Author’s response to reviews

Title: Healthcare Information Systems: The Cognitive Challenge

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Author’s response to reviews:

Editor Comments:

In addition to the revisions requested by the reviewers, we would be grateful if you could make the following editorial revisions:

1. As suggested by reviewer 1, please complete a copy edit of the entire manuscript and correct any spelling and grammar errors that you find.

A Response: Done

2. Please ensure that the abstract is split up into the following sections only: background, main body of the abstract and short conclusion. Please re-upload the revised abstract into the submission system so that it matches the abstract included in the manuscript file.

A Response: Done

3. At the end of the main text (before the references) please include a full declarations section which must contain all of the following sub-sections:

- Ethics approval and consent to participate
- Consent to publish
- Availability of data and materials
- Competing interests
- Funding
- Authors’ Contributions
- Acknowledgements

Where a mandatory Declarations section is not relevant to your study design or article type, please write "Not applicable" in these sections.

A Response: All Checked

Reviewer reports:

Felicity Callard (Reviewer 1):

I am happy to accept for publication. (There are a couple of typographical errors to pick up in the copy-editing -- e.g. sometimes Greenhalgh is missing the final 'h' of her name.

A Response: Done

Karen Dunn Lopez (Reviewer 2):

Background

* Should provide context about discussing use of HIT worldwide or in Britain, Australia and Canada. For example, some of the statements do not apply to the U.S. See below.

"Furthermore, usage by clinicians of these systems is disappointingly low [9]:

* Citation is from 2010. In the U.S. EHR usage is now quite high. https://dashboard.healthit.gov/quickstats/pages/FI-G-Hospital-Progress-to-Meaningful-Use-by-size-practice-setting-area-type.php

A Response: BACKGROUND Para 3, starting line 5: We have adjusted this to: Furthermore, usage by of these systems has been disappointingly low [9], possibly because clinicians have experienced them as disruptive and inefficient [8, 10]. More recently, usage rates have been reported at above 90%, but dissatisfaction with the impact of healthcare information systems on workflow and patient throughput remains high [Medscape EHR Report 2016].

"Policymakers have promoted the development and use of computerized information systems under the assumption that they will improve quality, efficiency, and safety of healthcare"-

* Suggest citing primary sources/the policies or laws.

A Response: We found this difficult because the policies and laws are so diverse across the jurisdictions. It was not possible to make a succinct statement about this. Policymakers
encompass a range of entities from hospital administrations through to state and national governments.

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The background is missing a strong and clear definition or explanation of macro cognitive processes that can be threaded through the case studies to improve clarity. For example, sense making is frequently mentioned in the case studies, but is not included in the explanation of macro cognitive processes.

A Response: BACKGROUND, sub-section Decision Centered Design, following paragraph 1, We have added two paragraphs on this.

Purpose

The purpose section improves the overall clarity, however the argument for cognitive capabilities is not clearly threaded in the case studies. This is similar to my earlier comment about macro cognitive processes.

A Response: We have gone through the first two case studies to ensure we have linked the discussion to our section and our explanation of Macrocognition. However, Case Study: UK NHS presented a problem. We discuss our solution below.

I do not agree with the authors' assertion: "In our review of the research into healthcare information systems as summarized above, we found little mention of cognitive issues." There is quite a bit of research on numeracy, graph literacy, risk literacy, and cognitive workload for example. Perhaps describing or defining what the authors mean by cognitive issues would clarify.

A Response: PURPOSE, first two paragraphs: In making this observation, we were referring specifically to the literature we cite earlier in the paper in relation to the effectiveness of computerized information systems. The mentions were not entirely absent but those we did find were not presented in a manner that would suggest a design solution. We have reorganized the ideas in these two paragraphs to clarify this.

Paragraph 3 should be supported with citations Case Study- Patient Evacuation

A Response: We did not understand this comment. We believe that this reference is to paragraph 3 in the section titled purpose, but we do offer citations in that paragraph.

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I am surprised that the authors could not identify a more common scenario especially since scheduling is a common occurrence in healthcare. This is not my area, but I could locate several articles about dynamic changes and technology for scheduling in healthcare.
A Response: The work we know related to scheduling in healthcare does not offer a meaningful evaluation of the system or a meaningful analysis of the cognition involved in the scheduling work.

Case Study- Anesthesiology

* Consider clarifying by making more concise, especially paragraphs 2 and 3. The last paragraph is quite clear.

A Response: We did some minor editing here but, while this may be more than is necessary for a healthcare professional, we are speaking, in part, to IT professionals who typically are not sensitive to the complexity and subtlety of healthcare work at this level of detail. Possibly, our earlier clarification on the nature of workflow will reveal the value of these details.

Case Study: UK NHS

* Does not have nearly the amount of detail and explanation as first two case studies. In particular does not note which cognitive processes are interrupted.

A Response: Yes, given our focus on macrocognition, this is out of place. We have moved it earlier to the Background, paragraphs 5 & 6.

* Cite first sentence

A Response: Done

* Check citation for unquestioning belief that healthcare needs to take advantage of new technological developments [11]

A Response: These authors do not use these words, but do refer to a technology push and a techno-centric mindset [p 1057], which we take to imply what we say here.

* Second paragraph needs citations.

A Response: Done

Facing the Challenge

* Section would be stronger with more citations. For example, what evidence supports this statement: "...in developing cognitive support systems, information technologists are guided by an outmoded and constraining usability paradigm, and by a distorted view of how healthcare professionals handle competing and interacting cognitive demands and goals." There are several other unsupported assertions.
A Response: This comment alerted us to a problem with this FACING THE CHALLENGE section. Early in the section we said we were going to resolve two issues. We then failed to specify or even clarify what those issues might be. We have retitled this as COGNITIVE ENGINEERING and split it into two subsections, Work Analysis and Cognitive Design. We now clarify what the two issues are in the first paragraph of that section and allocate the next two paragraphs to the subsection, Work Analysis, retaining the wording essentially as it was. We have changed the remainder of this section, now under subsection, Cognitive Design, substantially. In doing so, we have removed the assertions that concerned reviewer 2.

* There is also a large volume of literature about decision support in healthcare that could be cited for the following statement: "Notably, the healthcare community tends to rely on rule-based strategies (e.g., written procedures, alarms, algorithms, lists) for clinical decision support."

A Response: Last sentence in Cognitive Design subsection: We have reworded this.

A Response: We have moved our FACING THE CHALLENGE heading to this point.

Case Study Diabetes

* I disagree with the authors that there are no definitions of cognitive interviews. Willis GB, Knafl, K are just two authors that have published in this area.

A Response: It is not so much that we cannot come up with a definition, but rather that any definition we have seen or can construct refers to other cognitive constructs which then also must be defined. The Willis definition refers to mental processing. We could define that as a cognitive activity but that becomes circular. We have avoided this problem by dropping the reference to the interviews being cognitive and being more explicit about what they were aimed at.

Conclusion

* Suggest make it clear which 2 cases studies referring to in "Two of our case studies illustrate..."

A Response: Done

* Some of the statements in the conclusion are related to the topic but not specifically supported by the case studies, such as 1) forces working against...2) select committee of professionals..., 3) technology acquisition process.

A Response: CONCLUSIONS, second paragraph: We have reorganized this paragraph, added a citation and clarified that one of these claims is based in the personal experience of the first author.