

Improving the quality of the order-writing process for inpatient orders and outpatient prescriptions

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Medication errors are receiving widespread attention in both the lay press and the medical literature.¹⁻⁷ The death of a newspaper reporter at the Dana Farber Cancer Institute began the heightened awareness across the nation to the seriousness of medication errors.⁸ More recently, an Institute of Medicine report, which estimated that 44,000 to 98,000 Americans die each year as a result of medical errors—7000 of these attributed to medication errors, escalated the focus on this topic.⁹

Numerous steps are involved in the hospitalized patient's medication process, beginning with the practitioner's decision to order the drug and ending with the monitoring of the administered dose. Each step is primed with opportunities for errors. For example, one study of the medication process identified 6.5 adverse drug events and 5.5 potential adverse drug events per 100 nonobstetrical admissions; 49% of the preventable errors occurred at the ordering stage.¹⁰ The prescriber may write an inappropriate dose, wrong medication, or inappropriate

Abstract: Because many preventable medication errors occur at the ordering stage, a program for improving the quality of writing inpatient orders and outpatient prescriptions at one institution was developed.

To determine whether potential problems existed in the order-writing process for inpatients, all physician orders for a seven-day period in 1997 were reviewed ($n = 3740$). More than 10% of all orders had illegible handwriting or were written with a felt-tip pen, which makes NCR copies difficult to read. Other potential errors were also identified. Following educational programs for physicians and residents focusing on the importance of writing orders clearly, physician orders were reviewed for a 24-hour period ($n = 654$). The use of felt-tip pens decreased to 1.37% of all orders, and no orders had illegible handwriting. A similar quality improvement approach was used to evaluate the outpatient prescription-writing process. A review of all new prescriptions for a consecutive seven-day period at a local hospital-owned community pharmacy ($n = 1425$) revealed that about 15% of the prescriptions had illegible handwriting and roughly 10% were incomplete. Additional data were gathered through a survey sent to 71 outside provider pharmacies requesting information on problems related to prescriptions writ-

ten by physicians from the institution; 66% responded. Failure to print prescriber name (96%), illegible signature (94%), failure to include DEA number (89%), and illegible handwriting other than signature (69%) were reported as the main problems. Each physician was given a self-inking name stamp to use when writing prescriptions. In addition, educational programs covering examples of poorly written prescriptions and the legal requirements of a prescription were held for physicians and residents. A follow-up survey showed that 72% of pharmacies saw stamps being used; when stamps were not used, however, illegible signatures continued to be a problem. Follow-up reviews of outpatient prescriptions indicate improvements in handwriting and completeness, but continuing educational efforts are needed. The quality of order writing for inpatients and outpatients continues to be monitored on a regular basis.

Ongoing educational programs, follow-up reminders, and feedback to physicians have greatly improved the prescription-writing habits of physicians.

Index terms: Education; Medication orders; Pharmacy, institutional, hospital; Physicians; Prescribing; Prescriptions; Quality assurance; Readability

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length of drug treatment. The prescriber may also fail to detect allergies, fail to monitor serum concentrations or adverse reactions, and communicate poorly either orally or in writing with the nurse, pharmacist, or patient.

According to the National Coordinating Council for Medication Error Reporting and Prevention, in 15% of the medication error reports it receives, the error occurred because of illegible handwriting, problems with leading and trailing zeroes, misinterpreted abbreviations, and incomplete medication orders.¹¹

This paper describes a program for improving the quality of the order-writing process for inpatient orders and outpatient prescriptions at the Scott and White Memorial Hospital and Clinic in Temple, Texas. Scott and White is a 486-bed nonprofit institution with a multi-specialty group practice of 515 physicians in a clinic setting, plus a health plan that covers 170,000 lives. The clinic's main campus is connected to the hospital, and 20 regional clinics are located throughout central Texas.

Identification of the problem

In 1997, a medication-safety team composed of pharmacists, nurses, and physicians was formed to review the medication process for potential errors at Scott and White Memorial Hospital and Clinic. Because the majority of errors occur when medications are ordered,¹⁰ a subgroup consisting of one pharmacist and one physician was assigned the task of examining the order-writing process, initially focusing only on inpatient care. Through pharmacist interventions, data were already being documented on errors in that process associated with lack of knowledge and application of drug therapy, lack of knowledge and use of patient factors, and mathematics.¹² Not being addressed were issues related to the improper, un-

clear, and incomplete orders written or called in by prescribers.

