

Effect of serum potassium, ionized Calcium and magnesium on mortality, ventricular arrhythmias and QTc interval in patients admitted to the coronary care unit

Aims: To investigate the level of commonly obtained electrolytes (including serum potassium, ionized calcium, and magnesium) associated with in-hospital mortality, ventricular arrhythmias, and corrected QT (QTc) intervals among the coronary care unit (CCU) patients.

Methods and Results: This study identified 8,498 consecutive CCU patients from 2004 through 2013. Serum potassium 4.0- $<$ 4.5 milliequivalents per liter (mEq/L), ionized calcium 4.6- $<$ 4.8 milligrams per deciliter (mg/dL), and magnesium 2.0- $<$ 2.2 mg/dL were used as the references. An association between first serum electrolytes and in-hospital mortality included a U-shaped relationship for serum potassium [Odds Ratio (OR) 1.54 and 2.95 for potassium 4.5- $<$ 5.0 mEq/L and \geq 5.0 mEq/L, respectively] and an inverted J-shaped relationship for ionized calcium (OR 2.86 and 1.76 for calcium $<$ 4.4 mg/dL and 4.4- $<$ 4.6 mg/dL, respectively). For serum magnesium, the mortality was greater only among patients with the highest levels (\geq 2.4 mg/dL; OR 1.80) compared to the reference level (figure 1). Serum potassium $<$ 4.0 mEq/L and ionized calcium $<$ 4.4 mg/dL were independently associated with prolonged QTc intervals (figure 2). Their respective levels and trends of ventricular arrhythmias were similar but weaker. However, serum magnesium did not affect the QTc interval or ventricular arrhythmias (figure 2). Sensitivity analyses examining the association between post-admission serum electrolytes and the outcomes were similar to the main findings.

Conclusions: Albeit serum potassium $<$ 4.0 mEq/L is related to prolonged QTc intervals, potassium \geq 4.5 mEq/L is paradoxically associated with higher mortality. Furthermore, serum ionized calcium $<$ 4.6 mg/dL is associated with an increased mortality and risk of QTc

prolongation. Finally, there is no relationship between serum magnesium and QTc interval, but magnesium >2.4 mg/dL is associated with the greatest mortality among CCU patients.

Figure 1: In-hospital mortality and ventricular arrhythmias (VA) by serum electrolytes

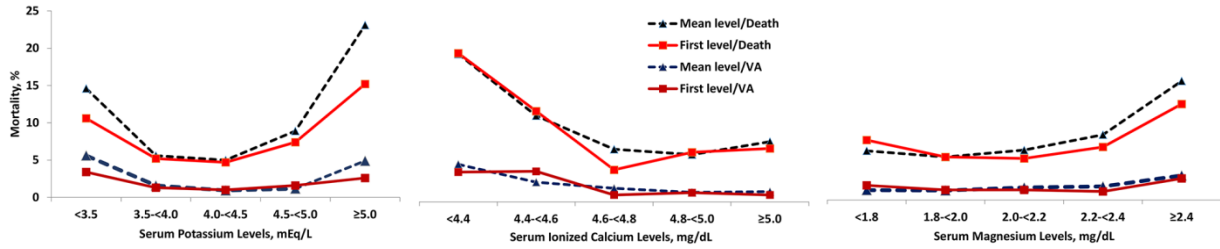


Figure 2: QTc Intervals by serum electrolytes

