

Medication Bar-Code Scanning in AIMS: An Impact Study of Education Efforts and a User-Interface Error on Anesthesia Provider Compliance

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Introduction: The adoption of various technologies to improve patient care and safety has increased over the past few years with widespread use of Anesthesia Information Management Systems (AIMS).¹ Bar-code medication verification technology embedded in an Electronic Medical Record (EMR) has been shown to decrease administration errors and adverse reactions.² In this impact study, we assessed the association between education efforts on AIMS medication scanning, and the effect of an unintended systems error on provider performance.

Methods: Bar-code scanning for pharmacy-prepared medications (e.g., antibiotics, medication infusions) was introduced in the institutional AIMS (Epic™, Madison, WI) in January 2016. Passive educational efforts to improve compliance began in May 2016. Compliance with scanning was introduced as a department patient safety metric, per the institution's guidelines, in July 2016. The goal was a 20% improvement from the baseline scanning rate (~40%). The extensive education effort included hands-on training in a simulation lab for all clinical providers was performed in June 2016. A planned AIMS upgrade occurred in August 2017. An error in the user-interface of scanning activity in AIMS appeared following the upgrade. The error could only be bypassed by opening the "medications activity" in AIMS and scanning again. The error was fixed with an update in October 2017. We examined the week-by-week rate of compliance of bar-code scanning by anesthesia provider type (attending anesthesiologist, resident, CRNA, SRNA) over this entire period of 2 years (January 2016 to December 2017).

Results: The week-by-week compliance percentage is shown in Figure 1. The compliance improved from approximately 2% in January 2016 to 10% by May 2016. Passive educational efforts resulted in improvement to 30% by June 2016. The introduction of medication scanning as a department metric, and hands-on training, resulted in a significant change from 40% to 75% by August 2016 (more than the expected 20% improvement). The rate gradually improved to more than 90% compliance by December 2016 and plateaued at this rate until August 2017. The error introduced by the AIMS upgrade resulted in a significant decrease in compliance to 75% in the first week after the upgrade, plateauing at 82% for the next 7 weeks. Fixing the system error resulted in compliance improvement to greater than 90%. Figure 2 shows the pattern of scanning compliance based on type of provider; all 4 types of providers followed a similar pattern.

Discussion: The initial roll out of scanning technology in AIMS resulted in only moderate compliance with the request to scan all pharmacy-prepared medications into the EMR. Hands-on training and making compliance a departmental quality metric resulted in significant improvement of the scanning rates. An unintentional error introduced by an AIMS system

upgrade resulted in a significant drop in scanning rates because additional steps were required to scan medications. Fixing this systems error resulted in provider compliance improving to baseline pre-upgrade rates.

User-interface issues of an EMR can result in a decrease in the *usability* of the system, an important component of human-computer interaction.³ The error introduced by the system upgrade resulted in unintended *usability testing* of the AIMS and uncovered the implications of a task load and workflow burden on the compliance of an important quality metric for patient safety within EMR.

References:

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Figure 1

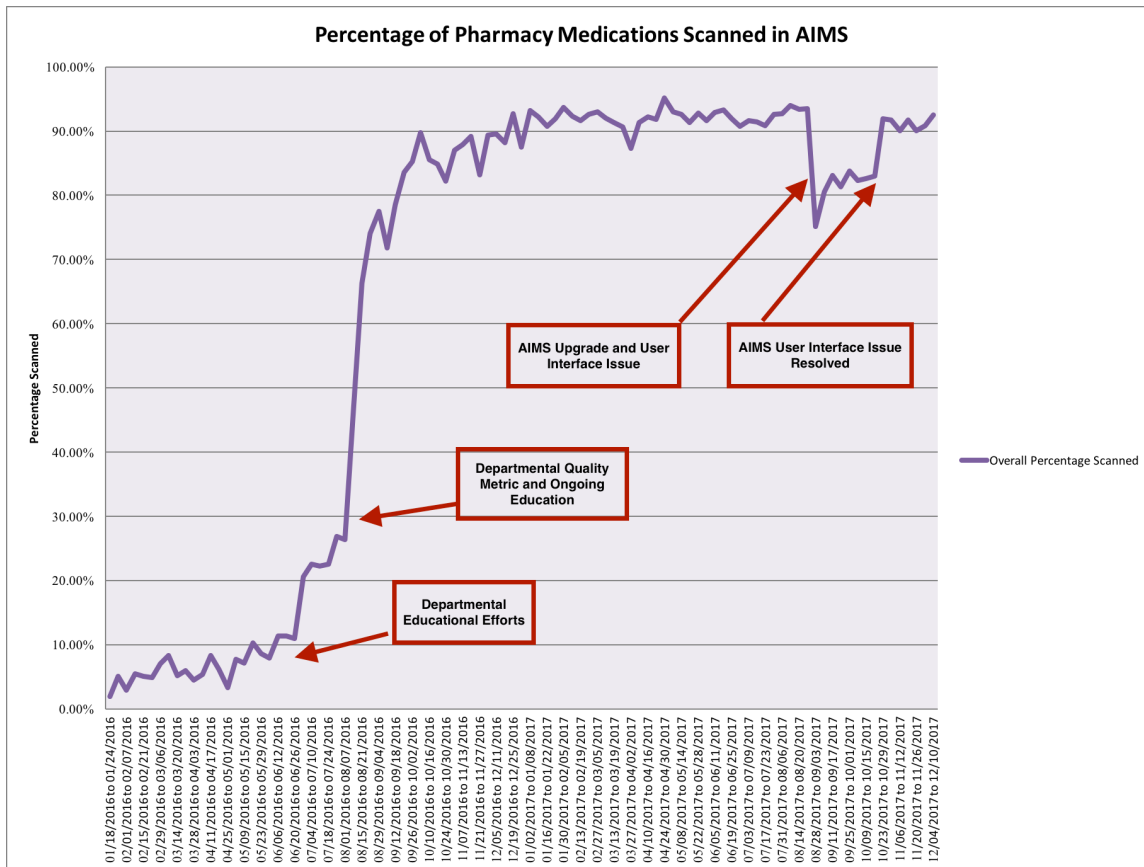


Figure 2

