

# ASSOCIATION OF INTRADIALYTIC CENTRAL VENOUS OXYGEN SATURATION VARIABILITY AND MORTALITY



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## Background

Hemodialysis (HD) patients have an elevated mortality compared to the general population; the majority of deaths are due to cardiac disease. Intradialytic myocardial stunning and left ventricular hypertrophy may eventually result in low cardiac output. Central venous oxygen saturation (ScvO<sub>2</sub>) is reflective of balance between cardiac output, oxygen delivery and oxygen consumption. Low and declining intradialytic ScvO<sub>2</sub> may be a marker of hemodialysis induced hemodynamic stress and an inability of the cardiovascular system to appropriately compensate. While small studies have evaluated intradialytic ScvO<sub>2</sub>, none have followed it continuously throughout dialysis.

## Methods

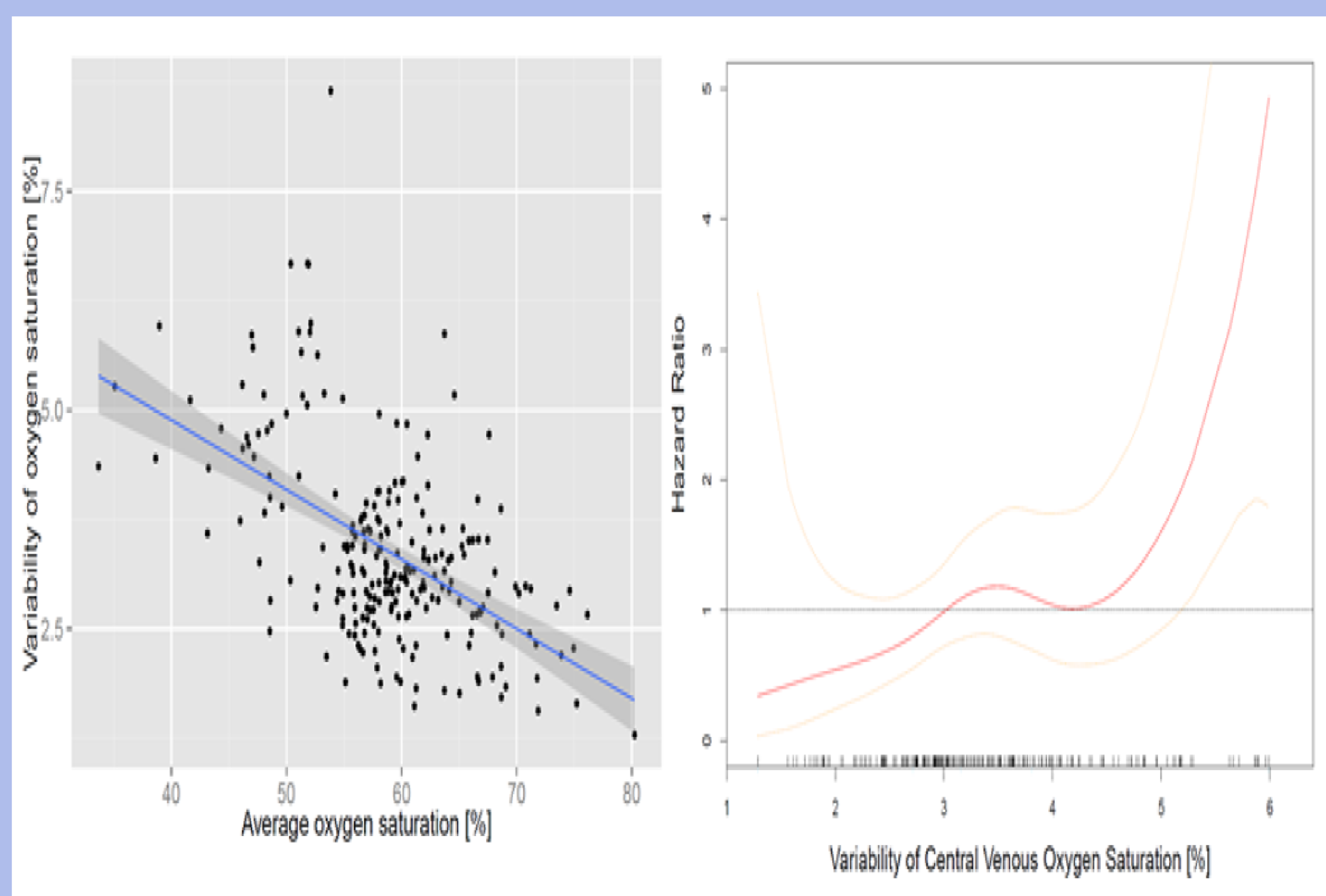
The Crit-Line Monitor™ reports hemoglobin oxygen saturation once a minute and was routinely used in 17 outpatient HD units across the U.S. ScvO<sub>2</sub> levels were obtained in patients with central venous catheters (CVC) as vascular access. We studied a total of 232 patients between 1/2012 and 8/2015, whereby a 6-months baseline period preceded follow-up until the end of the study for up to 36 months follow up. Mean ScvO<sub>2</sub> and standard deviations (SD) of ScvO<sub>2</sub> were calculated per treatment and averaged across treatments per patient during baseline period. Average SD on a patient level served as an indicator of ScvO<sub>2</sub> variability. The relationship between ScvO<sub>2</sub> variability and mortality was examined using spline analysis of hazard ratios (HR).

## Results

Mean ScvO<sub>2</sub> was 58.7% ± 7.3% and ScvO<sub>2</sub> variability was 3.4% ± 1.1%. During follow-up, 54 patients died. Mean ScvO<sub>2</sub> and ScvO<sub>2</sub> variability were inversely correlated (r = -0.53, P<0.001). (Fig 1 left panel) HR spline analysis indicated significantly higher risk of death in patients with ScvO<sub>2</sub> variability > 5%. (Fig 1 right panel)

## Discussion & Conclusion

To our knowledge, this is the first study to examine intradialytic ScvO<sub>2</sub> continuously. We have identified a moderate inverse association between mean ScvO<sub>2</sub> and ScvO<sub>2</sub> variability. Furthermore, patients with higher ScvO<sub>2</sub> variability had higher mortality. We hypothesize that intradialytic hemodynamic stress and autonomic dysfunction may be root causes of higher ScvO<sub>2</sub> variability and that high ScvO<sub>2</sub> variability is likely to identify patients with poor cardiovascular compensatory reserve. Specifically designed studies are required to further test this hypothesis.



**Figure 1:** *Left panel:* Scatter plot of ScvO<sub>2</sub> variability versus mean ScvO<sub>2</sub>.

*Right panel:* Spline analysis of hazard ratio for mortality as a function of ScvO<sub>2</sub> variability. The solid line represents mean HR, the dotted lines 95% confidence intervals.