Conflicts between terminology and EHR information models as obstacles to semantic interoperability: a scientific review

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Introduction

An aim in eHealth is achieving semantic interoperability. Healthcare paradigms are therefore moving towards a time-, location- and treatment-independent care paradigm, where information and knowledge need to be shared among several actors in several locations.

In parallel different means to achieve semantic interoperability are explored in areas as terminology modeling and EHR information models. [1,2,3] However, challenges with both terminology systems and EHR information models arise when clinical contents need to be expressed, because of multiple ways to express given concepts.

Methods & Material

The method used to answer the research questions is shown in Figure 1. Table 1 shows the search strategy for the literature. Boolean operators AND, OR and NOT were used in combination with keywords.

### Study selection, Data extraction and metaanalysis

- **Step 1:** Search and abstract reading followed by a categorization of papers. Categorization done by posing question 1: "Which perspective is taken in this study?"
- **Step 2:** Abstracts from the category "Terminology and EHR models" selected for further reading and assessment.
- **Step 3:** Obstacles identified by extracting key issues in selected papers. In this case questions such as: 'Which main issue can be recognized across categories?'

Findings

In SNOMED CT ambiguity is emphasized in two main areas:
- **Concept composition:** ambiguity occurs when concepts are used in combination, resulting in multiple representations.
- **Level of granularity:** ambiguity occurs when concepts are granulated at different levels, resulting in semantic conflicts.

In EHR information models the ambiguity issue is dependent on the development paradigm and thereby how the data model is exchanged.
- **Data interpretation:** ambiguity occurs when imported EHR data are misrepresented, resulting in misrepresentation.
- **Syntax issues:** ambiguity occurs in the core of EHR, resulting in incomprehensible data.
- **Semantic issues:** ambiguity occurs when a term used is not rigorously described, resulting in lost context.

### ISSUES OF AMBIGUITY

Happen when terminology systems and EHR information models are in interaction.
- **Multiple mappings:** Observations described by an information model may relate to several concepts. Finding appropriate concepts to align with an information model is a very low-practical approach and time-demanding.
- **Semantic ambiguity:** Combining data models with terminology can lead to a conflict between the semantics of a given expression.

Discussion & Conclusion

- The solution of the overlap problem has multiple facets.
- Well-documented methodological approaches are used in papers to determine whether issues can be solved. However, generic or automatic solutions are not given the same priority as proprietary solutions for legacy systems.
- Awareness of obstacles is important, but the scientific literature is not specific in its description of these.
- Issues related to the integration of terminology systems and EHR information models are closely linked to the EHR implementation process.
- Findings show that ambiguity is key issue. One attempt to solve this issue is to use terminology binding.

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References