

Sanderson, Isaac and Stones, Antony (2025) Addressing the challenge of student involvement in out-of-hospital cardiac arrest. *Journal of Paramedic Practice*, 17 (1). pp. 28-32.

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Title: Addressing the challenge of student involvement in out of hospital cardiac arrest

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Abstract

Management of out-of-hospital cardiac arrest (OHCA) is a key requirement of qualified paramedics. However, paramedic students are rarely provided with hands-on experience in this skill. Reasons for this lack of exposure are numerous and include pragmatic challenges and ethical dilemmas for students, mentors and patients. Poor exposure of students to OHCA may lead to inferior outcomes for patients upon students' registration. Maximising students' exposure to OHCA should thus be a target of paramedic education. This article discusses the challenges associated with student involvement in OHCA and suggests greater tailoring of healthcare placements to address this shortfall in paramedic education.

Acknowledgement

Conflict of Interest

The authors declare that there are no conflicts of interest.

Keywords

Out-of-Hospital Cardiac Arrest (OHCA)

Cardiac Arrest

Paramedic Student

Paramedic Education

Paramedic Clinical Placement

Key Points

- Student paramedics gain insufficient hands-on experience in managing out-of-hospital cardiac arrest (OHCA)
- Reasons for lack of exposure to cardiac arrest are numerous, but include pragmatic challenges such as lack of incidence and ethical reasons such as the patient's right to receive optimum care
- Lack of exposure to OHCA as students leaves patients at risk following these students' qualification as paramedics
- Greater tailoring of wider healthcare placements may provide an avenue for student paramedics to gain experience in managing cardiac arrest

Reflective questions

Should student paramedics get greater hands-on experience in managing out-of-hospital cardiac arrest? Why and how so, or why not?

When should student paramedics start to practice managing real-life out-of-hospital cardiac arrest?

Are there any other areas which student paramedics need greater experience before qualification?

Introduction

The management of out of hospital cardiac arrest (OHCA) is a critical paramedic skill, however it is one that many paramedics, including student paramedics, lack experience of (Bray et al. 2020; Dyson et al. 2016). Simulated practice allows student paramedics to develop the knowledge and psychomotor skills – including advanced life support (ALS) and situational awareness – necessary for OHCA management, without the associated stress of a genuine cardiac arrest situation (Wheeler and Dippenaar, 2020). However, the exclusion of common stressors such as bystander presence, unexpected regurgitation, and innate fight or flight reactions, diminishes the efficacy of high-fidelity simulations (Jones et al. 2011). Furthermore, the realistic manikins needed to develop high fidelity simulations can be prohibitively expensive. Consequently, educators must consider alternative approaches to maximise learning opportunities for their students.

Typically, educators use clinical placement to bridge the theory-practice gap (Iqbal et al. 2020). However, during these clinical placements students often have limited exposure to high acuity cases, including OHCA (Stein 2009; Wongtongkam and Brewster 2017; Page et al. 2021). Stein (2009) illustrates this, reporting that only 29% of second year students were able to partake in practicing adult cardiopulmonary resuscitation (CPR) and bag-valve-mask (BVM) ventilation in the field. This may, in part, be explained by the students lacking the self-esteem required to put themselves forward in an OHCA situation. Factors such as age, gender, and socioeconomic status may influence students' self-esteem, and subsequently their willingness to step forward (Orth et al. 2018).

Additionally, Stein's work focusses on South African students: the proportion of OHCA associated with prehospital resuscitation is significantly lower in South Africa than in the UK – 7.4% and 79.3% respectively (Hawkes et al. 2017; Stassen et al. 2021). Research exploring

the skills practiced by UK-based student paramedics would help to further understand the problem. Nonetheless, a lack of clinical practice as a student poses a potential risk to patient outcome throughout the individual paramedic's career, as survival to discharge following OHCA is associated with the attending paramedic having dealt with other OHCA's within the previous three years (Dyson et al. 2016).

Furthermore, neurological outcomes following OHCA have been associated with quality and consistency of chest compressions (Awad et al. 2022). The quality of compressions delivered by students has been shown to be lower than that by qualified clinicians (Zhou et al. 2014; Korber et al. 2016). Indeed, in a study by Korber et al (2016), early medical students and paramedic teams produced compression rate of 83.4 and 95.4 compressions per minute, respectively ($p < 0.001$). The average hands-off-times were 6.4 and 5.2 seconds per minute for student and paramedic teams, respectively ($p < 0.001$). The European Resuscitation Council guidelines state that patients should receive at least 100 compressions per minute and that hands-off-times should be kept to a minimum (Monsieurs et al. 2015) (although where the student is supernumerary, time off the chest is reduced (Zhou et al. 2014)). Students' lack of exposure to, and therefore experience in, OHCA likely impacts the quality of care given when the opportunity arises. As a result, the likelihood of survival to discharge is reduced and neurological outcomes worsen.

There is no guarantee that student paramedics will have sufficient exposure to OHCA to enable them to develop their skills and confidence prior to graduation. Furthermore, upon registration, a paramedic may find themselves serving as the lead clinician responsible for managing an OHCA.

The challenge

Patient safety

The issue of sufficient exposure for students undergoing clinical placement is not unique to paramedicine (Jafarian-Amiri et al. 2020; Hlahla et al. 2024; Xie et al. 2024). However, OHCA is a particularly acute clinical event where delayed or poorly conducted interventions are associated with increases in mortality and morbidity (Myat et al. 2018). Furthermore, prolonged scene time is associated with poor neurological outcomes following OHCA (Jung et al. 2022).

