Physicians Failed to Write Flawless Prescriptions When Computerized Physician Order Entry System Crashed

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ABSTRACT

Purpose: Clinical care has become increasingly dependent on computerized physician order entry (CPOE) systems. No study has reported the adverse effect of CPOE on physicians' ability to handwrite prescriptions. This study took advantage of an extensive crash of the CPOE system at a large hospital to assess the completeness, legibility, and accuracy of physicians' handwritten prescriptions.

Methods: The CPOE system had operated at the outpatient department of an academic medical center in Taiwan since 1993. During an unintentional shutdown that lasted 3.5 hours in 2010, physicians were forced to write prescriptions manually. These handwritten prescriptions, together with clinical medical records, were later audited by clinical pharmacists with respect to 16 fields of the patient's, prescriber's, and drug data.

Findings: A total of 1418 prescriptions with 3805 drug items were handwritten by 114 to 1369 patients. Not a single prescription had all necessary fields filled in. Although the field of age was most frequently omitted (1282 [90.4%] of 1418 prescriptions) among the patient's data, the field of dosage form was most frequently omitted (3480 [91.5%] of 3805 items) among the drug data. In contrast, the scale of illegibility was rather small. The highest percentage reached only 1.5% (n = 57) in the field of drug frequency. Inaccuracies of strength, dose, and drug name were observed in 745 (19.6%), 517 (13.6%), and 435 (11.4%) prescribed drug items, respectively.

Implications: The unintentional shutdown of a long-running CPOE system revealed that physicians fail to handwrite flawless prescriptions in the digital era. The contingency plans for computer disasters at health care facilities might include preparation of stand-alone e-prescribing software so that the service delay could be kept to the minimum. However, guidance on prescribing should remain an essential part of medical education. (*Clin Ther.* 2015;37:1076–1080)

Key words: ambulatory care, CPOE system downtime, handwritten prescriptions, stand-alone e-prescribing software, medical education.

INTRODUCTION

The computerized physician order entry (CPOE) system has been widely promoted in the past 3 decades as a potential tool for minimizing adverse effects in clinical practice. Compared with handwritten prescribing, the advantages of a CPOE system include standardization, legibility, completeness, and feasibility of data retrieval. Past studies have found that >70% of medication errors in an outpatient setting could be avoided by a CPOE system.[1–6] However, implementing a CPOE system also results in unintended adverse consequences and new types of error (eg, inadvertently selecting a wrong drug item from the dropdown menu and uncritically accepting the default values for dose and frequency).[7,8] Some of these errors could be attributed to overdependence on technology.[9]

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When physicians become increasingly dependent on technology in patient care, some of their manual skills might deteriorate.[10,11] No study has examined the detrimental effect of a CPOE system on physicians' ability to handwrite prescriptions. In the present study, we assessed the completeness, legibility, and accuracy of physicians' handwritten prescriptions during an unintentional crash of a long-running CPOE system at a large hospital.

METHODS

The study has been approved by the institutional review board of Taipei Veterans General Hospital, Taipei, Taiwan. This retrospective study was conducted at the department of pharmacy at a 2900-bed academic medical center where >8000 ambulatory prescriptions were processed daily. All prescriptions were issued by physicians through the CPOE system that started to operate in 1993. Physicians can easily search and select drug items by keying in at least 3 letters and searching the dropdown list. Physicians then need only to verify the default values in this autogenerated prescription.

On September 27, 2010, at 12:30 PM, the CPOE system at the outpatient department experienced a total failure because of hardware problem of the server. The shutdown lasted 3.5 hours, the longest that ever happened. The works of recording, prescribing, and dispensing were forced to proceed manually. The standard paper prescription forms (**Supplemental Appendix**) came into use. The physicians wrote prescriptions in English.

All handwritten prescriptions during the shutdown were collected for analysis. Forty clinical pharmacists who worked at the studied hospital reviewed these handwritten prescriptions and the corresponding medical records. Before the review, a consensus meeting was held to reduce the interrater variability by standardizing the assessment. Each prescription was assessed by 2 pharmacists. In case of disagreement, 3 coauthors (C.C.H., C.L.C., and C.C.H.) were consulted to make the final judgment.

The analysis of a handwritten prescription was divided into 2 major parts: (1) patient's and prescriber's data in 8 fields: patient name, identification number, age, sex, diagnosis, prescribing date, department, and prescriber's signature; and (2) drug data in 8 fields: drug name, dosage form, strength, dose, route, frequency, duration, and quantity for each prescribed drug item.

For each handwritten prescription, we assessed the completeness, legibility, and accuracy successively. The completeness was defined if all necessary fields were filled in. In the filled fields, the legibility was operationally defined if there was no need to reconfirm with prescribers, patients, or medical records. In the legible fields, the patient's data (name, identification number, age, sex, and department) were cross-checked against clinical medical records. The prescribed drug items were verified with the help of hospital formulary. Examples of inaccuracy included misspelling of drug name; unavailable dosage form or strength; strength or dose without units; dose, route, or frequency against the recommendation of formulary; and miscalculation of drug quantity. In addition, acronyms, abbreviations, or symbols not listed in formulary were regarded as inaccurate. In the present study, we did not analyze treatment decisions so that the accuracy of diagnosis and duration left unevaluated.

The spreadsheet software (Microsoft Office Excel version 2007, Microsoft Inc, Redmond, Washington) was used for data recording and computing. Descriptive statistics were displayed for each field, including frequencies and percentages of omission, illegibility, and inaccuracy. For fields of patient's and prescriber's data, the percentage of omission, illegibility, and inaccuracy was determined by the frequency of omitted, illegible, and inaccurate prescriptions divided by the total number of prescriptions. For fields of drug data, the percentage of omission, illegibility, and inaccuracy was determined by the frequency of omitted, illegible, and inaccurate drug items divided by the total number of prescribed drug items.

RESULTS

A total of 1418 prescriptions with 3805 drug items were handwritten by 114 physicians to 1369 patients. Not a single prescription had all necessary fields filled in. A prescription had a mean (SD) of 1.6 (0.8) omitted fields of patient's and prescriber's data and 9.6 (7.3) omitted fields of drug data. For a prescribed drug item, a mean (SD) of 3.0 (0.9) fields were not written.

For all 8 fields of patient's and prescriber's data, only 64 (4.5%) of 1418 prescriptions fulfilled the criteria of completeness, legibility, and accuracy. The most commonly omitted fields were age (1282 [90.4%]), diagnosis (437 [30.8%]), and sex (313 [22.1%])