"Resuscitation on the go"- Musculoskeletal discomfort, CPR quality and provider experiences in a transit ambulance setting: A simulated, mixed-methods study

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Abstract

Background Performing high-quality cardiopulmonary resuscitation (CPR) in a moving ambulance poses biomechanical and ergonomic challenges. This pilot study aimed to evaluate musculoskeletal discomfort, CPR quality, and provider posture, while exploring the experiences of healthcare providers delivering CPR in a moving ambulance.

Methods A mixed-methods study involving 30 Emergency Medical Service (EMS) providers and students aged 18–40 years trained in Basic Life Support was conducted. Participants performed CPR simulation in an in-hospital stationary setting and a moving ambulance using a Little Anne® QCPR mannequin (Laerdal Medical, Stavanger, Norway). Musculoskeletal discomfort was assessed before and after CPR in the moving ambulance using the Numerical Pain Rating Scale. CPR quality parameters, including compression score, depth, rate, recoil, and chest compression fraction, were recorded using the QCPR® app. Body posture was assessed using mean trunk and elbow angles during compression and recoil. Semi-structured interviews explored participants' experiences.

Results Median pain scores increased significantly after CPR in the moving ambulance [0 (0, 2.75) before vs. 4 (0, 6) after; $p < 0.001$]. The most common pain sites were the lumbar region and wrists. Chest compression score and good rate percentage were lower in the moving setting. Trunk and elbow angles showed greater flexion in the moving ambulance, with changes observed across consecutive CPR cycles. Qualitative analysis revealed themes of physical fatigue, balance issues, safety concerns, and ergonomic limitations. Participants recommended simulation-based training, improved ambulance design, and mechanical CPR devices.

Conclusion CPR in a moving ambulance was associated with increased musculoskeletal discomfort and lower CPR quality metrics. Ergonomic modifications, provider training, and mechanical aids may help address these challenges. Further studies with larger and more diverse populations and real-world transport conditions are warranted.

Trial registration Prospectively registered in Clinical Trial Registry India (CTRI/2024/09/073482) on September 5th, 2024.