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CLINICAL PAPER

Comparison of sequential and simultaneous breathing and pulse check by healthcare professionals during simulated scenarios☆

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Summary
Background: Basic life support guidelines for healthcare professionals recommend a sequential breathing and carotid pulse check allowing up to 10 s for each assessment. Life support providers are sometimes taught to do a simultaneous assessment of breathing and pulse check for up to 10 s. It is not clear whether this assessment improves diagnostic accuracy.
Methods: We recruited 119 healthcare professionals. The SIM-Man™ was used to develop 10 simulated cases scenarios. To assess performance, 89 participants did 10 simultaneous assessments followed by 10 sequential assessments, and 29 participants did the assessment techniques in reverse order. The primary outcome of the study was the number of correct diagnoses made with each assessment method.
Results: There were more correct diagnoses with a sequential assessment; 48.2% (569 out of 1180) compared to 33.5% (395 out of 1180) for the simultaneous method. Only 26.3% ($n = 31$) had more than five accurate diagnoses with a simultaneous assessment, compared to 44.1% ($n = 52$) for sequential assessments. Those performing sequential assessment achieved a median score of 5/10 correct diagnoses compared to a median score of 2.5/10 for the simultaneous method (Wilcoxon $Z = -4.63$, $p < 0.001$). Sensitivity for the pulse check was 99% for both assessments; specificity was 48.9% for a simultaneous assessment and 61.9% for the sequential approach. For breathing check, specificity, sensitivity and accuracy were also higher with the latter method (sensitivity 99.6%, specificity 70.6% and accuracy 88%)

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Conclusion: A sequential assessment of breathing and pulse by healthcare professionals has greater diagnostic accuracy in simulated case scenarios.

Introduction

Early recognition of cardiorespiratory arrest and avoiding delays in summoning help and starting resuscitation improves survival.[1] A shorter assessment period and the early initiation of cardiopulmonary resuscitation are associated with better outcomes after cardiac arrest. However, recognising a cardiopulmonary arrest can be difficult even for healthcare staff.

Studies of healthcare professionals and laypersons assessing the absence or presence of a carotid pulse with healthy non-obese volunteers,[2–4] manikins,[5] anaesthetised patients[6] and those undergoing cardiac surgery[7] show that many experience difficulties in detecting signs of circulation. Accuracy in palpating the carotid pulse improves when the assessment time increases from 5 to 10 s. Two studies[2,3] reported success rates of between 73.7 and 88% in pulse detection within a 10 s timeframe, yet in another study only 15% of participants achieved a correct diagnosis within 10 s.[7] This study[7] used anaesthetised patients undergoing cardiac surgery and randomly allocated lay persons, paramedics in training or certified paramedics to a 10 s assessment period of spontaneous circulation or non-pulsatile cardiopulmonary bypass to confirm the absence or presence of the pulse. This approach may account for the difference in results with studies involving healthy volunteers[2,3] where circulation is always present. To further estimate the diagnostic accuracy in detecting the pulse, the specificity and sensitivity were calculated using a 2×2 matrix grid. The results show that for pulse check, the sensitivity was 90% and specificity 55%. Hence, the absence of the pulse was not confirmed in 10% of instances, and in 45% of cases this sign was undetected despite being present. Based on this evidence,[7] the pulse check is no longer recommended for use by lay rescuers.[10] Recent studies[8,9] cast further doubt over the skills and techniques of healthcare trainees in checking signs of circulation.

The ability of first responders and lay rescuers to assess signs of breathing has also being questioned. Of 261 volunteers who were assessed checking breathing during an emergency situation, just over half achieved an accurate diagnosis within a defined time.[11] Increasing the time taken to check breathing and the amount of training in this area were proposed as ways of improving diagnostic accuracy. A more recent study of 48 2nd year medical students who were shown a series of video clips of normal, abnormal and absent breathing, concludes that the participants are unable to identify normal breathing from abnormal breathing reliably, leading to inappropriate and detrimental actions.[12]

Thus, despite advances in resuscitation practice, the evidence implies that both lay persons and healthcare staff cannot reliably perform breathing and pulse checks. While it is recognised that resuscitation manikins are valuable in developing a range skills they have their limitations in that they are unable to simulate physical movements or changes in skin colour which rescuers are taught to assess in those found collapsed and unresponsive.

The current basic life support (BLS) guidelines[1,13] recommend that breathing and carotid pulse check should be performed sequentially taking up to 10 s for each assessment. Some healthcare professionals however are taught to perform both skills simultaneously for up to 10 s to save time in making a diagnosis. It is not clear whether a sequential or simultaneous breathing and pulse check produces greater diagnostic accuracy. This study aims to compare the diagnostic accuracy of simultaneous assessment of breathing and pulse for up to 10 s with a sequential assessment for up to 20 s.

Methods and materials

The setting was a clinical skills training laboratory in a university health and social care department.

Participants

Participants had to be registered healthcare professionals employed by one of three local hospitals, have undertaken a BLS course since qualification and enrolled as a current university student. The study had ethical approval from the hospital and university research ethics committees. Informed consent was obtained from all participants. A total of 119 participants were recruited over an 18-month-period up to December 2004.