Reviewer's report

Title: Use of a blood gas analyzer and a laboratory autoanalyzer in routine practice to measure electrolytes in intensive care unit patients

Version: 2 Date: 4 March 2012

Reviewer: Paul D’Orazio

Reviewer's report:

This manuscript compares sodium and potassium results for a population of 84 patients in ICU using data from a blood gas analyzer (direct measurement in whole blood) and data from a clinical chemistry analyzer (indirect measurement in serum). Statistically significant differences were found for both sodium and potassium with the direct sensing device reporting lower than the indirect sensing device.

Major Compulsory Revisions

1. The authors conclude that values obtained using blood gas analyzers are not completely reliable in terms of clinical decision making (4th paragraph of Discussion) and central laboratory results should be used, in preference to POCT data, when critical management of therapeutic decisions must be made (final paragraph of Discussion). These conclusions are in disagreement with previously published reports (references 4 and 14) which conclude that direct ISE results reflect electrolyte activity more accurately than indirect ISE because direct ISE are not sensitive to changes in plasma water content due to high or low protein concentration, etc. Data in reference 14 show reported direct ISE data for sodium and potassium to be lower than indirect ISE, in agreement with the authors’ data, related to low protein concentrations as might be found in critically ill patients. The authors should explain why their conclusions are in disagreement with earlier publications.

2. The authors should include data for protein concentration, if available, for their study population to attempt to explain differences in the sodium and potassium data between the two methods.

3. The authors need to support their conclusion of better accuracy for the indirect ISE device with some reasoning. Is it because Na+ and K+ reference intervals at their institution are based on this type of device, or other rationale?

Minor Essential Revisions

1. Statement of approval of the study by ethics committee should be move from its present location in the text to the section titled “Study population”.

2. Reference 16 is a repeat of reference 3 and could be omitted.

3. The title of Table 1 should be changed to include the fact that the measurements shown are for quality control materials.
4. The word "linear" is misspelled throughout the manuscript.

Discretionary Revisions

1. The authors state at the end of the Discussion section that it is not possible to establish whether the central laboratory or ABG values were closer to the true values for either analyte. Standard Reference Material (SRM 956), based on human serum and with Na+ and K+ values assigned by the definitive method, is available from the US National Institute for Standards and Technology (NIST) for this purpose. The authors may consider using this material to test accuracy of their methods.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

My employer is a manufacturer of blood gas analyzers, similar to the device used by the authors of the manuscript. However, I have had a long standing interest in standardization of electrolyte measurements and my employment has not influenced review of this manuscript.