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Literature Analysis on Ontologies Applied in Clinical Decision Support Systems

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1. Introduction

Clinical decision support systems (CDSS), a critical component of electronic health record (EHR) systems, have been used for decades [1,2]. According to a 2015 national survey in the USA, the rates of CDSS usage range from 68.5% to 100% in office-based primary care practices [3]. Among the adopting practices, solo practices have significantly lower rates of CDSS usage than group practices [3]. CDSS rules are a core factor in dictating the behavior of CDSS. Many efforts have been made to share or reuse CDSS rules across institutions, e.g., CDS Connect or OpenCDS [4]. Most of these efforts targeted large institutions with more financial resources and in-house IT support. For small practices, especially solo ones, reusing and sharing CDSS rules poses significant challenges. Ontologies are the enabling technology of the Semantic Web, and they could improve the reusability and shareability of ontology-based CDSS rules. We propose to build an upper-level ontology for CDSS, including elements needed for machine-interpretable rules for immunization recommendations. To capture existing applications of ontologies in CDSS, we conducted a systematic literature review [5] on applications of ontologies in CDSS, CDSS rules. This poster analyzes included papers.

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2. Methods

We used PubMed, the ACM Digital Library, and the Nursing & Allied Health Database for the literature search. The search strategies include CDSS as a MeSH term and Ontolog* or Rule* appear in title or abstract. Each publication was screened independently by at least 2 biomedical informaticians.

3. Results

The literature search generated 1235 distinct publications and we included 81 publications[6]. PubMed covered 90% of these publications. We noticed core sources for the 81 publications. *Studies in Health Technology and Informatics*, as a critical international venue, contributed 21 of the 81 publications. We also noticed the global locations of contributors and their collaborations. Among 81 publications, 58 (72%) had collaborations, of which 20 had international collaborations. 58 (71.6%) of the papers were funded by grants, 6 of which (10.3%) received grants from more than one country.

The contribution from each continent was counted as the aggregation of publication numbers from their respective countries without removing duplicates. Europe was, by far, the leader in this area, with more than half (61) of the 115 total contributions. France (14), Spain (10), UK (8), and Germany (5) are the leading contributors in Europe. North America had 29 contributions: USA (19) and Canada (10). Asia had 18 contributions: China (12), South Korea (3) are the top contributors. Australian contributed 4 publications. South America contributed 2 and African (Egypt) with 1 contribution.

4. Conclusions

The 2 themes were international contribution and collaboration on the junction of CDSS, applications of ontologies in CDSS, and CDSS rules. The results indicate that the interests and expertise in the topic are across the border, which can be a critical foundation for broader engagement in ontology review, evaluation, consensus, and even the downstream adoption and implementation.

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