Reviewer's report

Title: Implementation and evaluation of a nurse-centered computerized potassium regulation protocol in the intensive care unit: a before and after analysis.

Version: 1 Date: 15 September 2009

Reviewer: Karl Werdan

Reviewer's report:

> 1. Background

> 1.1. Medication errors are not investigated in the study. Elaboration on this topic is misleading in the introduction. (Di)

> 1.2. Whether or not the implementation of GRIP-II causes only "marginal additional costs and virtually no extra effort" was not assessed in the study. It can hence not be part of the "hypothesis". (Ma)

> 1.2. The exact aim of the study should be clearly stated either at the end of "Background" or in "Methods". A sentence such as "... we describe the extension of GRIP..." is narrative and thus insufficient.

> 2. Methods

> 2.1. It is referred to a "physician protocol" and "these guidelines" with regard to the situation before GRIP-II. The process of potassium regulation before GRIP-II needs a sound description. (Ma)

> 2.2. Why was consultation of an ethics committee not deemed necessary? (Di)

> 2.3. "In a recent study..." - discussion should be avoided in "methods", the paragraph should be kept functional. (Ma)

> 2.4. "The GRIP-II potassium algorithm..." this is trivial and could be spared. (Di)
> 2.5. The methods need a statement that nothing else changed during the study period, otherwise all changes (e.g. changed glucose target or insulin sliding scale for intensive glucose control) should be clearly listed. (Ma)

> 2.6. The exact study period dates should be stated. (Mi)

> 2.7. Fig. 2 is to appear as a detailed flow chart that puts a programmer in the position to write a programme such as GRIP-II. All hidden formulas such as "predicted potassium clearance" or "estimated creatinine clearance" should be explicit. How was the presence of renal replacement therapy incorporated in the algorithm? (Ma)

> 2.8. "...advised this rate..." - this is not in accordance with Fig. 2 as it seems to depend on GFR, potassium and presence of haemofiltration. (Mi)

> 2.9. "...i.e., potassium <2.8 or >6.0mmol/L..." - this is not in accordance with Fig. 2 as it depends on diuresis or GFR, respectively. (Mi)

> 2.10. What is the rationale behind the proposed GRIP-II algorithm and its cut-offs?. (Di)

> 2.11. "The reference range of arterial potassium..." - no need for this statement. (Di)

> 2.12. "Patients received potassium either" - this is redundant as it is described twice in this paragraph. (Mi)

> 2.13. "Before implementation of GRIP-II..." - this should be described above (see 2.1.) (Mi)

> 2.14. How was the decision reached regarding the administration route (parenteral vs enteral)? How were reflux/gastroparesis/diarrhoea managed? Was there a enteral night pause? (Ma)

> 2.15. Was the nurse questionnaire anonymous? At what time during the implementation did they complete the questionnaire? (Ma)

> 2.16. "Prevalence of hypokalemia..." the term " incidence" should be
considered instead? (Di)

> 2.17 It is not clear how the "duration of hypokalemia or hyperkalemia" was calculated from the point measures obtained. (e.g., what is the duration if, between two values within range, just one value was hypo- or hyperkalemic?) An explanation is obligatory. Giving just the number of hyper-/hypokalaiemic measurements would be more intuitive. (Ma)

> 2.18. "skewed data" - How was skewness tested? (Mi)

> 2.19. What was the level of significance? (Mi)

> 2.20. Information on blinding/role of the data acquisition staff is advised. (Mi)

> 2.21. It is mandatory to clearly state primary and secondary endpoints of the study. (Ma)

> 3. Results

> 3.1. Table 2 seems to be table 1. (Mi)

> 3.2. "There were no baseline differences..." might be right according to the data presented. Whether or not it applies to the groups studied is, based on the data presented, just a broad estimation. The following baseline data should be included in table 1 both to characterize the cohort studied (and thus to characterize the cohort to which the results apply) and to be surer about the conclusion "no baseline differences". (Ma)

> - What was the illness severity of the patients? (e.g. APACHE-II-Score)

> - What was the prevalence of chronic kidney disease, chronic dialysis, and the GFR at baseline?

> - What was the incidence of acute kidney injury during the study?

> - What was the rate of renal replacement therapy?
> - What was the baseline potassium?

> - How many patients received potassium enteral/parenteral?

> 3.3. "Figure 4" is missing. (Mi)

> 3.4. How does the diagramme relate to the primary and secondary endpoints? As a "time course of potassium" was not prespecified in the methods section, this appears arbitrary here. (Ma)

> 3.5. "The median levels or their time course..." - this in incomprehendable. Figures (i.e. numbers) are not given. How does this relate to the primary and secondary endpoints (still to be defined). If this is a relevant endpoint of the study it is to be described in the methods section and accompanied by a table with the respective figures. (Ma)

> 3.6. "after the first 8h of ICU admission" - How does this relate to the primary and secondary endpoints (still to be defined). If this is a relevant endpoint of the study the cutoff of 8hrs is to be explained in the methods section. (Ma)

> 3.7. "(defined as..." - this is methods, not results. (Mi)

> 3.8. "of hypokalaemia" duplication of words. (Mi)

> 3.9. "In 14 patients..." How does this relate to the primary and secondary endpoints (still to be defined). This statement follows no systematic plan. (Ma)

> 3.10. "...compared to the old paper protocol..." - which one? (Ma)

> 4. Discussion

> 4.1. There is no relevant contribution of the 2nd paragraph to the discussion. Consider deletion. (Di)
4.2. "...since such factors..." - unfortunately we were unable to understand the meaning of or the idea behind this sentence. (Di)

4.3. "...did not add any significant nursing time or cost..." - we suggest a clear expression that this statement is not a conclusion of the study but a frank estimation of the scientists as time and costs have not been measured in this study. (Ma)

4.4. What was the reason for nurse's noncompliance in the first few weeks of implementation and how could potential obstacles be overcome? (Ma)

4.5. In our view the comparison between a nurse paper protocol and GRIP-II was an even more relevant study subject. The authors should refrain from suggesting that the computer is better than a paper protocol just from extrapolating from earlier findings. The superiority of the computer algorithm over paper protocols published elsewhere is not the result of the presented study. (Di)

5. Limitations

5.1. How could a Hawthorne effect have interfered? (Di)

5.2. Does "...the sharpened glucose control during the study period" mean that other interventions have interfered with the study intervention? This needs definite explanation. (Ma)

5.3. It is suggested that limitations of the nurse survey be included. (Ma)

6. Conclusions

6.1. Safety has not been evaluated in this study. (Ma)
7.1. The GRIP-II source code is NOT available from the website cited. Instead, as document length is no issue in BMC, it is suggested to incorporate it to the paper as an attachment. (Di)

What next?

Acceptance after thorough revision

Level of interest

An article of importance in its field.

Quality of written English

- Acceptable
Statistical review

No, the manuscript does not need to be seen…

Declaration of competing interests

The authors of the peer review declare that they have no competing interests.