

e-Prescribing/Patient Safety Analysis utilizing the Pharmacy and Prescriber e-Prescribing Experience Reporting (PEER) Portal

Prepared for:

The National Alliance of State Pharmacy Associations (NASPA)

The Alliance for Patient Medication Safety (APMS)

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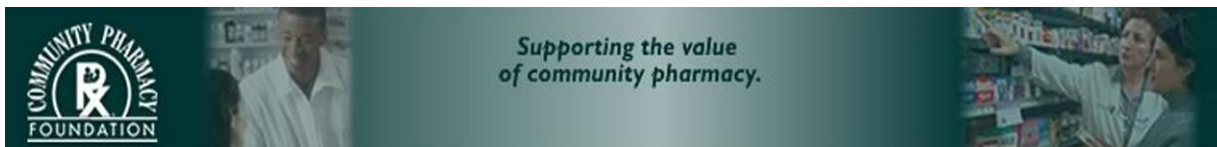
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COMMUNITY PHARMACY FOUNDATION
COMPLETED GRANT SYNOPSIS

e-Prescribing/Patient Safety Analysis utilizing the Pharmacy and Prescriber
e-Prescribing Experience Reporting (PEER) Portal

Alliance for Patient Medication Safety
National Alliance of State Pharmacy Associations

Richmond, VA

Objectives	
1) Identify the types and quantify the problem(s) pharmacies and prescribers experience with e-prescribing through a data collection and analysis mechanism, 2) Estimate the financial impact of e-prescribing by including “time spent in resolution,” 3) Develop recommendations for possible solutions.	
Methods	
Design	<ul style="list-style-type: none"> • Development of a web-portal: “the Pharmacy and Prescriber e-prescribing Experience Reporting (PEER) Portal” to collect data on electronic prescribing problems nationwide. • Prospective data analysis
Study endpoints	<ul style="list-style-type: none"> • Quantify type and number of electronic prescribing problems
Results	
<ul style="list-style-type: none"> • A total of 308 reports were received during the study; 86% of respondents (n=266) were pharmacists, 10% (n=31) technicians, 3% (n=9) students, and 0.3% physicians (n=1). • The majority of reports; 97% (n=298) came from pharmacies (including retail, mail-order, and outpatient clinics), 2% (n=7) from medical offices and one report came from other unspecified setting. • In 38% of the reports the incidents described were “near misses;” only 4% of the reported incidents reached the patient. • The majority of reports involved problems with SIG/directions (25%) and quantity selection (18%), followed by electronic prescriptions containing conflicting information (11%) and dose selection (10%). • The median of the time spent resolving problems was 10 min (IQR=10), which represents an estimate of \$9.00 per e-prescription issue resolved. 	
Conclusion	
<p>The PEER Portal showed to be a successful tool to report e-prescribing problems. It allowed health care personnel to report weakness of prescribing systems. This research showed evidence that there are a variety of issues regarding e-prescribing. The majority of the issues reported in this study were related to SIG and quantity selection. System changes are necessary in order to decrease or eliminate some of these issues.</p>	

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Project Background

The Institute of Medicine 1999 report “To Err is Human: Building a Safer Health System” highlighted the dangers and the costs of medication errors and the potential role of information technology in reducing such errors. However, new technologies may introduce a new set of errors that threaten patient safety.^{1,2}

Technological errors are significant and are increasingly evident as the entire healthcare system moves to towards Health Information Technology adoption. It is believed that these system problems primarily occur because of human error and technological faults. To resolve these errors, communication between the pharmacist and the physician office practice is needed. In addition, health professional education and training regarding what types of errors are most common and what systems improvements are needed to reduce the most frequent human errors. To help prevent these errors, providers need to track and report the errors even if they do not reach the patient. Therefore, data need to be aggregated, analyzed and best practices developed and updated. To resolve technology errors, system vendors need to be aware of what is not working. If technology vendors do not make system modifications voluntarily, standards need to be revised and enforced to mandate the problem resolution.