To determine whether potential problems existed in the order-writing process, we screened all physician orders for a seven-day period in April 1997. Table 1 lists the screening criteria used. Each criterion had been responsible for medication errors at Scott and White or cited in the literature as causing an error.^{11,13-15} Improper modification occurs when a prescriber recognizes that an order is incorrect and marks through, changes, or rewrites only part of an order rather than striking through and rewriting the entire order, which is the correct procedure. The use of felt-tip pens was included because NCR copies are less legible when written with a felt-tip pen compared with ballpoint. We believed that these criteria represented poor prescribing habits, and improvement was possible if problems could be quantified and addressed.

We also decided to examine two additional variables. One of these was the percentage of orders that did not include the prescriber's pager number. Although this does not in itself cause errors, inclusion of the pager number helps the nurse or pharmacist identify and contact the prescriber efficiently if order clarification is necessary.

The percentage of oral (telephone) orders was also reviewed. While we considered oral orders a necessity at our institution, we recognized their having a high potential for errors because of misinterpretation or miscommunication. Knowing the kinds of errors associated with oral orders would help us focus our educational efforts.

Table 1 shows the baseline results. Of the 3740 physician orders (containing 7776 individual medication orders), 20.3% were given orally; 28.1% failed to include a pager number. Over 10% of all physician orders were written with a felt-tip pen or had illegible handwriting.

Plan for improvement and follow-up evaluations

On the basis of these findings, we developed a plan for improving the order-writing process. Our first step was to present the results, along with examples of potential problems and our proposed plan for educating prescribers, to the medical staff executive committee (MSEC). This committee sets policy for the medical and house staff and is composed of medical department chairs. Once we got approval to go ahead with our quality improvement initiative, we made a similar presentation to the quality council, safety committee, and pharmacy and therapeutics (P&T) committee. Presentations at a medical staff quarterly meeting, medical staff division meetings, and resident orientation and resident conferences followed. These educational programs focused on the importance of writing orders clearly, the order-writing guidelines (including the writing of pager number on orders), special considerations when giving telephone orders, and examples of actual errors and potential problems using orders from our institution.

In addition to these educational programs, we published the order-writing guidelines in the Scott and White calendar book and posted them in all hospital patient-care units and clinic areas. We also presented anonymous problem orders in every issue of the clinic staff newsletter, which is published every six weeks.

In July 1997, three months from the first analysis, medication orders were again reviewed, this time for a 24-hour period. There was a total of 654 physician orders (containing 1188 individual medication orders) (Table 1). Illegible handwriting improved dramatically. Improvement of legibility was deemed critical because illegibility had a potentially serious negative impact on patient safety. Improving legibility also eliminates extra work for the pharmacist and nurse who need to track down the prescriber for clarification.

Table 1.

Screening Criteria for Potential Errors in Medication Order-Writing Process for Inpatients

| Screening Criterion | % of All Physician Orders | | | |
|--|---------------------------|------------------------|----------------------------|--------------------------|
| | April 1997 (n = 3740) | July 1997 (n = 654) | February 2000 (n = 425) | August 2000 (n = 368) |
| Use of felt-tip pens | 13.03 | 1.37 | 0 | 0.27 |
| Illegible handwriting | 10.90 | 0 | 0 | 0 |
| Improper modifications | 1.79 | 1.07 | 2.58 | 2.71 |
| Use of "u" rather than "units" | 1.79 | 2.90 | 3.15 | 5.70 |
| Failure to include signature | 1.00 | 0.76 | 0 | 0 |
| Absence or presence of trailing zeroes | 0.85 | 0.76 | 0.23 | 1.08 |
| Ambiguous orders | 0.34 | 0 | 0 | 0 |
| Incomplete orders | 0.26 | 0.38 | 0 | 0 |
| Use of apothecary system | 0.09 | 0 | 0 | 0 |
| Writing ampul or vial rather than strength | 0.05 | 0 | 0 | 0 |
| Improper abbreviations | 0 | 0 | 0.23 | 0 |
| Orders for wrong patient | 0 | 0 | 0 | 0 |
| Failure to include pager number | 28.10 | 25.22 | 17.17 | 18.47 |
| Oral orders | 20.30 | 18.34 | 19.29 | 23.91 |

tion, and it expedites delivery of the medication to the patient.

