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Evaluation of a Multilayered Knowledge Representation Using the GuideLine Implementability Appraisal

CIRD Clinical Informatics Research & Development

Seth Meltzer[1], Aziz Boxwala, MD, PhD[2], Saverio Maviglia, MD, MSc[13], Blackford Middleton, MD, MPH, MSc[13]

[1]Clinical Informatics Research & Development, Partners HealthCare, Boston, MA; [2]Section on Clinical Informatics, University of California at San Diego, San Diego, CA; [3]Harvard Medical School, Boston, MA

Introduction

- The CDS Consortium has developed a multi-layered knowledge representation model that can enhance the sharing of codified knowledge artifacts for use in CDS systems across institutions[1]
- In addition to the unstructured narrative guideline and machine executable forms, two intermediate layers in the model exist.
- In the semi structured recommendation, the knowledge of individual recommendations remains in text form but is more organized.
- In the structured recommendation, the knowledge is encoded so as to make it computable but not to be used directly in a CDS system.
- Our hypothesis was that the implementability of a guideline in a CDS system would increase with structuring of the content, i.e., structured recommendations would be easier to implement than the semi-structured recommendations in CDS.

Example of a semi structured recommendation for Diabetes Mellitus

Example of a structured recommendation for Diabetes Mellitus

Methods

- We invited 24 CDS implementation experts from the member institutions of the CDS Consortium to rate three semi-structured and three structured recommendations across several implementation related dimensions.
- The evaluation instrument we used was derived from the GuideLine Implementability Appraisal (GLIA)[2].
- Of the nine GLIA dimensions, we used five: decidability, executability, presentation, flexibility, and computability.
- From these four dimensions, we incorporated and modified the items from GLIA to arrive at 14 items in the instrument.
- The response scale for each item was "Yes", "No", and "Cannot determine".
- We also included an open-ended question for the experts to share general comments regarding the recommendations or their rationale for their answer to any of the GLIA items.

Conclusions

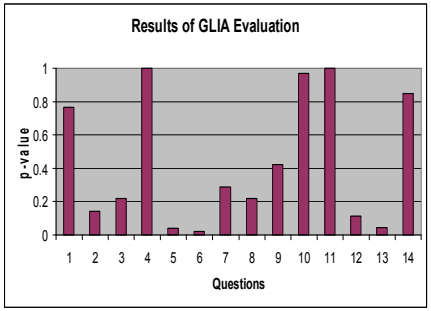
- Our results suggest that implementability increases with the structuring of the content, though strong conclusions could not be drawn due to limited sample size.
- The difference in responses to questions 5, 6, and 13 suggest that structured actions are more implementable than semi-structured ones.
- This effect was not seen for clinical scenarios (questions 3, 4, 10, 11, and 12).
- Despite not being as structured, the semistructured level still has considerable value as a vehicle to enhance communication between subject matter experts and knowledge engineers.
- We are currently looking at ways to enhance our knowledge representation model, including expanding the structured layer to represent more CDS types.

Acknowledgements

This project was funded under contract # HHSA290200810010 from the Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services.

Results

- The null hypothesis was that there was no association between the recommendation type and the user's response.
- We performed the Chi-square test of significance, except for cases of small cell size, when we employed the Fisher's exact test.
- The results of statistical tests are shown in the graph below. Asterisked p-values are from Fisher's exact test, otherwise from the Chi-square test (the results were concordantly less than or greater than 0.05, the pre-designated threshold value to determine statistical significance, in all cases).
- Three questions, 5, 6 and 13 had significant p-values.



Item	p-value	Percentage of non-response or 'Cannot determine'
1	0.765	10
2	0.14	9
3	0.22	7
4	1.000*	22
5	0.04	9
6	0.022	15
7	0.287*	9
8	0.218*	19
9	0.422*	22
10	0.966	31
11	1.000*	34
12	0.116	10
13	0.045	6
14	0.847	16

References

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