Proposed Pharmacy Data Element Ontology

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The Rx Info project is a NIST funded joint venture to develop “intelligent” systems that will enable healthcare practitioners and researchers to evaluate drug therapies based on past clinical experiences at hospitals and other healthcare facilities. Such systems will improve clinical decision-making and reduce administrative costs and healthcare expenses.

One of the challenges in this project is preparation of an analyzable database. Pharmacy data elements are collected from pilot hospitals, refined/defined, and linked into longitudinal patient records appropriate for process and outcomes analysis. The major technical challenge in this phase is heterogeneity of the data elements. Each data source has its own method of data coding. They rarely speak the same language, either they choose different vendors’ solutions or they have different definition for the same data field, or they just use free text. One particularly difficult element is prescription dosage. This element is complicated by the close relationship between dosage, dosage form, package size, and unit of measure. In any given instance each of these elements may, or may not, be the same. How much a patient received may be expressed as any of the following: one tablet, 500mg, 60ml, or one vial, each of which are technically correct, but difficult to work with without a quantity qualifier.

A common data element ontology would facilitate not only collection of clinical data in a repository such as Rxlnfo, but also digital prescription, clinical referral and other clinical data interchange.

There exist several standards related to pharmacy. None of them adequately convey the pharmacy information at a level needed for clinical outcome measurement. Drug identifiers have been addressed on multiple levels1,2. HL7 standard v2.3 has several pharmacy-related messages including pharmacy/treatment dispense message (RDS) and pharmacy/treatment administration message (RAS). It defines the message formats clearly, but lacks the precision in the meaning of the data element. Different applications can plug the different things into the same data field. ASTM standards E1384: Standard Guide for Content and Structure of the Computer-Based Patient Record and E1633-96: Standard Specification for Code Values Used in the Computer-Based Patient Record, lack data elements needed for pharmacy process and outcome study. Data elements such as drug code (NDC), drug volume dispensed, drug volume administered, drug component information, etc., need be added into the standard using a well defined ontology. The National Council for Prescription Drug Programs (NCPDP) Telecommunication Standards are excellent in expressing the drug dispensing information, but weak at conveying the clinical context such as sig.

Rx Info has defined an ontology of multiple pharmacy elements that allows uniform comparison and deployment of analyzable data. The solution borrows from the HL7 3.0 concept of conditionality. For example, a dosage given in "tablets" is allowable, but requires the conditional field of "milligrams per tablet" be supplied. It also prefers the separation between quantity number and quantity unit for efficient data mining and conversion. The result is that systems can continue to report in their natural units, while allowing the central system to apply all required conversions in a deterministic manner.

The various standards committees, medical practitioners, and software vendors should coordinate efforts to create a common ontology. This will help accelerate building the systems that provide real-world queries necessary to support critical clinical decisions and improve therapy outcomes while reducing the cost associated with these practice guidelines, hospital visits, pharmaceutical therapies. The proposed ontology not only complies with the existing standards but also overcomes their weakness.

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REFERENCES:
