Optimising Human Factors in Three-Person Resuscitation Teams

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SUMMARY

Cardiac arrest survival depends on timely, effective resuscitation, guided by Advanced Cardiac Life Support (ACLS) protocols designed for six-person teams. However, real-world constraints like staffing shortages often force teams to operate with only three members, creating a critical gap between protocol standards and clinical practice.

This qualitative study explored the perspectives of experienced ACLS faculty (n=6) to analyse teamwork dynamics, role allocation, and cognitive workload in three-person resuscitations, using the Systems Engineering Initiative for Patient Safety (SEIPS) framework.

Thematic analysis of semi-structured interviews revealed that role distractions occurred in approximately 80% of scenarios, primarily during high-cognitive-load tasks like rhythm analysis. While standardised protocols provided a shared mental model initially, unexpected events necessitated a difficult shift to explicit problem-solving. Environmental stressors, such as night-shift conditions, amplified cognitive demands. Key findings indicate that successful three-person resuscitation hinges on two factors: strict role specialisation to prevent cognitive overload and strong leadership to act as a cognitive buffer, coordinating the system and absorbing complexity.

The study concludes that ACLS training should incorporate specific modules on role adherence and leadership for small-team configurations. Future research should combine these qualitative insights with physiological measures, like functional near-infrared spectroscopy (fNIRS), to validate these relationships and develop evidence-based tools tailored for constrained teams.

KEYWORDS

ACLS, Resuscitation, Cognitive Load, Teamwork, SEIPS

Introduction

Cardiac arrest remains a significant causes of mortality, with survival outcomes dependent on the timely and effective resuscitation (Chong et al, 2025; Hunziker et al, 2010). Advanced Cardiac Life Support (ACLS) protocols provide a standardised algorithmic approach to resuscitation. However, their optimal application is influenced by human factors, particularly teamwork (Hunziker et al, 2010; Hosseini et al, 2022). High-fidelity simulation study (Hunziker et al, 2010) demonstrates that ineffective teamwork can lead to delays in defibrillation, unnecessary pauses in chest compressions, and medication errors. In addition, physiological data from fNIRS monitoring reveal that critical tasks like medication administration and defibrillation impose high cognitive demands on providers, potentially undermining performance despite protocol adherence (Ivankovic et al, 2023). ACLS frameworks traditionally define six distinct roles (e.g, team leader, airway, compressor, recorder, defibrillation and medication), real-world constraints such as staffing shortages during night shifts or infection control measures, often force resuscitation teams to operate with only three members. This discrepancy between ideal and actual team structures risks compromising teamwork. This

study analyes perspectives of experienced ACLS faculties, to explore role allocation, communication patterns, and cognitive workload management in three-person resuscitations, aiming to bridge the gap between protocol-based standards and pragmatic clinical realities.

Methods

A qualitative, descriptive design to explore ACLS faculty perspectives on teamwork dynamics in three-person resuscitations. A purposive sample of faculty members (n=6), each with over 10 years of experience in both teaching and practicing ACLS was selected. Semi-structured interviews, guided by a review of human factors literature in resuscitation (Hunziker et al, 2010; Hosseini et al, 2022). The interviews were audio-recorded, transcribed verbatim, and anonymized. A thematic analysis was then performed, informed by the Systems Engineering Initiative for Patient Safety (SEIPS) framework (Carayon et al, 2006), to systematically examine interactions between person, tasks, tools, environment, and organization in small team resuscitation.

Results

Person: Cognitive Load and Distraction

All faculties report indicated that role distractions occurred in approximately 80% of simulated three-person scenarios, primarily during rhythm analysis and medication administration, similar as the result from Ivankovic et al, (2023). As one participant elaborated, "The compressor must be solely on the quality of compressions... any distraction degrades performance." This aligns with Cognitive Load Theory, where finite working memory resources are overwhelmed, leading to performance degradation.

Tasks: The Dual Nature of Standardised Resuscitation Tasks

In the first 5 cycles (2nd dose of amiodarone given), the standardized protocol provided a predictable structure that reduced cognitive load. However, this stability was fragile. Faculties reported that unexpected events (e.g, rhythm check / equipment issue) triggered a critical transition. One participant described this shift: “The algorithm gives you a route prompt to drive on, but when there is a traffic accident, you need to plan again without a map.” This highlights a gap in task design for constrained teams, where implicit routines must transition to explicit problem-solving.

Tools and Technologies: Protocol as a Cognitive Tool

The ACLS protocol functions as a shared mental model offloading cognitive demand. However, this study found aids designed for six-person teams cause delays in smaller teams. As one faculty member noted, “We need time to decide the best person for a task because the aid is designed for 6 people, not 3 people team.” This points to a critical gap in the toolkit available for small-team, suggesting an urgent need for the development and validation tools specifically designed for role overlap in three-person teams.

Environment: The Physical and Temporal Constraints

Environmental factors, such as night shift staffing or infection control measures, amplified cognitive demands. One participant stated, “During night shifts or infection control restriction, and you are limited people; the stress is palpable, and every second feels compressed.” These temporal and physical pressures act as environmental stressors that exacerbate cognitive load. These pressures interacted with SEIPS elements, making role clarity critical to buffer against stressors.

Organisation: Leadership as a Cognitive Buffer

Strict role adherence reduced self-reported cognitive overload. Leadership emerged as a central mechanism for coordinating the system, absorbing complexity to protect members focused on tasks like compressions or ventilation. This micro-level organizational structure is essential for managing dynamic resuscitation processes.

Key takeaways or learning points

Key findings indicate that successful three-person resuscitation requires: (1) strict role specialisation to prevent cognitive overload, and (2) strong leadership to act as a cognitive buffer. These insights suggest that ACLS training should incorporate modules on role adherence and leadership in small-team configurations. Future research should combine qualitative insights with physiological measures (e.g, fNIRS) to validate these relationships and develop evidence-based interventions for real-world resuscitation scenarios.

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