Intraoperative Fluid Balance Does Not Enhance Ion Shift Index Predictions Of Postoperative Complications

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Introduction

- A combined Ion Shift Index incorporating four electrolyte values better predicts 30- and 90- day mortality over any individual electrolyte.
- Perioperative fluid balance has also been implicated in worse postoperative outcomes.
- We investigated whether incorporating total operative fluid balance would enhance the postoperative predictive ability of the PACU Ion Index.

Study Design

- Retrospective Cross-Sectional

Methodology

- We retrospectively analyzed 561 consecutive patients who underwent RAPL between September 2010 through January 2025. Potassium, magnesium, phosphate, and calcium levels were recorded from Post-Anesthesia Care Unit timepoint.
- These electrolyte values were used to calculate Ion Index scores at each timepoint using the formula: “(Potassium+Magnesium+Phosphate)/Calcium”.
- Total operative fluid balance was documented to include crystalloids, colloids, transfusion, estimated blood loss, and urine output.
- Total number of complications was recorded and included, but was not limited to, any incidences of AKI, respiratory complications, cerebrovascular incident, pulmonary embolism, myocardial infarction, and hypotension.
- Spearman correlations and Poisson Regression analysis were used to analyze interactions between the ion index and operative fluid balance.

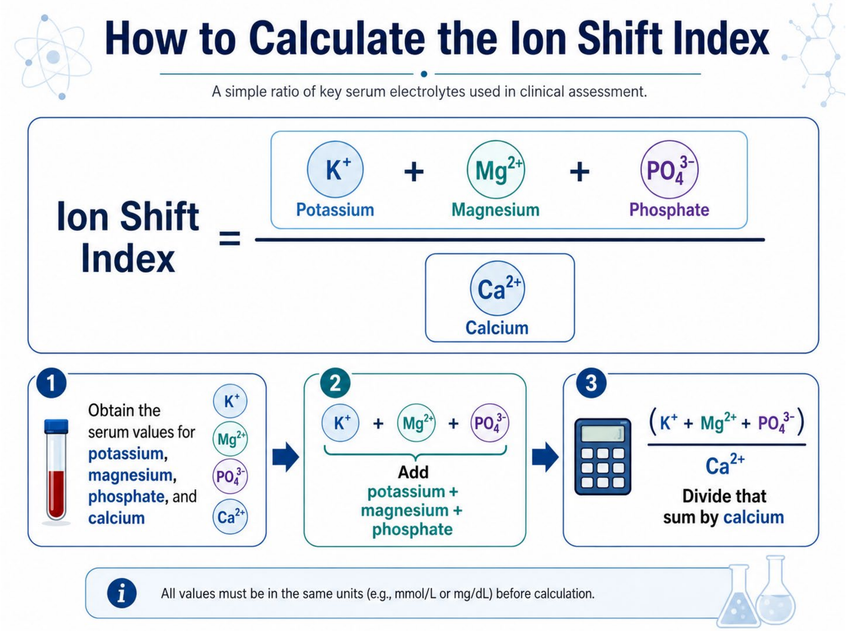

Table 1: Patient Demographics and Baseline Characteristics

Characteristic	Value
Total patients, n	561
Age, years, median (IQR)	70 (63–76)
Male sex, n (%)	366, (44%)
Body Mass Index, kg/m², median (IQR)	27.1 (24.0–31.0)
Charlson Comorbidity Index Score	5 (4–7)

Results

- Mean total operative fluid balance was 1358 ± 42, and mean number of complications across the cohort was 0.96 ± 0.04.
- The PACU index demonstrated a weak, non-significant relationship with total complications (Spearman ρ=0.030, p=0.5022).
  - Poisson regression models including the PACU Ion Shift Index and intraoperative fluid balance demonstrated minimal variance (R^2=0.024).
  - Testing for interactions did not significantly improve model performance (interaction coefficient = 0.003, R^2=0.0023).
- Stratified analysis by low, medium, and high intraoperative fluid balances similarly showed no significant association between PACU Ion Shift Index and postoperative complications.

Conclusion

- Neither the PACU Ion Index nor total operative fluid balance were independent predictors of postoperative events.
- Regression models showed that incorporating fluid balance did not significantly increase the predictive performance of the Ion Shift Index, which implies that postoperative complications are difficult to predict and highlights the need for multifactorial models that integrate more perioperative and patient-specific factors.

Questions?

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