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Impact of the introduction of electronic prescribing on staff perceptions of patient safety and organizational culture

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ARTICLE INFO

Article history:
Received 5 October 2016
Received in revised form
24 January 2017
Accepted 1 February 2017
Available online 9 February 2017

Keywords:
Electronic prescribing
Safety culture
Patient safety
Safety attitudes questionnaire

ABSTRACT

Background: Electronic prescribing (EP) systems are online technology platforms by which medicines can be prescribed, administered, and stock controlled. The actual impact of EP on patient safety is not truly understood. This study seeks to assess the impact of the implementation of an EP system on safety culture, as well as assessing differences between clinical respondent groups and considering their implications.

Methods: Staff completed a modified Safety Attitudes Questionnaire survey, 6 weeks following the introduction of EP across surgical services in a hospital in Dorset, England. Responses were assessed and differences between respondent groups compared. Rates of self-reported adverse events were compared before and after implementation.

Results: Overall response rate was 34.5%. There was no significant difference between usage patterns and previous experience with EP between user groups. Overall safety was felt to have been reduced by the introduction of EP. Significant differences between clinician and nonclinicians were seen in ability to discuss errors (3.23 ± 0.5 *versus* 2.8 ± 0.69, $P = 0.004$), drug chart access, and ease of medication prescribing. Regression analysis did not identify any confounding factors. Despite a significant reduction in the adverse event rate in other divisions of the hospital that did not implement EP at the same time, this same reduction was not seen in the surgical department.

Conclusions: This is the first study to assess the impact of EP on safety culture using a validated assessment tool (Safety Attitudes Questionnaire). Overall safety culture deteriorated following introduction of EP. Problems with system usability/intuitiveness, nonstandardized implementation, and competence assessment strategies may have all contributed to this result. Centers seeking to implement EP in future must consider these factors to ensure a positive impact on patient safety and outcomes.

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http://dx.doi.org/10.1016/j.jss.2017.02.001

Introduction

Electronic prescribing (EP) systems are online technology platforms by which medicines can be prescribed, administered, stock controlled, and costed. EP has its origins in early decision support applications for physicians dating back to the late 1980s. At the turn of the millennium, the US Institute of Medicine issued a series of reports into how use of this technology might improve patient safety,[1,2] leading to the Medication Errors Reduction Act[3] and the Patient Safety and Quality Improvement Act.[4] Both of these aimed to increase funding to help organizations purchase electronic health care software, including EP systems, to improve patient safety.

The uptake of EP in the United Kingdom has been comparably delayed, with a survey of 188 hospitals[5] indicating only 2% of centers reported full implementation of EP in the year 2000, and 89.4% had no EP system at all.

However, the actual impact of EP is unclear. Although studies have revealed a lower prescription error rate following implementation of EP,[6,7] others have also found that EP brings with its own unique errors. Donyai *et al.*[8] noted in one study that following EP implementation at one center, numerous new errors were found relating to the software itself, wherein prescribers for example often selected the wrong medication or wrong administration frequency from the prescribing menu.

There is a paucity of high-level evidence into the benefits of EP, with published evidence almost exclusively consisting of single-institution observational studies. The variability between individual EP systems and environments in which they are used can lead to widespread heterogeneity that makes comparisons difficult. Despite this, EP systems are frequently cited as important systems to improve overall patient safety and safety culture.[9]

Despite some evidence pointing toward EP reducing discrete errors, whether it actually contributes to an improvement in safety culture has yet to be formally evaluated. To measure safety culture, a number of tools have been developed to measure it. To date, the most widely used of these is the Safety Attitudes Questionnaire (SAQ). Developed at the University of Texas by Sexton *et al.*,[10] the SAQ is currently the best assessment of safety culture due to its extensive validation across the United States, United Kingdom, and New Zealand, in 203 varying clinical areas, involving just under 11,000 health care providers.

Previous studies of prescriber attitudes toward EP systems have been largely performed in primary care settings. Perceptions of other staff groups have been somewhat underrepresented, particularly in an acute hospital environment. Understanding the impact of EP on hospital staff perceptions could have important implications for other centers seeking to implement similar technologies.

This study seeks to assess the impact of the implementation of an EP system of overall perceived safety culture as measured by the SAQ. Particular focus will also be made on assessing whether there are differences between clinician and nonclinician (allied health professional [AHP]) groups and understanding the potential implications of these on patient safety. Although the data for correlation of the impact of staff attitudes on actual clinical outcome are still relatively limited, some authors are beginning to provide evidence that improved safety culture has a positive effect. Haynes *et al.* used the SAQ before and after intervention of the World Health Organization surgical safety checklist. A reduction in postoperative complication rate was associated with an improvement in staff attitudes.[11] Positive correlation has also been demonstrated in obstetric settings, where Pettker *et al.*[12] demonstrated a significant reduction in the Adverse Outcome Index following implementation of multiple patient safety initiatives, associated with a significant increase in SAQ scores.

Methods

This study was reviewed and given approval by an institutional audit and research department review committee at the Dorset County Hospital. Dorset County Hospital is a rural district general hospital with full acute medical, surgical, and pediatric services in the South West of England, United Kingdom. The JAC Medicines Management System (Mediware Information Systems Inc, Lexena, KS), an EP system with broad uptake both in the United Kingdom and internationally was implemented here (with full suite of prescribing/stock-taking capabilities) across all surgical services in December 2014.

The SAQ assesses individual staff attitudes using six distinct variables that contribute to overall culture. These are teamwork climate, job satisfaction, perceptions of management, safety climate, working conditions, and stress management. Each domain is assessed through a series of safety-orientated statements, with respondents asked to agree or disagree via a Likert-scale response. Some hospitals in the United States use this tool on an annual basis for quality improvement purposes.[13]

This is a cross-sectional study, which targeted all hospital staff involved in the care of surgical patients. Staff were asked to complete a modified SAQ survey, 6 weeks following the introduction of EP. These included both clinician and nonclinician (i.e., pharmacists and nursing) staff. The modified SAQ included all domain questions of the SAQ, and asked respondents to rate the impact of the introduction of EP on their attitudes for each on a Likert scale ranging from 1 (very negative) to 5 (very positive). In addition, respondents were asked about the perceived impact on overall error following EP implementation, impact on ease of prescribing and reviewing prescriptions, demographic data, and free-text boxes to allow respondents' to provide any further information.

The questionnaire was sent out by email to 238 staff of all grades and specialties involved in surgical patient care. A mailing list was generated by departmental search on the hospital intranet system. After a period of 1 week, a repeat email was sent. Staff were also approached in person, and hyperlinks to the survey were placed on workspace computer desktops. The data collection period lasted 2 weeks overall. Responses were collected anonymously with implicit consent through participation and completion of the survey form.