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The Use of UMLS to Establish a Mediation Terminology for Exchanging Patients' Allergy Profiles between two U.S. Federal Agencies' Electronic Health Records

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Abstract and objective

Recognizing that interoperable health information system can lower costs, reduce medical errors, and improve quality of care, the Department of Veterans Affairs (VA) and the Department of Defense (DoD) are working towards seamless sharing of real-time clinical data between the respective agency's Electronic Health Records (EHR). One strategy to achieve this goal is through the mapping of the two agencies' proprietary terminologies to standard vocabularies. However, the difficulty is that most terminologies are not fully mature to adequately cover the allergy domain. This paper describes the process of using the Unified Medical Language System (UMLS) to derive a mediation code set for exchanging patient's allergy profile. With our initial effort, 84% of allergens sent by the VA are successfully mediated, computed on, and stored in the DoD's Clinical Data Repository (CDR) and 82% of allergens sent by the DoD are successfully mediated by the VA's Health Data Repository (HDR).

Keywords:

unified medical language system, electronic health records, computerized/* terminology standards, allergy and immunology/*standards

Introduction

Having interoperable health information systems has been recognized as a necessary step toward improving the quality of health care, reducing medical errors, and controlling costs. Over the past decade the VA and the DoD have been making great efforts at sharing the health information of their mutual beneficiaries. In 2004, the VA and the DoD successfully prototyped the Clinical Health Data Repository (CHDR) application for the exchange of codified patient data. Through this application, health information can be transferred and stored at the other agency's clinical data repository as computable data which then can be used in clinical decision support applications. In 2006, the two agencies continued to improve upon this prototype to exchange medication and allergy profiles. Patient safety researchers have pointed out that giving patient medication that they are known to have an allergy against is one important and preventable cause of adverse drug events. Since no designated set of standards exist for the allergy domain at the initial start of the CHDR project, the two agencies evaluated the use of UMLS to mediate the two agencies patient's allergy lists.

Methods

The DoD extracted a set of UMLS Concept Unique Identifiers (CUIs) associated with RxNorm concepts. RxNorm alone does not provide adequate coverage of the allergy domain because it does not contain a semantic type for drug classes. However, the DoD used RxNorm concepts as the initial effort to harvest UMLS CUIs already mapped to RxNorm. Automated mapping between the DoD's allergen file and the RxNorm concepts was made through exact string and lexical variants matching. When there were one-to-many matches, terminology subject matter experts manually set a precedence flag. The VA extracted its mapping to CUIs directly from the UMLS metathesaurus. Independent experts reviewed the two mapping tables side-by-side and identified any discrepancies. The System Acceptance Testing (SAT) for CHDR was carried out at William Beaumont Army Medical Center, El Paso Texas during the period of September 11-15, 2006.

Results

The mapping tables contained respectively 7157 and 8358 allergens for the VA and the DoD. The expert review of the 1924 common concepts identified less than 3% discrepancies which were resolved. The majority of the vocabulary differences were due to the use of generics and brand names and ingredient base or salt forms. The SAT indicated that 84% of allergens that are sent from the VA to the DoD are successfully mediated, computed on, and stored in the DoD's CDR and 82% of allergens that are sent from the DoD to the VA are successfully mediated, computed on, and stored in the VA's HDR.

Conclusion

The Consolidated Health Informatics panel has now recommended a set of terminologies to cover the allergy domain: FDA UNII codes for drug ingredients; RxNorm for brand names (which have relationships to generic names), NDF-RT for drug classes. However, the FDA UNII codes are incomplete and not ready for implementation. The VA-DoD patient exchange project has demonstrated that the use of UMLS is an effective mediation standard for the drug allergy domain.