

POTASSIUM: IS HIGHER BETTER?

In Preventing Atrial Fibrillation Post-Cardiac Surgery

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INTRODUCTION

Potassium is a fundamental electrolyte in maintaining cardiac function and is critical for treating and preventing cardiac arrhythmias. The association of potassium to cardiac automaticity has led to the common practice of maintaining an elevated potassium level in the critical setting, particularly for post-cardiac surgery patients, to reduce the incidence of atrial fibrillation (AF) ^{1, 2}

Several clinicians and institutional protocols advocate for maintaining potassium levels more than above the normal range (>4.5mmol/L). A 2019 survey by the European Association of Cardiothoracic Anaesthetists (EACTA) showed that 73% of the respondents target high normal serum potassium levels, while 69% of responders use it as a preventative measure ⁴.

Despite the widespread use of maintaining potassium levels > 4.5 mmol/L in post-cardiac surgery to prevent or treat AF, it still lacks empirical support. The 2024 update of guidelines in preventing and managing AF post-cardiac surgery highlights this gap.

Three key studies will be examined:

1. A 2016 retrospective timed-match analysis explored the electrolyte-potassium and magnesium-level changes and post-cardiac surgery AF occurrence ⁶.
2. A 2020 observational cohort study exploring the association of serum potassium and magnesium levels with AF after cardiac surgery ⁷.
3. A 2024 open-label, non-inferiority, randomized clinical trial that explores the impact of potassium level >3.5mmol vs >4.5mmol on AF in post-cardiac surgery ⁸.

This seeks to answer the question: Is maintaining higher serum potassium better for post-cardiac surgery patients to prevent AF. While modest in scope, this hopes to provide a new perspective on the current literature and offer implications for clinical practice, research, and education.

DISCUSSION

First, in a **2016 single - centred retrospective timed-matched** analysis that examined the relationship between potassium levels and AF in 2,041 post-coronary artery bypass grafting (CABG) or valve surgery patients. The findings suggest that **potassium levels were higher for those who developed post-cardiac surgery AF** as compared to those who did not (4.30 vs 4.21 mmol/L, p=0.001). And for those with low potassium levels, **supplementation of potassium did not significantly influence post-cardiac surgery AF development** ^{6, 9}.

Second, the **2020 observational cohort study** further explored potassium and magnesium levels within 72 hours post-cardiac surgery. Of the patients in this study who experienced higher levels of potassium concentration of > 4.5 mmol/L, 48.4% developed AF and 58.0% did not develop AF (p < 0.001). The **relationship between the reduction of post-cardiac surgery AF and maintaining potassium levels <4.5mmol/L ⁷ was modest** (OR 1.43; CI: 1.17-1.75, p < 0.001). While the 2020 observational cohort study provides evidence of modest association of maintaining higher potassium levels and AF post-cardiac surgery, the use of retrospective design prevents the strict standardisation of patient management.

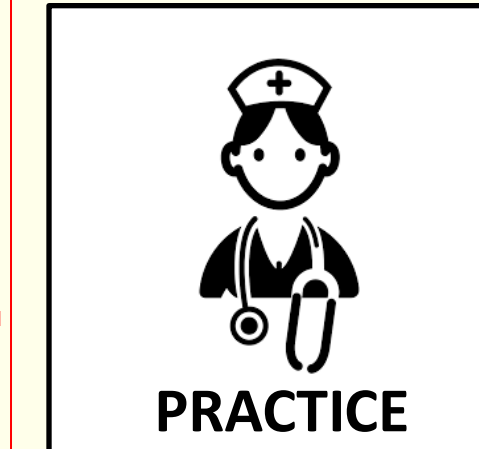
Third, a 2024 non-inferiority, randomised clinical trial (RCT) compared levels at 3.6 mmol/L versus 4.5 mmol/L in preventing AF among adults post-CABG, in sinus rhythm, 120 hours post-cardiac surgery. **The findings highlight the non-inferiority (risk difference of 1.7; 95% CI, -2.6%to 5.9%) of supplementing potassium when level is < 3.6 mmol/L versus when level is <4.5 mmol. The two potassium level groups also did not have any differences in the development of AF among patients after cardiac surgery.** This prospective RCT involved 23 cardiac centres in the UK and Germany from October 2020 to November 2023. The participants were randomised in 1:1 ratio, using block permutation, stratified by site with randomisation done by an independent statistician via secure Sealed Envelope website with all participants accounted for.

CONCLUSION

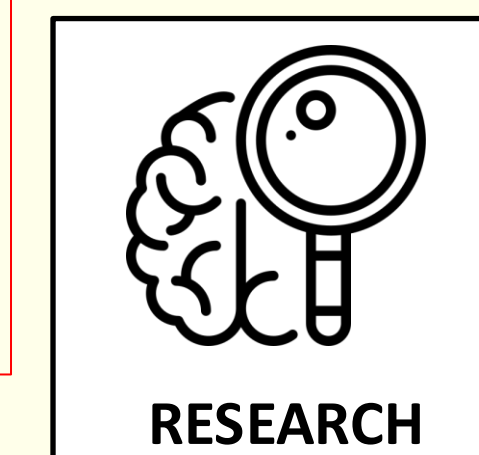
Despite the practice of maintaining elevated potassium levels in post-cardiac surgery critical care settings, there is incongruent evidence to support this as an effective strategy for AF prevention.

While efforts to optimize potassium levels to the higher range seem reasonable in theory, current evidence suggests that keeping potassium at normal levels may offer similar effectiveness. This observation could possibly shift our focus from strict numerical targets to a more nuanced approach that considers how individual patients' electrophysiological responses to electrolyte levels might influence outcomes.

Implications:



1. Consider **K+ target above 3.6 mmol/L** in the management of post-cardiac surgery patients.
2. Revisit potassium supplementation protocol



1. Studies on the relationship between potassium and AF.
2. Explore the interactions of electrolytes and their role in AF prevention, considering the overall balance of electrolytes and AF risk.



1. Update clinical guidelines to reflect the evolving evidence on electrolyte management in post-cardiac surgery AF prevention

Contains 20 mmol potassium in 100 mL

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