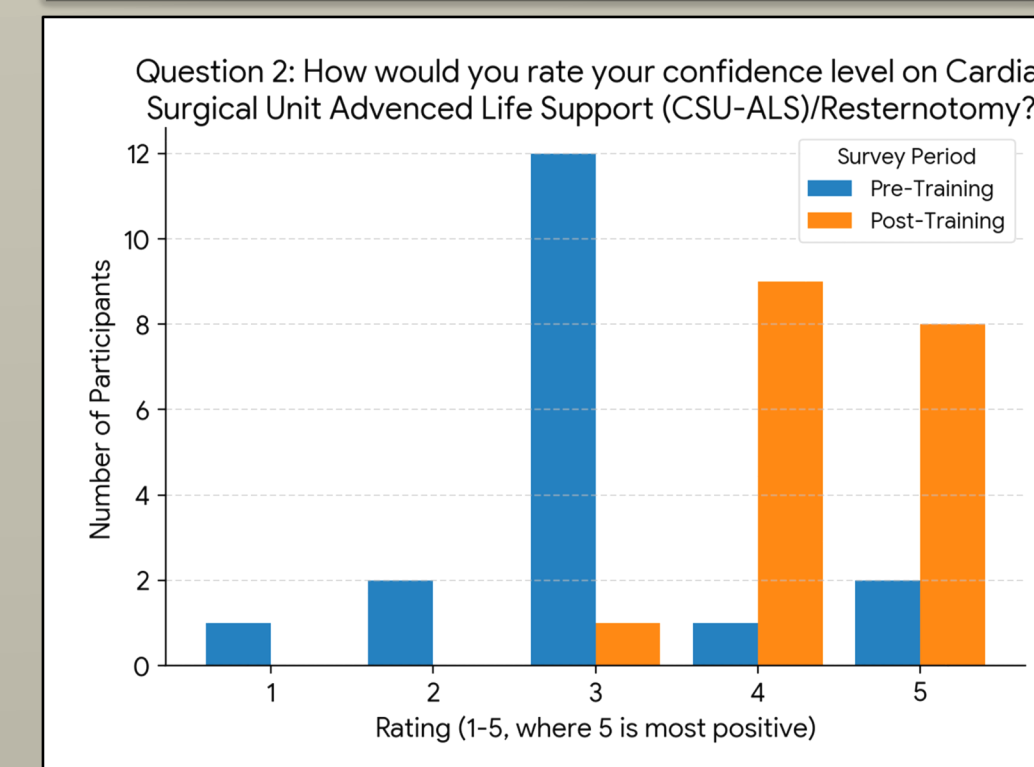


METHOD

CSU-ALS training was implemented with the Cardiac Advanced Resuscitation Education (CARE) center, certifying 18 nurses and physicians. To ensure sustainability, some became trainers. The curriculum covered post-cardiac surgery resuscitation, open-chest management, emergency recognition, electrical therapies, and human factors. A pre-post design used Likert-scale surveys to assess confidence, comfort, and preparedness in managing cardiac emergencies. All participants completed a final certification exam to meet credentialing requirements and demonstrate competency.

EVALUATION

- ❖ Evaluate participation and engagement of the hospital Code Blue Team and Trauma Surgery service in CSU-ALS training sessions and simulations.
- ❖ Pre/Post Surveys: Measure confidence and knowledge levels among participants.
- ❖ Long-Term Monitoring: Track code blue outcomes, re-sternotomy rates, and survival rates.
- ❖ Simulation Participation: Monitor continued competency through quarterly simulations.
- ❖ Certification Records: Ensure >90% of staff remain certified in accordance with Center Of Excellence requirements.



CONCLUSIONS

A total of 4 physicians and 14 registered nurses participated in this project. Most (n=15, 83%) participants had more than 10 years of clinical experience and only one had prior formal CSU-ALS training. Average participants reported an average increase in perceived knowledge (21%), overall confidence (22%), overall comfort (20%), and confidence to identify and act on complications (19%). Changes in these domains were assessed using the signed Wilcoxon rank test and were all found to be significant. However, perceived importance of the training, training with procedure specific supplies, and value of simulation with a CSU-ALS manikin did not have significant changes between pre-intervention and post-intervention responses. These concepts likely were impacted by the ceiling effect as average ratings pre-implementation were 4.6 on a 0-to-5-point scale. All participants (18/18; 100%) achieved passing scores on the certification examination, demonstrating attainment of required competency standards.

Successful certification and improved assessment scores confirm enhanced knowledge, confidence, and readiness for managing cardiac surgical emergencies in a high-acuity setting. Establishing internal trainers creates a sustainable framework for maintaining competency despite staff turnover. This initiative aligns with BAMC's mission to advance patient safety, education, and outcomes, positioning the institution as a leader in cardiac resuscitation preparedness within the Department of War. By strengthening interdisciplinary coordination and frontline readiness, CSU-ALS implementation addresses a critical safety gap and ensures the highest standard of care. These findings validate simulation-based education as a scalable strategy for sustaining high-reliability practices.

IMPLICATIONS FOR NURSING PRACTICE

The CSU-ALS training program significantly enhanced staff knowledge, confidence, and perceived readiness to manage cardiac surgical emergencies. By creating internal trainers, the project provides a sustainable framework for maintaining high-reliability practice despite staff turnover. This initiative directly supports BAMC's mission to advance patient safety and clinical excellence, positioning it as a Department of Defense leader in cardiac surgical resuscitation. The findings reinforce the value of structured, simulation-based education for improving interdisciplinary coordination and readiness in complex environments.