The use of felt-tip pens substantially decreased to 1.37% of all medication orders. Since pharmacy and nursing received NCR copies of orders, this helped ensure that they received clear, readable copies of medication orders. A slight increase in percentage was seen in the use of "u" for units and incomplete orders.

Our program for monitoring the writing of medication orders has been in place for three years. Overall, all areas have shown improvement, except for the following categories: use of "u" for units, improper modification, and trailing zeroes (Table 1). The subgroup continues to track potential errors in the medication-ordering process and periodically reports trends to the quality council and medication-safety team. The trends help focus our educational efforts on areas that need improvement. In an effort to keep prescribers aware of the importance of writing clear medication orders, each month we continue to feature examples of problems in the order-writing process in the clinic staff newsletter.

Extension to outpatient prescribing

While medication errors influ-

encing inpatient care have been well documented, the same is not true for ambulatory care. The shift of health care services to outpatient settings increases the importance of careful observation of potential risks associated with medication misadventures in the outpatient setting. According to a recent study, the number of outpatients who died from medication errors increased 8.5 fold from 1983 to 1993.¹⁶ Given our experience reviewing the order-writing process for inpatients, our subgroup was asked to review the error potential of outpatient prescriptions using a similar quality improvement approach.

As a first step in identifying problems in the outpatient prescription-writing process, during a seven-day period in August 1997 we reviewed all new prescriptions filled at a Scott and White pharmacy located in Temple; almost all prescriptions filled there were from physicians associated with Scott and White. While the elements listed in Table 2 are not all necessarily errors, they were included as review criteria because they fit one or more of the following categories: it is a legal requirement, it provides information that helps pharmacists detect potential problems, or it has been shown

to contribute to errors.

Of the 1425 new prescriptions reviewed at baseline, two thirds did not include the indication, and 15.01% had illegible handwriting. Almost 10% of the prescriptions were incomplete. Of the 213 prescriptions for controlled substances, 64 were missing DEA numbers (30.05%).

As a second step in evaluating the outpatient prescription-writing process, in January 1998 we sent surveys to 71 pharmacies in our network that contract to fill prescriptions for patients in the Scott and White health plan. The survey solicited information on problems or concerns related to prescriptions written by physicians associated with Scott and White. Responses representing 47 pharmacies (66%) were received. These pharmacies filled a total of 1580 prescriptions daily, and respondents indicated 33% of the prescriptions were problematic.

Illegible signature, illegible handwriting, and failure to print prescriber name were cited as the main problems for the majority of respondents (Table 3). The use of improper abbreviations, failure to include strength, failure to include amount to be dispensed, and failure

Table 2.
Screening Criteria for Potential Errors in Prescription-Writing Process for New Outpatient Prescriptions

| Screening Criterion | % of New Prescriptions | | |
|--|---------------------------|---------------------------|----------------------------|
| | August 1997 (n = 1425) | August 1998 (n = 1142) | February 2000 (n = 254) |
| Failure to include indication | 66.80 | 38.61 | 63.77 |
| Illegible handwriting | 15.01 | 0.35 | 2.36 |
| Incomplete (missing date, patient's name, directions, or the like) | 9.47 | 5.42 | 4.33 |
| No route or wrong route | 8.14 | 7.61 | 15.35 |
| Lack of or wrong strength or frequency | 1.96 | 0.26 | 0 |
| Use of apothecary system | 0.35 | 0 | 0 |
| Presence or absence of trailing or leading zeros | 0.14 | 0 | 0 |
| Use of "u" rather than units | 0.07 | 0 | 0 |
| Improper abbreviation | 0 | 0 | 0 |
| Wrong patient | 0 | 0 | 0 |
| Missing DEA number ^a | 30.05 | 25.75 | 45.83 |

^aFor this entry, results are presented as a percentage of the number of new prescriptions for controlled substances, not the total number of all new prescriptions (n = 213, 167, and 24 for August 1997, August 1998, and February 2000, respectively).

