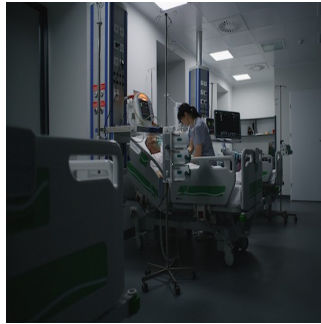

Arterial Partial Oxygen Pressure and Mortality in Sepsis Patients



Sepsis is a severe condition characterised by organ dysfunction due to impaired oxygen delivery and utilisation by cells. In ICUs, oxygen is often administered to sepsis patients, especially those with sepsis-induced hypoxaemic respiratory failure. Traditionally, the goal is to maintain a partial pressure of oxygen in arterial blood (PaO₂) around 60 mm Hg, where over 90% of haemoglobin is saturated. However, this target may not be appropriate for sepsis patients due to their abnormal oxygen transport and utilisation.

Observational studies suggest a U-shaped relationship between PaO₂ and mortality, leading to trials to optimise the oxygenation range in ICU patients. Despite these studies, no consensus exists on the optimal PaO₂ range for sepsis treatment. Some studies indicate higher mortality with high oxygen levels, while others suggest that higher oxygen targets may improve outcomes. Recent research has shown higher mortality with low oxygen targets than with high oxygenation strategies.

A new review evaluates the hypothesis that higher PaO₂ (≥ 80 mm Hg) benefits critically ill sepsis patients, comparing the effects of higher oxygenation ranges on mortality with conservative oxygenation therapy. The study utilised data from the Korean Sepsis Alliance (KSA) registry, an ongoing nationwide observational cohort. The registry collected data prospectively on 13,827 sepsis patients from 15 hospitals in South Korea between September 2019 and December 2022.

Of the 13,827 patients in the KSA registry, 4,147 were included in the study. Baseline characteristics of the entire cohort were largely similar, except for age, sepsis type, infection site, C-reactive protein levels, mechanical ventilation use, and microbiological factors. 1,211 patients were assigned to the liberal PaO₂ group and another 1,211 to the conservative PaO₂ group.

The median PaO₂ measured on ICU day 1 was 107.2 mm Hg in the liberal PaO₂ group and 84.4 mm Hg in the conservative PaO₂ group. Throughout ICU days 1–3, median PaO₂ values were significantly higher in the liberal PaO₂ group than in the conservative group.

The median FiO₂ on ICU day 1 was 44.0% in the liberal PaO₂ group and 40.0% in the conservative PaO₂ group, with no significant difference. On ICU day 2, FiO₂ levels were similar between the groups. However, on ICU day 3, the conservative PaO₂ group had significantly higher FiO₂ than the liberal PaO₂ group.

On ICU day 1, the respiration SOFA score was not significantly different between the groups. However, on days 2 and 3, the conservative PaO₂ group had significantly higher respiration SOFA scores than the liberal PaO₂ group.

At day 28, there was a significant difference in mortality between the liberal PaO₂ and conservative PaO₂ groups, with 190 out of 1211 patients (14.9%) in the liberal PaO₂ group and 231 out of 1211 patients (19.1%) in the conservative PaO₂ group experiencing mortality. The liberal PaO₂ group showed a significantly higher probability of survival. These differences were consistent for early prognosis at 7-day and 14-day mortality.

In secondary outcome analysis, ICU and hospital mortality rates also favoured the liberal PaO₂ group. Although not statistically significant, the liberal PaO₂ group had a lower 90-day mortality (27.0%) than the conservative PaO₂ group (31.3%). The incidence of new-onset renal replacement therapy (RRT) was lower in the liberal PaO₂ group compared to the conservative group. No statistical differences were observed between the groups in terms of invasive ventilation, arrhythmia, or cardiopulmonary resuscitation.

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Competing risk analysis indicated that a higher oxygenation range was associated with an increased likelihood of ICU discharge by day 28 compared to conservative oxygenation, even after adjusting for death as a competing event. Subgroup analyses suggested that higher oxygenation levels were associated with reduced 28-day mortality risk in males, patients with hospital-acquired sepsis, those receiving vasopressors, mechanically ventilated patients, those without moderate to severe ARDS, and those with lactate levels ≥ 4 mmol/L. Among patients with pulmonary infection, those in the liberal PaO₂ group showed a lower tendency for mortality at day 28 compared to the conservative group.

Overall, differences in outcomes between the liberal and conservative PaO₂ groups were more pronounced on ICU days 2 and 3 compared to ICU day 1, highlighting the potential benefits of higher oxygenation levels in critically ill sepsis patients early in their ICU stay.

These findings challenge the notion of a universal oxygenation strategy, particularly in sepsis. Future studies on optimal oxygenation should focus on more homogeneous patient groups to better understand and tailor oxygen therapy to individual patient needs.

Source: [Critical Care](#)

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