

# Adverse drug reaction (ADR) identification using rule-based data mining software to improve pharmacovigilance in a community hospital: Initial pilot and results

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## BACKGROUND

The Centers for Medicare and Medicaid Services (CMS) mandates that hospitals have policies in place that define adverse drug reactions (ADRs) and programs that manage ADR tracking and reporting. The pharmacy department at Englewood Hospital and Medical Center (EHMC) accomplishes this national safety requirement by using retrospective review through electronic medical record (EMR) investigation and real-time reporting through a risk alert system. Tracked ADRs are disseminated quarterly through the Pharmacy and Therapeutics (P&T) Committee. Implementation of Senti7 real-time patient surveillance software in our institution allowed for the expansion and streamlining of our current ADR identification and documentation process using Pharmacy Department generated reports. These reports are very convenient; it was anecdotally noted that equivalent traditional reports required a larger time commitment to consolidate and review as they were generated and disseminated by another department on a daily basis (International normalized ratios [INR] greater than 5, digoxin level greater than 2 ng/mL) or relied on automated dispensing cabinets (Dextrose 50% injection and naloxone injection withdrawals).

## OBJECTIVE

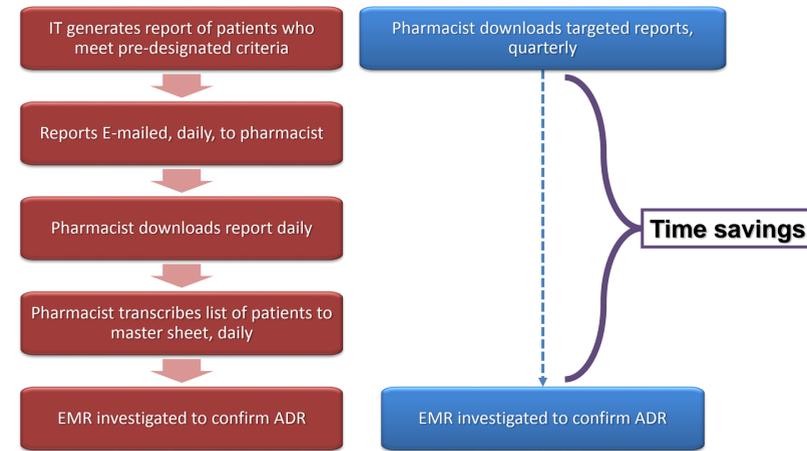
- The objective of this descriptive report is to characterize the utility of Senti7 software on ADR monitoring and compare its identification of targeted ADRs to the former system at EHMC

## METHODS

- Rules were created using Boolean operators and a mixture of clinical and demographic information to identify patients that have experienced specific quantifiable ADRs
- Reports were generated from these rules to allow for retrospective chart review and ADR documentation upon confirmation of an event using our EMR
- A year-over-year comparison (Q4 2013 vs. Q4 2014) of the number of ADRs tracked using two systems was assessed
- ADRs were grouped based on their occurrence during inpatient (IP) stay or prior-to-admission (PTA)

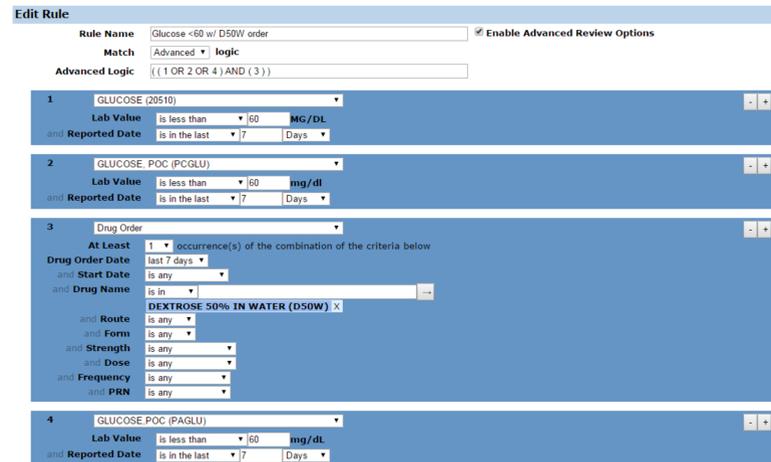
## METHODS cont.

Figure 1. Traditional vs. New Targeted ADR Identification



- Time savings and total number of ADRs identified were compared using reports for INR > 5 and digoxin levels > 2 ng/mL during April 2015
- A pilot of real-time ADR tracking in Senti7 using two decentralized pharmacists was completed to assess feasibility of widespread use
- A comparison of both systems' ability to identify ADRs triggered by ordering and/or dispensing of rescue medications was planned

Figure 2. Senti7 Rule Logic Tree Example



The screenshot shows a 'Senti7 Rule Logic Tree' for a rule named 'Glucose <60 w/ D50W order'. The logic is defined as '((1 OR 2 OR 4) AND (3))'. The rule is broken down into four conditions: 1. GLUCOSE (20510) Lab Value is less than 60 MG/DL and Reported Date is in the last 7 Days. 2. GLUCOSE POC (PCGLU) Lab Value is less than 60 mg/dl and Reported Date is in the last 7 Days. 3. Drug Order At Least 1 occurrence(s) of the combination of the criteria below last 7 days. 4. GLUCOSE POC (PAGLU) Lab Value is less than 60 mg/dl and Reported Date is in the last 7 Days.

