Reviewer's report

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

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Reviewer: Claudio Eccher

Reviewer's report:

The manuscript reports the analysis of RAEs at Partners in order to define requirements for a scalable and comprehensive tool to manage enterprise level rules for CDSs.

The problem of designing efficient, user friendly, collaborative and reliable tools for knowledge acquisition for CDSs is well known and a relevant topic in current medical informatics research.

The results, however, are interesting but not new, most of them confirm results well known by the medical informatics community.

Some comments to improve the clarity of the paper in Discretionary revision.

- Major Compulsory Revisions
- Minor Essential Revisions
- Discretionary Revisions

Section Background

1) Sentence: “Guideline modelling tools such as Asbru, EON, GLIF.. etc.“
Actually, the cited acronym refer to modelling languages and/or complex methodologies to guideline modelling, authoring, and execution, possibly complemented with modelling tools (e.g., DELTA for Asbru, Protégé for EON), the sentence should be modified to:

“Guidelines modelling tools such as those for Asbru, EON, GLIF, ecc.”

2) Sentence: “They served to isolate knowledge base form execution...”
The sentence seems to suggest that rule editors allow the separation between knowledge bases and the software to execute them (information model).
Actually, the isolation of knowledge bases from the execution system is precisely the aim of developing formal guideline languages, since this approach allows building a general execution engine maintaining and updating only the knowledge base. Moreover, this is the approach that should be adopted in building a decision support system. The building of rule editors that operate only on knowledge bases is a consequence of this approach. If the knowledge bases
were not separated from the execution engine when designing the CDS, it can hardly be done by a rule editor.

3) Sentence: “Efforts have been made at other institutions to design standardized rule authoring tools…”

To my knowledge, the efforts are towards the design of tools for specific guideline modelling languages. The design of a standard tool that can build knowledge bases in every language is a very difficult task due to the peculiar features of each language. Even though, as studied by Peleg et al., Task-Network Models CIGs (Computer Interpretable Guidelines) have in common many components, they differ in the underlying decision models, goal representation, use of scenarios, and structured medical actions.

Subsection Goal Analysis

4) Sentence: “This step is critical to help us identify possible solutions to achieve our goal of developing common CDS rules as…well as centralized rule execution services.”

In my opinion, the use of a common knowledge representation language is the necessary condition to develop common CDS rules.

In the paragraph above, however, the authors state that “diverse RAEs have been developed at different time periods for different purposes and implemented on different platforms.” The authors should specify which CIGs the CDSs use and if there is a common formalism. In my opinion, the impossibility of developing common CDS rules is not due to the plurality of RAEs at Partners, which is the consequence and not the cause of this problem.

Section Methods:

5) For the sake of clarity, the authors should specify which kind of rules the clinical reminder CDS(s) and the medication management CDS use. Simple if-then conditions? More sophisticated task network languages? Again, to they use the same formalism?

Section Results

Subsection Overview of the Rule Authoring Environments

See comment under Result section.

Subsection Major Limitations of Current Systems

6) Sentence: “However, it is unclear to what degree these limitations are due to the diversity of authoring environments, […], rather than the lack of shared knowledge repository, execution engine, or underlying knowledge representation.”

This sentence seems to be in contradiction with the following paragraphs (Isolated, Nonsharable, Nonstandardized) where the authors correctly recognize that the common source of problems is the lack of a standardized language and shared knowledge based. In fact, in my opinion the diversity of RAEs
environments are not limitations of the RAEs, but a consequence of the fact that currently a common rule language and a common knowledge repository have not yet defined at Partners.

Paragraph Nonextensible

7) Sentence: “The current RAEs are not well-structured to accommodate the future complexity of knowledge representation needs due to the content diversity.”

The authors should elaborate on this. The sentence is not clear because they do not detail what kind of representation language CDSs use. If the CDSs are based on if-then rules, they can accommodate all the knowledge expressible with if-then rules. If new knowledge is not expressible in rules, the adoption of a different knowledge representation language, and the consequent modification of RAEs, is needed.

In general, the effort of the guideline community has been to define CIGs that can accommodate all the present and future knowledge expressible in guidelines. RAEs are tools to put the medical knowledge in the chosen format.

Section Discussion

Subsection Critical Success Factors

Sub-subsection Collaboration Support


The following sentence, however, puzzles me: “In the current system, most rule specifications are stored in Microsoft Word or Excel documents.”

Are these rules machine executable? Are they written in Visual Basic Application or as text? Are your CDSs based on engines for VBA? If rules are stored as text, how can CDSs at Partners use them for giving support? And do RAEs maintain textual CIGs?

Sub-subsection User-interface

8) Sentence: “Some commercial or open-source products mainly use traditional rule logic representations and artefacts such as if-then rules, decision tables, and decision trees.” What do the CDSs at Partners use? I understood that CDSs were rule based. Are they hard-coded in Java component? How are they related to rules in Excel or Word?
Sub-subsection Terminology integration

9) Sentence: “However, these subsets are defined by mixed use of local and standard terminology...” Why the use of local terminologies, once codified, does constitute a problem for RAEs? An effort of mapping local terminologies to some reference terminology can be made if you need the interoperability with external systems.

Level of interest: An article of limited interest

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

I declare that I have no competing interests