Reviewer’s report

Title: Economic and organizational impact of a clinical decision support system on laboratory test ordering

Version: 2 Date: 19 Apr 2017

Reviewer: Nicolas Delvaux

Reviewer’s report:

I first want to commend the authors for this interesting and extensive evaluation of a decision support service. I have several remarks to substantially improve the manuscript.

1. The introduction of the manuscript is far too long. Extensive descriptions of decision support services are made which are not of value to this evaluation. The logic for choosing the charge per test as a proxy for the laboratory's full cost is very extensive and this can be summarized and made more concise. The documentation of the choice for the POESUS survey (including the table with the different surveys) is also too long and can be made more concise. What I do miss in the introduction is a rationale for limiting the decision support service to redundant testing. The review by Zhi 2011 demonstrated that over-utilization is certainly the largest cause for inappropriateness. This can be caused by redundancy, but also by wrongful testing (wrong indication). Additionally, under-utilization is a form of inappropriateness which is not targeted at all here. I also miss a description of how the redundancy rules are triggered in the absence of an indication. For example, a yearly cholesterol-test may be redundant in a healthy 30 year old male, but not in a 65 year old male with cardiovascular disease. If this information is missing, how is it possible to design accurate rules?

2. I had some troubles understanding the methods of this evaluation. At the end of the introduction, 3 objectives are formulated, however in the discussion section 4 (different) objectives are repeated. It is unclear what the true objectives of this trial were and which type of research design was used. In the methods section, a form of before-after design with a historical control group is suggested, however in the results section table 5 reports on a 'control' group. It is unclear to me what this control group was since it appears that they also has a CDSS implemented? I would like to see a coherent and concise description of the study design in the methods section which mirrors the results section. I would like to see a primary outcome and an assessment whether the samples reported on are sufficient to be able to measure a clinically significant difference for this primary outcome.

3. The results section can be made more concise to convey the most important results more easily readable. It is unclear why the results are not reported in total and always per facility. I would prefer to see total results (like in table 3), and where relevant, the results per facility. I do not agree with the report on (in my view) the most important result. Table 3 reports that mortality before the intervention was 10.46 (units are unclear) and increased to 12.03 after the intervention. This is a 15% increase! However, the authors report this as 'not substantial'? All the tables lack units (15 FT4 requests in 3 months for a medicine department seems very low). There
is also need for more statistical analysis. The statistics reported on are very basic, with no confidence intervals or p-values.

4) The discussion section needs improvement. The objectives reported here were not mentioned before and the results do not offer an answer to these objectives. There are no reports on turnaround time, no reports on organizational performance, no report is made on the cost evaluation of non-appropriate testing, no measure is made of the number and percentage of inappropriate tests, and no reports are done on adverse events. Whereas the introduction is far too long, the discussion is far too meager. No limitations to this trial (and there are several) are described. The discussion claims that there were no "statistically significant differences in the inpatients' characteristics", but no p-values were reported and I would be very surprised if a 15% difference in mortality between both groups would not be 'statistically significant'.

Conclusion: if this report is to evaluate effectiveness of the CDS on inappropriate testing, then some fundamental design issues need to be addressed. I suggest taking a look at CONSORT statements to guide the structure of the manuscript. If the objective is to report on usability, acceptability and user satisfaction, then a more detailed description of the implementation strategy is needed and a more structured discussion on barriers and facilitators to using decision support systems is required. I would also advise to have the manuscript proofread by a native English speaker before submission.

**Are the methods appropriate and well described?**
If not, please specify what is required in your comments to the authors.

No

**Does the work include the necessary controls?**
If not, please specify which controls are required in your comments to the authors.

No

**Are the conclusions drawn adequately supported by the data shown?**
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