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Medical Concept Representation: The Years Beyond 2000

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Abstract and Objective

This work aims at understanding the state of the art in the broad contextual research area of "medical concept representation". Our data support the general understanding that the focus of research has moved toward medical ontologies, which we interpret as a paradigm shift. Both the opinion of socially active groups of researchers and changes in bibliometric data since 1988 support this opinion. Socially active researchers mention the OBO foundry, SNOMED CT, and the UMLS as anchor activities.

Keywords: medical concepts, ontology, bibliometric analysis, social computing

Methods

This study of the IMIA working group *Medical Concept Representation* (MCR WG) was aimed at exploring the status of the research area of medical concept representation. MCR WG published the last in-depth, analytic overview of the domain in 2006 [1]. The present study (based on bibliographic measures, on-line text mining tools and a social media survey) revives this tradition. The catch phrase "medical concept representation"[1] and its contextual environment were analyzed by the *Scopus Term Analyzer* for a time line and the *Ultimate Research Assistant* to extract contextual environment. The search expression *'concept representation AND (medical OR medicine) AND (knowledge OR information)'* was used to find relevant papers. Trend changes were analyzed by citation and relevance ranks for the two periods 1988-99 and 2000-12. We text-mined titles of the top ranked papers and also cross-checked against a third set, obtained by a social media tool: a targeted survey of the LinkedIn group of the IMIA MCR WG. Noun phrase frequencies of bibliometric data and survey data were compared. Text mining was performed with *Textalyser*.

Results

The most important results: Figure (1) shows the declining use of exact catchphrase "medical concept representation". Figure (2) shows the change of title terms over time using the results of mining the paper titles for most frequent single noun phrases. Terms not used any more are shown in white. New, incoming terms are red. The contextual domain was broadened, new terms as "semantics" and "ontology" represent the new paradigm. In our survey the most influential papers quoted by IMIA MCR WG LinkedIn group members (http://goo.gl/LVJhd) mention repeatedly the OBO foundry, SNOMED CT and the UMLS as a kind of anchor activities.

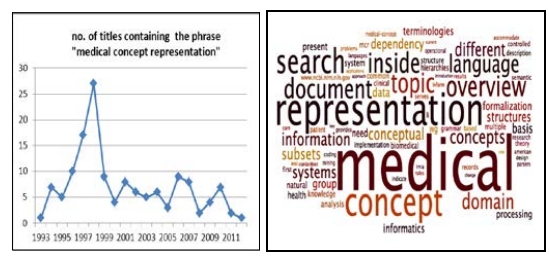

Figure 1- time line and tag cloud based on text mining of titles for "medical concept representation"

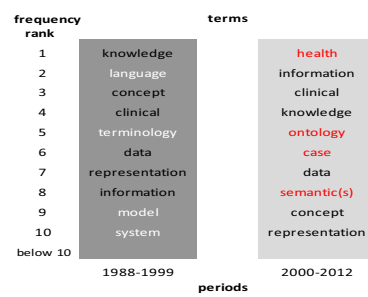

Figure 2 - changing of the most frequent title noun phrases of papers on medical concept representation over time

Conclusion

The focus of research changed in the new millennium, barely ten percent of mostly cited authors of the nineties remained in the top cited lists. The central role of the term "concept" has been abandoned. Reading the most influential papers shows that the current paradigm is based on capture of medical information and knowledge by ontologies. Open reference resources for content are developed collaboratively. Web enabled standards help to achieve transparent results.

References

[1] Cimino JJ, Smith B Introduction: International Medical Informatics Association Working Group 6 and the 2005 Rome Conference J Biomed Inform. 2006 Jun;39(3) pp 249-251

[1] Not to be mixed with "concept representation" as a category used in cognitive science and psychology.