Studies have documented the significance of e-prescribing system issues. Pharmacists must intervene on electronic prescriptions as often as they do on hand written prescriptions because this technology still poses threats to both medication safety and effectiveness. One study conducted in 68-chain community pharmacies during three months found that, after reviewing 2,690 electronic prescription orders, pharmacists took action 102 times for an intervention rate of 3.8%.³ This study also found that the rate at which pharmacists identified problems on new e-prescriptions was nearly twice that of refills (4.1% and 2.2%, respectively). In another study, pharmacists reviewed 1,678 new electronic prescriptions and intervened on 153 (9.1%) over a 13-day period.⁴ Although research has found that electronic prescriptions may decrease the risk of errors compared to CPOE printouts given to patients, e-prescription error rates are not smaller to prescription error rates reported before the electronic era. In an study from 1992, Rupp et al. found that pharmacist had to intervene in 623 (1.9%) of 33,011 new prescriptions over a period of eight months.⁵

The Alliance for Patient Medication Safety (APMS) developed the Pharmacy and Prescriber e-prescribing Experience Reporting (PEER) data portal to identify the problems experienced with e-prescribing and estimate the financial impact of resolving e-prescribing errors, with the ultimate goal of improving the quality and effectiveness of electronic prescribing technologies. With support from the Community Pharmacy Foundation, enhancements were made to the portal, extensive outreach was made to promote reporting amongst state and national pharmacy associations, and a thorough analysis was completed on those reports that were received.

The specific project goals were:

- a) Identify the types and quantify the problem(s) pharmacies experience with e-prescribing through a data collection and analysis mechanism,
- b) Estimate the financial impact of e-prescribing by including “time spent in resolution,”
- c) Develop recommendations of possible solutions.

Methods

Data Collection

The APMS launched the Pharmacy and Prescriber e-prescribing Experience Reporting (PEER) Portal Data Collection process at the end of October 2010. This portal was available free of charge to anyone that had an Internet connection. State pharmacy associations worked with APMS and promoted use of the PEER portal to their members by adding links to on their websites and sharing information in their electronic newsletters and other publications. Some also spoke about the portal in presentations to their members including continuing education programs on medication safety and quality assurance. Additional outreach was made to several national associations, many of which also promoted the portal to their members. Examples of those national associations include The American Society for Automation in Pharmacy, National Association of Boards of Pharmacy, Pharmacy e-Health Information Technology Collaborative, Pharmacy Quality Alliance, American Association of Colleges of Pharmacy, Surescripts, Arizona Partnership Implementing Patient Safety, University of Arizona Medical Association, Centers for Medicare and Medicaid Services, Office of the National Coordinator, and Pharmacy Times.

The PEER Portal consisted of 12 questions intended to provide reporters with a tool to report their e-prescribing experience with the ultimate goal of improving the quality and effectiveness of electronic prescribing technologies (See Appendix A). The first ten items included in the Portal were selected from published articles in the field of e-prescribing and community pharmacy.⁶ The last two items were developed by the investigators and APMS to assess the reporters' time spent in error resolution in order to estimate the financial burden of addressing e-prescribing issues. APMS assessed the PEER Portal content validity.

To leverage reporting, bimonthly short reports summarizing preliminary results were prepared by the investigators and were shared with the state pharmacy associations to include in communications to their members (See Appendix B). Moreover, a short note encouraging PEER Portal use was submitted for publication to the Journal of the American Pharmacists Association (JAPhA) in May 2011 (See Appendix C).

Data Analysis

Univariate summary statistics were calculated. The percentage of participants choosing each response category was reported for each PEER Portal item. These data were analyzed using STATA 11.0. A qualitative coding approach was used to analyze the open-ended data as recommended by L. Richards.⁷ The coding technique involved: descriptive coding, topic coding, analytical coding, and post-coding. Descriptive coding was used to code participant demographic characteristics in this case reporter type (pharmacist, technician, or provider). Topic coding was used to label the responses according to its subject. Topic coding consisted of two steps: a general classification of categories and an iterative recoding process to include more sub-categories. Analytical coding was applied to evaluate possible ramification of responses.