Table 3.
Problems in Outpatient Prescription-Writing Process Reported by Pharmacies

| Problem | % of Pharmacies Reporting Problem | |
|--|-----------------------------------|--------------------------|
| | January 1998 (n = 47) | October 1998 (n = 54) |
| Failure to print prescriber name | 96 | 89 ^a |
| Illegible signature | 94 | 89 ^a |
| Failure to include DEA number | 89 | 57 |
| Illegible handwriting (other than signature) | 69 | 9 |

^aLegibility of physician's name substantially improved through the use of name stamps; 72% of the respondents indicated that they saw stampers being used. These results refer only to the respondents' perception of prescriptions not stamped with the prescriber's name.

to include directions were indicated as occasional problems. Problems mentioned in the "other" category included prescriptions from physician assistants, misspelling of patient name, lack of one designated phone number for questions regarding prescriptions, missing four-digit suffix (pager number) on DEA numbers, illegible printed name, and failure to write out quantity for controlled substances prescriptions.

Additional concerns or problems pharmacists at these outside pharmacies encountered were being unable to fill illegible prescriptions, filling prescriptions without being able to clarify, and violating the law by filling prescriptions without DEA

numbers. Several pharmacists wrote of problems concerning illegible physician name. They noted that patients often do not recall the physician's name, except that of their routine physician. Sometimes pharmacists refuse to fill prescriptions with an illegible physician name because of possible rejection of payment by Medicaid. Some solve the problem by placing the name of the physician from a previous prescription on the prescription label. If a patient calls back with a problem or adverse effect or if refills need to be authorized, however, pharmacists are unable to consult with the physician. Pharmacists are also concerned about the possibility of filling a bo-

gus prescription if they are unable to read the physician's signature or check DEA number.

Since the prescription analysis and survey results showed that the majority of issues centered on illegible handwriting (especially for signatures) and failure to provide necessary information, we established a plan for improving the quality of the outpatient prescription-writing process. We basically followed the same plan as for the inpatient order-writing process. That is, we presented the results to the MSEC, quality council, safety committee, and P&T committee. We then presented educational programs to physicians and residents that focused on examples of poorly written prescriptions, the legal requirements of a prescription, and errors that have occurred because of failure to provide the necessary elements of a prescription. To address the issue of illegible signature, we gave each physician a self-inking stamp to use when writing prescriptions; it contained the physician's name, division or department, and internal identification number.

To assess the effectiveness of the plan, we sent a second survey to the same 71 outside pharmacies in October 1998; 54 (76%) responded. Together these pharmacies filled 1940 prescriptions daily. Almost three fourths (72%) of the respondents indicated that they saw prescriptions with signature stamps being used. When stamps were not used, however, 89% of respondents reported illegible signatures and failure to print name legibly as a problem (Table 3). Failure to include DEA number and illegible handwriting improved substantially. The remaining five other areas also showed improvement.

Just as for the inpatient program, we continue to track the quality of the outpatient prescription-writing process by reviewing new prescriptions at the Scott and White pharmacy and report trends to the

MSEC, quality council, medication-safety team, and P&T committee (Table 2). The February 2000 analysis of outpatient prescriptions indicates that improvement made in the quality of order writing for outpatients has slipped. Our group plans to increase educational efforts in this area, focusing on the need to include indication, route, and DEA number (for controlled substances) on all prescriptions. The quality of the order-writing process will continue to be evaluated at regular intervals.

Conclusion

Our plan for improving the medication order-writing process for both inpatients and outpatients has met with full approval from the executive medical staff, hospital and clinic administration, and risk management department. Ongoing educational programs, follow-up reminders, and feedback to physicians have greatly improved the prescrib-

ing habits of physicians at our institution. Our goal is to continue to increase prescribers' awareness of potential problems in order to obtain the highest quality process for ordering medications with the lowest frequency of errors.

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