## RESULTS cont.

Use of Senti7 rules resulted in identification of more ADRs from elevated INRs and digoxin levels in Q4 2014 as compared to Q4 2013 (24 vs. 13). There were 11 (4 IP, 7 PTA) patients with INR > 5 in Q4 2013 as compared to 14 (1 IP, 13 PTA) in Q4 2014. The number of patients with digoxin levels > 2 ng/mL identified in the Q4 2013 was 2 (0 IP, 2 PTA) compared to 10 (4 IP, 6 PTA) in Q4 2014. Using reports from April 2015 for these two triggers as a benchmark, the estimated time needed to identify patients with potential ADRs was 27 minutes/quarter vs. 2.5 minutes/quarter with Senti7. More patients overall were identified with these quantifiable ADRs using Senti7 (14 vs. 3) than the old system in April 2015. Rescue medication triggers (Dextrose 50% and naloxone orders) did not yield evaluable data due to logic flaws in their rules leading to the identification of > 1000 patients for review in Q4 2014. Subsequently, the old system of identification was used for this timeframe (176 patients to review), and the rules in question were updated. Decentralized pharmacists that piloted real time reporting using Senti7 documented 8 ADRs during April 2015, reducing reliance on additional chart review for the Q2 2015 quarterly report.

## RESULTS

Figure 3. Patients (#) with Digoxin Lvl > 2 ng/mL

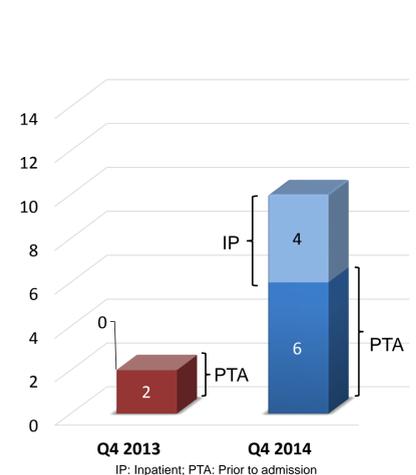


Figure 4. Patients (#) with INR > 5

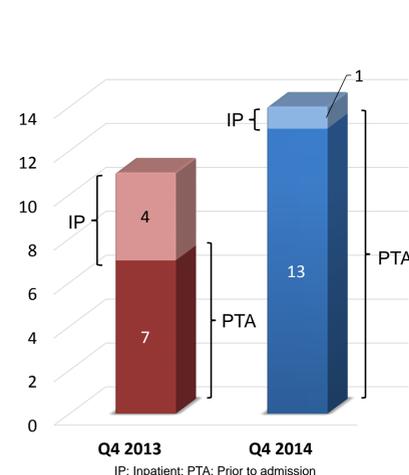


Figure 5. Estimated Time Savings

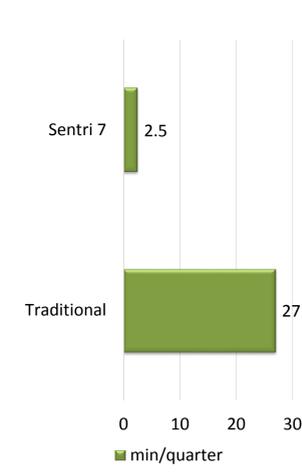
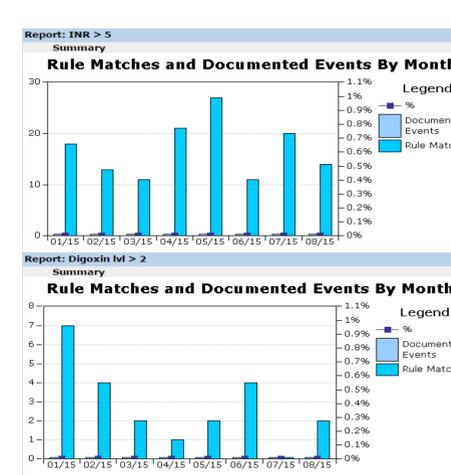


Figure 6. Senti7 Report Examples



## DISCUSSION

- Senti7 real-time patient surveillance software aids pharmacists in making clinical interventions using targeted rules
- Creative utilization of Senti7 rules can streamline and aid institutional ADR documentation and reporting programs
- The targeted report generation saved time and resulted in similar or better identification of quantifiable ADRs at our institution
- Future endeavors will include expansion of rule based ADR identification using other quantifiable triggers (Such as therapeutic drug levels) and fine-tuning rules that identify ADRs through identification of active orders for rescue medications

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### Disclosures

Senti7<sup>®</sup> was designed and developed by Pharmacy OneSource, Inc. Authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation:  
Joseph E. Cruz - Nothing to disclose  
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