Results

From September 1 2010 until June 30 2011, a total of 308 reports were collected through the PEER Portal.

Reporter Information

Eighty-six percent of respondents (n=266) were pharmacists, 10% (n=31) technicians, 3% (n=9) students, and 0.3% physicians (n=1). The majority of reports, 97% (n=298) came from pharmacies (including retail, mail-order, and outpatient clinics), 2% (n=7) from medical offices and one report came from other unspecified setting.

Type of electronic prescription

Out of 308 reports, 66% (n= 203) corresponded to electronic prescriptions received directly into pharmacies' computers and 31% (n=96) were computer-generated prescriptions faxed to pharmacies.

Type of e-prescribing problem

The results in Table 1 describe the types of e-prescribing problems reported through the PEER Portal. In 4% (n=12) of reports the problem reached the patient. Thirty eight percent of the reports were events that did not reach the patient, and 58% corresponded to comments, complaint or identified unsafe conditions regarding electronic prescriptions.

Table 1: Types of e-prescribing Problems Reported to the PEER portal

	Frequency (n=308)	Percentage
Unsafe condition or comments	179	58
Near miss (event did NOT reach the patient)	117	38
Incident or error (event reached the patient)	12	4

E-prescribing systems

As indicated in Table 2, the majority of reporters did not know the e-prescribing system used by prescribers to send prescriptions. Surescripts was involved in the majority of the reports where the e-prescribing system was identified.

Table 2: Frequency of e-Prescribing Systems Involved in PEER Reports

e- Rx System	Frequency	Percentage*
Unknown	163	53%
Surescripts	63	20%
Epic - Epic Summer 2009	27	9%
eClinicalWorks - eClinicalWorks 8.0	7	2%
HAC	7	2%
Stylesheet	5	2%
e-MDs - e-MDs Solution Series 6.3	4	1%
PFW	4	1%
Alteer Corporation - Alteer Office 8.0	3	1%
CentriHealth - CentriHealth IHR 2009.2.	2	1%
Compulink - Compulink e-Rx Uses NewCrop	2	1%
DrFirst.com	2	1%
Escribe EMR Solutions, Inc.	2	1%
GE Centricity Enterprise	1	0.3%
McKesson - Lytec	1	0.3%
NextGen EMR 5.6	1	0.3%
athenaClinicals	1	0.3%
Accumedic Computer Systems, Inc	1	0.3%
Allscripts - Allscripts Enterprise EHR	1	0.3%
Cerner - PowerChart M2007	1	0.3%
Emdeon - Clinician 7	1	0.3%
Medent - MEDENT 19	1	0.3%
OmniMD - OmniMD Version 8.2	1	0.3%
Pharmaserv	1	0.3%
RxLinc e-prescribing networks	1	0.3%
RxNT eRx 6.1.4	1	0.3%
eErrorPrescribing	1	0.3%
e-scripts	1	0.3%
All systems	1	0.3%

* Percent may not equal 100 due to rounding

The e-prescribing concerns received through the PEER Portal involved an ample variety of medications, thus there is not a therapeutic category that stands out. Results showed in Table 3 suggest that the e-prescribing issues were not specifically related to one type of medication.

Table 3: Frequency of Medications Involved in PEER Reports (n=308)

