Overcoming Limitations of Data Entry for the Semi-Automated Detection of Drug Orphans in the EMR

Chiang S. Jao, Ph.D., Daniel B. Hier, M.D., M.B.A.

Department of Neurology and Rehabilitation, University of Illinois at Chicago, Chicago IL

Abstract

Sophisticated decision support systems (DSS) can reduce preventable medical errors. A standalone DSS prototype was built to identify drug-disease mismatches in the electronic medical record (EMR). When drugs fail to match a known problem on the problem list (drug orphans), either the problem list is deficient or the drug was ordered in error. We tested the performance of an integrated DSS prototype by improving the data exchange with the standalone DSS prototype. By implementing a screen capture tool, we were able to accelerate data entry into the DSS prototype through the semi-automated operation. Preliminary results revealed a marked increase in the rate of data entry during testing the DSS prototype. The accelerated data entry streamlines workflow and promotes physician’s acceptance of the DSS.

Introduction

One approach to reducing preventable medical errors is to build sophisticated decision support systems (DSS) to identify and trap errors. Since many preventable medical errors relate to the selection and dosing of medications, DSS that run in concert with computerized provider order entry (CPOE) of medications offer an opportunity to prevent medication errors.

New DSS tools require prototyping and testing before integration into operational CPOE and EMR products. We have built a prototype DSS tool that matches drugs to diseases. This prototype DSS tool identifies orphan drugs that lack an indication on the patient problem list. Drug orphans (ordered drugs which do not have a corresponding indication on the electronic problem list) usually mean that either the problem list is deficient or that the drug was ordered in error. In order to expedite the testing and validation of our DSS prototype, we have developed a semi-automated data entry tool that moves data quickly from the EMR to the DSS prototype without requiring the manual re-entry of patient data.

Methods

We developed a standalone DSS prototype (Problem List Expert, or PLE) to perform automated chart audit. To assist testing the PLE, we set out to develop a Windows-based user interface that simulates both a CPOE for ordering medications and an electronic problem list. The PLE adopts machine learning and backward-chaining inferencing algorithms to update the knowledge base automatically and to activate the mechanism that matches drugs to diseases.

To overcome limitations of manual re-entry of data for testing the PLE, a useful screen capture tool was implemented to move patient data from the EMR to the PLE quickly and accurately. We tested a number of consecutive cases and conducted an assessment of the new interface. We assessed information flow, task execution, counts of matches completed, and the time of task execution.

Results

Connecting the screen capture tool to the PLE proved to be successful in expediting data entry and accelerating testing of the DSS. The improved operation accelerated the speed of entering the data by approximately 15 fold. The performance on testing the DSS prototype became remarkably efficient. The PLE simulated the ordering of medications on 15 consecutive patients admitted to the inpatient rehabilitation unit of the University of Illinois Hospital. The PLE decision support system correctly suggested the addition of 3.3±1.2 problems for each patient and was able to identify 23% of drug orphans (drugs without indication on the problem list).

Discussion

This study accelerated the testing of a DSS prototype by semi-automated data re-entry by connecting a useful screen capture tool. Whereas improving the performance of testing a DSS prototype, validation of an integrated DSS through more accurate data assessment is anticipated. Our approach in accelerating data entry streamlines a better DSS workflow and promotes physician’s accessibility to DSS.

This work was supported by the National Patient Safety Foundation and approved by the Institutional Review Board of the University of Illinois at Chicago.