Author's response to reviews

Title: A study of diverse clinical decision support rule authoring environments and requirements for integration

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Author's response to reviews: see over
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BMC Medical Informatics & Decision Making

Dear Editors,

We are resubmitting our revised manuscript, entitled “A study of diverse clinical decision support rule authoring environments and requirements for integration” (MS: 4911017107484833), for possible publication in the BMC Medical Informatics & Decision Making. This manuscript has not been submitted for publication nor has it been published in whole or in part elsewhere.

Thank you for your review of our manuscript. We appreciate that the reviewers re-reviewed our manuscript and provided valuable comments. We revised the manuscript based on Dr. Isern’s comments. We addressed each specific item, point-by-point, in the following.

Thank you very much for considering our work. We look forward to your review of our revised manuscript.

Sincerely,

Li Zhou

Below are Dr. Isern’s comments and our responses from the second review.

Version: 5 Date: 8 September 2012
Reviewer: David Isern
Reviewer’s report:
The comments of all reviewers have enriched the current release of the paper; however I already have some comments to do.

Major compulsory revisions
In my first review I listed two major drawbacks of the paper: a discussion of the availability of tools to connect the analysed systems with existing electronic health records, and an explanation of the information contained in rules.
Concerning the first issue, the authors made a copy&paste of my comment in the conclusions and it can be improved/changed.

Responses:
To address the reviewer’s comments, we made a major revision in the “Integration with EHR systems” section. We highlighted that in order to integrate a RAE with EHR systems, the RAE should adopt a formal information model, have modular, portable system architecture, and adopt standard open protocols and tools when they are available.

We also expanded the “Formal Knowledge Representation and Standards” section to emphasize that “Future work is needed to validate more expressive guideline representation languages and frameworks, particularly their effective integration with EHR systems.

In addition, in the “Recent Development” section, we described what standards, methods, and tools have been used in our ongoing effort.

Concerning the second issue, I have not found any change. For instance, the “Study Limitations” section says that there are some gaps in current rule representations, but this assumption is neither justified nor explained in detail. Which are these gaps? After this justification, another step is to solve them, but the reader needs more information (and concrete examples) of these rules and how they are represented.

Response:
In this revision, we’ve made substantial changes to the “Formal Knowledge Representation and Standards” section in Discussion. We discussed the existing guideline languages and models which represent clinical knowledge elements in guidelines, such as plans, actions, and decisions, as well as temporal and other relationships and constraints between these elements. Although current RAE models are able to represent certain metadata (e.g., type), conditions, coded responses, and actions, none of them can explicitly model alternative pathways, multistep task execution, or constraints between these components. We then pointed out that future work needs to be done to validate existing guideline representation languages and frameworks or develop new ones if necessary, and integrate them in working EHR systems. The adopted knowledge models should be capable of expressing different types of clinical knowledge and conveying the complexities and nuances of clinical knowledge at different levels of granularity.

In the “Recent Development” section in Discussion, we further discussed that our on-going efforts on resolving this challenge and also provided related references. We have developed a multi-layered knowledge representation framework for structuring guideline recommendations for implementation in a variety of CDS contexts. We have also adapted standards recommended by HL7, Healthcare Information Technology Standards Panel (HITSP) and elsewhere, to create a formal information model that describes clinical data required in the rules. There are ongoing research efforts at Partners to share knowledge specifications and collaborate on content across institutions using knowledge portals and repositories.
In addition, in the manuscript, we introduced in detail of each editor and rules authored using these tools.
- On page 7, we described the reminder rules and medication rules and also provided examples of each type.
- On pages 8 and 9, we described diversity and unique features of the RAEs. We provided descriptions and screenshots of the RAEs. We also provided examples about how the RAE assists KEs to manage meta-data and define rule logic (e.g., risk group, overdue conditions, coded responses, and message) and allows KEs to specify links to guidelines, literature, and other references.

We believe that the above content and changes should be able to sufficiently address “rule” related issues. As mentioned in the beginning of this paper, our goal was to “identify the critical success factors and challenges of a fully functioning Rule Authoring Environment.” Our main focus was not to address the gaps in rule representation per se. However, we have cited our other paper, our website, and other researchers’ articles that cover this related topic.

Minor compulsory revisions
Please, revise the format and some incomplete references (e.g. [26] [28] [41] [42]).

Response: all references are corrected.