Abstract

Background: Safe administration of oxygen during resuscitation and intensive care is crucial not only for supporting patient oxygenation but also in terms of preventing the risk of ignition during defibrillation. Increased oxygen concentration in the patient's surroundings may, in combination with an electrical discharge, pose a serious hazard. However, clinical data on actual changes in environmental oxygen concentration are limited.

Objective: The aim of this study was to determine whether different oxygen therapy modalities and airway management techniques lead to changes in oxygen concentration in the patient's surroundings at various time intervals and measurement locations.

Methods: This prospective observational study was conducted at the Department of Anaesthesia and Intensive Care Medicine and in operating theatres of the University Hospital Královské Vinohrady in Prague. A total of 57 patients were included. Oxygen therapy was applied using four modalities: face mask, bag-mask ventilation, laryngeal mask airway, and orotracheal intubation. Oxygen concentration was measured with the GOX 100 T device at six locations (in front of the face, on the chest, in both axillae, at 1 m and 2 m distances) and at eight time points (from initiation up to 10 minutes after termination of therapy). Statistical analysis was performed in R using the Shapiro–Wilk test, linear mixed-effects models, and post-hoc power analysis.

Results: The most pronounced increases in oxygen concentration were observed during bag-mask ventilation and orotracheal intubation, particularly in close proximity to the patient (face and chest). These changes appeared within the first minute, persisted throughout the therapy, and returned to baseline within 10 minutes after termination. Face mask oxygen therapy showed no significant changes, and laryngeal mask airway was associated with only a small, clinically negligible decrease. At 1–2 m distance, no relevant changes were observed.

Conclusion: The study demonstrated that different oxygen therapy modalities result in varying changes in oxygen concentration in the patient's surroundings, most notably during bag-mask ventilation and orotracheal intubation. However, these changes did not approach levels that would pose a real risk of ignition during defibrillation, provided that standard clinical procedures are followed. Our findings emphasize the importance of strict adherence to safety measures and continuous training of healthcare personnel when working with oxygen during resuscitation.

Keywords: oxygen therapy, defibrillation, safety, oxygen concentration, intensive care, resuscitation