

Safety Through Enhanced e-PreScribing Tools (STEPStools): Developing Web Services for Safe Pediatric Dosing

Principal Investigator:	Johnson, Kevin, M.D., M.S.
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Summary: The Safety Through Enhanced e-PreScribing Tools (STEPStools) project assessed a generally-available knowledgebase for pediatric medication management's impact on quality and safety. STEPStools constructed, pilot tested, and evaluated available tools that provide medication-specific knowledge about dose rounding and extemporaneous formulations necessary for small children. The project also evaluated the effectiveness of using a service-oriented architecture to distribute knowledge, which is an emerging method for knowledge management and dissemination.

The project committed to releasing this database as a toolkit, initially as a dataset available publicly through the Agency for Healthcare Research and Quality, and ultimately through the National Library of Medicine and RxNorm, the drug nomenclature for standardizing the representation of clinical drugs. The project informs the vendor community and general public about the utility of Web services as a tool for knowledge dissemination, and is specifically proposed as a method to distribute clinical decision support. In addition, the American Academy of Pediatrics (AAP) has contributed to this knowledgebase and will enable its availability to e-prescribing developers for many years.

Specific Aims:

- Convene a panel of AAP and American Medical Informatics Association experts to construct a knowledgebase of actionable data to guide e-prescribing systems in the appropriate rounding of calculated doses and selection of extemporaneous medication formulations. **(Achieved)**
- Develop Web services and Web browser client to allow browsing this knowledgebase. **(Achieved)**
- Evaluate the usability and content validity of these Web services through a series of pediatric prescribing use-cases, site visits to pilot users, and an examination of the error rate of prescriptions generated with and without the use of these Web services. **(Achieved)**

2011 Activities: The team completed the analysis of the validity of the rounding tolerances and the degree to which STEPStools recommendations were in agreement with the prescribing practices of practitioners. Due to delays in collaborations with vendors, Dr. Johnson used a 6-month no-cost extension to continue the evaluation through February 2011.

Impact and Findings: The team conducted a concordance analysis using a 24-item survey of test cases to assess the validity of the rounding tolerances and the degree to which STEPStools recommendations were in agreement with the prescribing practices of practitioners. The survey was piloted with 10 subjects and then distributed to a total of 172 pediatricians. Eighty test cases were compared. Of these, there was complete

concordance between the recommended dose/formulation and the prescribed dose/formulation for 31, or 39 percent of the cases. Forty-four complete responses were received after six reminders over the course of 3 months, for an overall response rate of 26 percent.

When combined with the data from all test cases, STEPStools either matched or exceeded the performance of the test cases in 46 (84 percent) of the cases where it was able to provide a recommendation. Results confirm that Web services are a feasible knowledge and tool distribution method. Some of the initial findings include the types of information that providers find useful in the tool. For example, the tool scores a variety of answers, starting from the top-choice medication, to one that would not be recommended. The team also learned what information providers think are extraneous.

Interviews were conducted before STEPStools' implementation (environmental scan) and after implementation (summative evaluation) with 11 subjects. The sample of prescribers and prescribing agents consisted of physicians and nurses representing general pediatrics, and three different pediatric specialties who regularly use the e-prescribing system RxStar to generate prescriptions. Users see potential for a tool to assist with rounding, however they would like more flexibility in recommendations, e.g., specific medication schedules and high-dose Amoxicillin. Certain subspecialties prescribe compounded medications more frequently than others; these prescribers found the added compounded medications in the list to be useful.

The project team also increased its understanding of how to link knowledgebases when working with vendors. RxNorm is used as a link between the rounding knowledgebase and the vendor-supplied knowledgebase. The RxNorm creates unique identifiers for the medication name (i.e., Amoxicillin), the routed form of the medication (Amoxicillin Oral), and the dispensable form of medication (Amoxicillin 400 mg/5mL Oral Suspension). Although the unique identifiers were expected to link with other knowledgebases, a number of unanticipated barriers arose. Another finding was that inactive ingredients in compounds are not typically included in RxNorm and are not coded in many vendor systems. Therefore, inactive ingredients are not included in the knowledgebase. Additional work should improve the performance of the rounding algorithm and the number of medications it is able to round.

Target Population: Pediatric*

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

Business Goal: Synthesis and Dissemination

** This target population is one of AHRQ's priority populations.*