Author’s response to reviews

Title: What hinders the uptake of computerized decision support systems in hospitals? A qualitative study and framework for implementation

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Author’s response to reviews:

REVIEWER 1

Dear Reviewer #1,

Many thanks for reviewing our article. We have carefully considered all your comments and suggestions and revised the paper accordingly. A point-by-point response is outlined below. Your feedback has been extremely helpful for clarifying our analytical approach and developing
our arguments. We want to extend our sincere appreciation for taking the time and effort necessary to provide such an insightful guidance.

1) Consider whether this is in fact a GT study or just a thematic analysis (i.e., coding of interview data and thematic analysis of relationships between codes). If GT, provide more detail about the GT process of asking questions, and verifying, expanding, and falsifying hypotheses. If thematic analysis, provide more detail on the coding and analysis process. What codes were developed? How did the authors move from these codes to the 2x2 framework and positions?

1) Many thanks for this comment. We appreciate that the previous version of the article did not include a clear description of our analytical approach, nor it clarified our sensitizing concepts. To address this issue, we have redrafted both the Background and the Data Analysis sections. The new Background section clarifies our hypotheses and sensitizing concepts and the role they had in interrogating our findings (pages 4-5). The new Data Analysis section outlines the stages of our analysis (please see section 2.4, pages 6-7).

Although we acknowledge that we did not follow all the steps of a traditional Grounded Theory approach, and that our theoretical sampling was limited for pragmatic reasons, we think that our approach went beyond a plain thematic analysis. We used our sensitizing concepts to interrogate the data (e.g. to challenge the view of a linear relationship between settings’ structural characteristics and participants’ attitudes towards CDSSs), adopted a constant comparative approach to generate higher-level themes from our preliminary codes, and identified the patterns and mechanisms that underpin the relationships among themes (our core category). To capture this, we re-labelled our approach as “a constant comparison approach inspired by Grounded Theory principles” (page 6, beginning of section 2.4; page 5, beginning of section 2.1).

2) Regardless of methodology, more detail is needed regarding the development of the 2x2 framework and positions. What constitutes a ‘position’? Are the positions mutually exclusive? How were these positions identified?

2) We addressed these questions in the newly written data analysis section (2.4, pages 6-7) and in the redrafted Discussion (Section 4, below Image 2, pages 14-15). In section 2.4, we explain how the positions emerged by plotting our preliminary codes on the two dimensions framework (familiarity with technology and trust towards evidences [Figure 1]). Each position captures a consistent set of experiences and representations of CDSSs, and is characterized by specific barriers to CDSS uptake. The six positions represent a gradient of
acquisition of control over the CDSS (from low to high). The concept of negotiation of control over the CDSS is the core category of our analysis.

In the discussion, we explain that the positions are, conceptually, mutually exclusive – but this does not mean that each setting is characterized by one position only. Participants from the same settings often provided a variety of different views, condensed into different ‘positions’. Moreover, a single interview has sometimes contributed to more than one position. The positions are not necessarily progressive, nor do they overlap with the point of view of individual participants. Rather they served as an analytical tool for giving (presentational) order to participant’s reflections and characterizing the various types of barriers to CDSSs’ uptake.

3) What evidence is used to support the 2x2 framework?

3) The idea that CDSSs are a complex healthcare interventions, and that scientific evidences and information technologies are two of its key components, is grounded in our theoretical background (see Section 1, 4th and 5th paragraphs). While progressing in our analysis, we have understood that participants’ perceived familiarity with information technologies and their perceived value of, and trust towards, scientific evidences played a more important role in shaping their perceptions of CDSSs than the structural characteristics of the setting where they worked in. We have therefore used these two dimensions to organize our preliminary codes and identify patterns of experiences of using the CDSS. This is explained in Section 2.4 and showed in Appendix 1 (supplementary material).

4) Are there differences among the settings in what positions are endorsed?

4) Thanks for raising this important question. As we now explain in the discussion, participants from the same settings often provided a variety of different views, condensed into different positions. We have not found a linear correspondence between contexts’ structural conditions (their informatization maturity and their access to evidence) and the positions that each setting endorses. For example, the second position features strong barriers to CDSSs’ adoption, and yet has been constructed based (also) on interviews from ‘mature’ settings such as C1. However, it is important to note the latest positions (5 and 6) are only represented in contexts that currently use a CDSS. This seems to suggest that the most challenging of perceived obstacles may exist prior CDSSs’ introduction, while the use of the technology itself might alleviate its tensions and negative expectations. We explain this in Section 4, below Image 2 (end of page 14, beginning of page 15). Appendix 2 (supplementary material) makes these findings more visible.
5) Please include a table that presents exemplar quotes for each setting and professional group for each position (or indicate that the quotes are not available). This will help establish that the quotes represent repeating patterns of views among the participants and will highlight what is being discussed more by leaders, physicians, and nurses. Differences among settings and professional groups should be highlighted.

5) The table can be found in Appendix 2 (supplementary material). In the newly written discussion, we have also explained that different professional roles contributed to constructing different aspects of the positions. Clinicians’ accounts form the core of each positions, reflecting the end-users perspectives and views of CDSS; IT staff and hospital managers, on the other end, assisted in outlining the organizational barriers/facilitators to CDSSs and constructing our framework for implementation. Please see Section 4, the paragraph below Image 2.

6) It occurs to me that the CDSS may not be that useful for orthopedic surgeons, for example. What is the evidence that the CDSS is in fact useful for all of the interviewed participants?

6) Many thanks for raising this important point. In the background (Section 1, page 4, second paragraph), we have added a sentence on the existing evidence in support of the benefits of the use of CDSSs in surgical fields. We acknowledge that the generalizability of this evidence is limited. Nevertheless, until opposite evidence is generated, we would suggest that these studies confirm the usefulness of CDSS for surgeons as well as physicians. We very much agree with the reviewer that surgeons might not perceive CDSSs as useful in the same way physicians do. Our theoretical sampling aimed to capture a diversity of perspective to generate a richer picture of the perceived barriers and facilitators to CDSS.

7) Consider presenting a conceptual framework for the study. It would be helpful for the reader to understand how this study fits in to extant theory, both in regard to implementation science, but also more broadly to the literature on individual and organizational change. Another potentially useful approach could be to ground this study in the CDSS literature. What don’t we know about implementing CDSS in particular, and how does this study advance knowledge in that area?

7) Many thanks for this comment – we agree that the article needed more grounding in existing literature and theory. Unfortunately, the word limit meant that we could not expand on out conceptual framework as much as we would have liked to without compromising description of our findings. We have, however, redrafted the Background section and provided references of the literature and concepts on which we ground our analysis.
We would like to thank you very much for your helpful and constructive feedback. We have taken your review very seriously and worked hard to address your comments. We believe that, as a result, the new version of the paper is stronger, clearer, and easier to read. A point-by-point response to your comments is outlined below.

1) It seems that there is a little confusion about the references. The first reference is the number 4, rather than 1. The references 1-3 are in the Box 1, and these references (1-3 in the Box 1) seem to relate to the references of the editor's letter. Please, review them. Box 1 looks important, since it presents the evidence for the implemented innovation, (the Computerised Decision Support System - CDSS). As the references are confusing, I didn't understand if Box 1 was a part of the manuscript or the letter. So, in my opinion, Box 1 should be in the manuscript, but the references must be corrected.

1) Many thanks for highlighting this issue. We want to clarify that the Box 1 is indeed part of the article text (and not of the cover letter). There was a technical issue with the references because the text was inserted in a text box, but we managed to solve it. The relevant references are 35, 36 and 37.

2) Another suggestion would be the adoption of SQUIRE (Standards for Quality Improvement Reporting Excellence), a publication guideline for quality improvement reporting. SQUIRE was developed in an effort to reduce uncertainty about the information deemed to be important in reports of healthcare improvement and to increase the completeness, precision and transparency of those reports (Ogrinc G, et al. SQUIRE 2.0: revised publication guidelines from a detailed consensus process. BMJ Qual Saf 2015).

2) Another valuable suggestion. We are familiar with the SQUIRE framework and we have reviewed our paper to maximize adherence to it. We believe that the new Background and Methods section are now more consistent with the SQUIRE recommendations (e.g. they provide a summary of what is currently known about the problem, including frameworks, models, concepts used to explain the problem; they describe the methods used to draw inferences from the data and for understanding variation within the data). Since our study is not a Quality Improvement report per se (it does not focus on the steps taken to introduce CDSSs, but rather on participants’ perceptions of them), we have deviated from SQUIRE
3) In my opinion, the importance of implementation and use of Computerised Decision Support Systems (CDSSs) should be more debated in the background. I think Electronic Health Record's benefits and the importance of scientific evidence in routine practice should be discussed by the authors. These topics seem to point that the use of CDSSs may improve both, clinical and process healthcare. Although this is a common justification for researchers in the area of quality improvement, the topic may not be very familiar to other professionals. I think you should talk about it.

3) Many thanks for this comment – we agree that the study needed more grounding in existing literature and theory. Unfortunately, the word limit meant that we could not expand on our conceptual framework as much as we would have liked to without compromising description of our findings. We have, however, redrafted the Background section (Section 1, pages 4-5) and provided references of the literature and concepts on which we ground our analysis. We also included more explanation of the potential value and controversies of both EHR and CDSS.

4) A grounded-theory approach: I would like to know more about what contextual factors, features, conditions and outcomes were collected.

4) We have substantially redrafted the Methods section to clarify on exactly what areas were explored through the interviews and how data were collected. Please see Section 2, and specifically sub-section 2.3 (page 6).

5) Participants: According to authors, the method used to collect data through interviews was the same to the different participants included (end-users of the CDSS, nurses and doctors; information technology staff; senior leaders). Please, rewrite it explaining this section and including more information about it. Is there any justification for the same factors to be collected between different participants? If there is, it's important to clarify. If there isn't, it's important to discuss.

5) We adopted the same interview topic guide for all our participants, irrespective of their role. However, the topic guide was used flexibly and adapted to the different groups of participants: it was not a close-ended questionnaire, but rather a flexible framework developed to explore participants’ views and experiences of CDSSs. For example, while
clinicians were prompted to reflect on their first-hand experiences of clinical evidences, information technologies and CDSSs, senior leaders were asked to discuss the high-level strategy of the hospital with respect to the same topics. The newly written Data collection section provides these clarifications – please see Section 2.3 (page 6).

6) Why are there different numbers of physicians, leaders and IT staff? What was the criteria for inclusion? Was there any refusal? Is there another explanation? Please, clarify it in the manuscript.

6) The newly written Settings and Participants sections (2.2, page 5-6) provides an explanation to these questions. The sampling criteria were partially defined a priori: we aimed to include not only end-users of CDSS (doctors and nurses) but also participants that may play key role in understanding the cultural and political underpinning of CDSS’s adoption. Consistently with the Grounded-Theory principle of ‘theoretical saturation’, the final number of research settings and interviewees-per-role was decided while the research was being conducted, based on the preliminary analysis of a sub-sample sample of interviews. For example, setting C2 was not included in the original study sampling; it was added during data collection to explore further complexity in the experiences of using CDSSs. Similarly, since nurses’ views and accounts were more consistent with each other than doctors’ ones (surgeons and physicians), we decided to expand our sample to include more doctors than nurses. Our sampling was limited for pragmatic reasons; we acknowledge this limitation (end of page 15) but we want to emphasize that this is qualitative study that does not aspire to achieve statistical generalizability. Rather it aims to generate insights that may be used to develop surveys that assess clinicians’ attitudes towards CDSS more extensively across contexts and countries.

7) The paragraph written after the figure 2 on page 14 is very important. In my opinion, it is relevant because it points the six positions not necessarily progressive or linear, nor they overlap the point of view of individual participants, independent of the moment of CDSS implementation in the service. However, understanding that the various stages of technology implementation in different settings of this study may be a bias in uptake of CDSS, I suggest you include some discussion about this in this section. I believe that this discussion is fundamental for the enrichment of the study.

7) Thank you for the valuable suggestion. In the new version of the paper, we provide in-depth discussion of the relationship between settings’ structural characteristics (access to evidence and level of informatization) and the six positions. You can find evidence of this in the newly written data analysis (Section 2.4) and in the discussion (Section 4, below Figure 2, pages 14-
15). Appendix 2 (supplementary material) also clarifies which positions are endorsed in which settings.