Where student paramedics conduct clinical interventions under supervision – including airway insertion, gaining intravenous or intraosseous access, and drug administration – there is a potential for delays associated with lack of confidence or ability (both of which may be rooted in a lack of practice). Subsequently, there may be a delayed scene time, increasing the risk of poor outcomes (Myat et al. 2018).

Legal and ethical

The delays potentially associated with student involvement in OHCA raise legal and ethical concerns. That is, the student's desire and need to learn conflicts with the patient's right to receive the best care. The Health and Care Professions' Council (HCPC) (2023) states that clinicians should only practice within their limits. However, students are unable to improve in their practice without trying to reach beyond their current limits.

The deontological approach refers to acting in a way which follows the principles of deontology, which suggest that students have a duty to avoid harming the patient irrespective of the consequences (Mandal et al. 2016). However, others would argue that in not acting, the student is allowing harm to the patient through the consequence of potentially avoidable death (Kamm 1991). The Doctrine of Double Effect (DDE) principle argues that one may inflict necessary harm in pursuit of a greater good, such as saving a patient's life (Kamm 1991). However, DDE does not account for the student's intent. For example, if the

motivation is for the student to gain experience (potentially at the expense of the patient), this would not balance out harm to the patient. In this case, any derived benefit is obtained by subsequent patients.

Utilitarianism refers to the favoring of options that are deemed to be the greatest benefit (Korner and Deutsch 2022). When considering the application of Utilitarianism, this article argues that students should gain exposure in resuscitation for the greater good of the patients they encounter in the future (Vearrier and Henderson 2021; Shin et al. 2022). However, the acceptance of inferior outcomes to initial patients in utilitarianism is only justifiable if the student can gain experience performing quality resuscitation, minimising harm to initial patients and maximising benefit to future patients. Consequently, a method must be devised to maximise students' access to patients undergoing cardiac arrest whilst ensuring that their role (although substantial) is associated with minimal risk to the patients' outcome.

The resolution

To resolve the challenges discussed, this article argues that greater tailoring should be made of paramedic student clinical placements. Pre-hospital placements are vital for preparing students for entry into the ambulance service (Ross et al. 2015). However, timetabling constraints and increasing burden on the ambulance service has meant students must gain clinical experience elsewhere as part of wider healthcare placements (College of Paramedics 2023). This has been controversial, with some suggesting that placements should be limited to ambulance settings only (O'Meara et al. 2015). However, if used appropriately, these placements provide students with opportunities to develop personally, professionally and clinically; including valuable experience in the diagnosis and management of presentations not often encountered in the prehospital environment. However, paramedicine's relative infancy in formalised education provides a challenge for education providers to determine

what constitutes an effective placement. The targets for which value can be derived from clinical placement are obscure and difficult to measure, and much of the research into the effectiveness of placements are derived using students from other health professions, such as nursing or medicine (O'Meara et al. 2014). To help describe the goals of wider clinical placement amongst paramedic students - with specific reference to OHCA - this article argues that wider clinical placement can be broadly categorized into the following two aims:

- Provide sufficient OHCA exposure to students
- Provide an environment in which the student can practice beyond their present scope to develop and consolidate their learning, while maintaining patient safety.

Appropriate exposure

As discussed, OHCA is sufficiently rare that placement as part of a paramedic crew will not guarantee sufficient exposure (Dyson et al. 2016). To address this, some have suggested extending clinical time indefinitely until sufficient exposure has been achieved (Stein 2009). However, due to various other factors such as financial constraints, this method is impractical for students, mentors, educators and placement providers. Instead, this article proposes that students undertake a wider healthcare placement as part of the rapid response team (RRT) (Mitchell et al. 2019). Importantly, there is a large proportion of patients at risk of in-hospital cardiac arrest (IHCA) whose clinical presentation is similar to OHCA patients, providing a substantial base for students to gain exposure to cardiac arrest management (Hoybye et al. 2021; Resuscitation council (UK) and ICNARC 2021). It could be argued that IHCA's are infrequent and placing a student with RRTs would not guarantee exposure to cardiac arrest management. Placement here may detract from other important experiences that would be gained elsewhere such as assessing minor wounds or management of chronic ailments. However, whilst this concern is acknowledged, the student would also gain exposure to other

relevant presentations such as chronic obstructive pulmonary disease exacerbations, pulmonary aspiration, and sepsis. Hence, placing a student with the RRT would not detract from other important experiences.

Appropriate environment

The second aim of clinical education is to provide an environment in which the student can practice beyond their present scope to develop and consolidate their learning, while maintaining patient safety. Importantly, this article argues that safeguarding measures must ensure suitable protection to all stakeholders without being constrictive to students' learning opportunities. Indeed, thematic analysis has revealed inconsistencies with respect to mentors' comfort in letting students undertake procedures, with some mentors allowing students considerably greater independence than others (Worsfold et al. 2024). To account for this, improved mentor education is needed to deepen mentors' understanding and build confidence surrounding the capabilities of students under their tutelage.

Conclusion

Many paramedic students struggle to gain practical experience in managing OHCA. This challenge is associated with multiple streams including infrequent OHCA events for students to attend, hesitation on part of students and mentors to get students involved in OHCAs, and ethical concerns related to patients' rights to receive the best care during OHCA. This challenge concerns patient safety as registered paramedics without OHCA experience may produce inferior OHCA outcomes (Dyson, et al., 2016). Greater use of wider healthcare placements to increase students' exposure to cardiac arrest may provide a solution to overcome this.

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