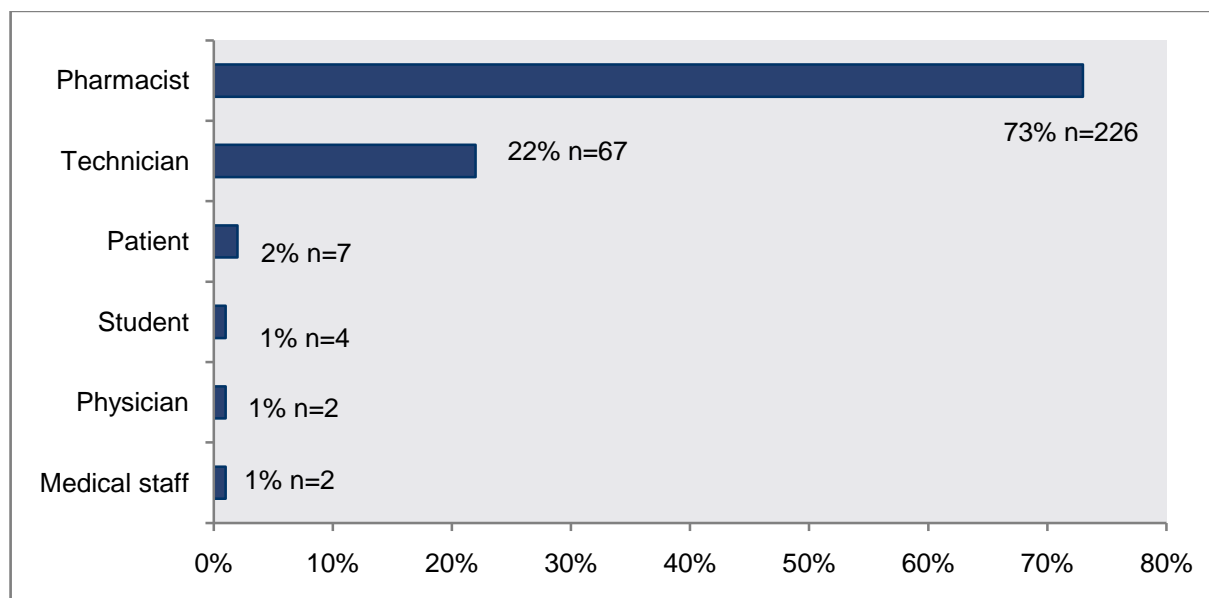
Drug Name	Frequency	Percentage*
Antilipemic Agents	20	6%
Antidepressants	18	6%
Not Specified	16	5%
beta-Adrenergic Blocking Agents	14	5%
Adrenals	13	4%
Anticonvulsants	13	4%
Antidiabetic Agents	13	4%
beta2-Adrenergic Agonists	11	3%
Analgesics and Antipyretics	9	3%
Anti-inflammatory Agents	9	3%
Eye, Ear, Nose, and Throat (EENT) Preparations	9	3%
Macrolides	9	3%
Penicillins	8	3%
Renin-Angiotensin-Aldosterone System Inhibitors	8	3%
Blood glucose test strips	7	2%
Opiate Agonists	7	2%
Antifungals	6	2%
Antihistamine Drugs	6	2%
Cephalosporins	6	2%
Antithyroid Agents	5	2%
Antivirals	5	2%
Diuretics	5	2%
Potassium Supplements	5	2%
Other**	83	27%

* Percent may not equal 100 due to rounding, **Other medications showed on Appendix D

Person identifying error

Pharmacists identified more than two thirds of e-prescribing problems followed by pharmacy technicians as shown in Figure 1.

Figure 1: The Role of the First Person who identified the e-prescribing Problem (n=308)



* Percent may not equal 100 due to rounding

E-Prescribing related problems

More than half of the issues reported through the PEER Portal corresponded to four problems: SIG or direction; quantity selection; conflicting information on the e-prescribing; and dose selection (See Table 4). Comments received through the PEER Portal confirmed these statistics; respondents indicated they had consistent issues with dose, quantity, and dosage form on e-prescriptions. Some respondents suggested that this could occur because systems erase dose and quantity information if the SIG is changed.

Other problems encountered with e-prescriptions were disagreement between SIG and drug route, strength that does not match the directions, and package size that conflict with SIG. In addition, compounded medications often are sent with insufficient information regarding final concentration and dosage forms and inhaler prescriptions are transmitted with incorrect package sizes. Reporters suggested that these errors occurred because default SIGs are available but prescribers may not verify them before sending the e-prescribing. Also, they indicated that prescribers are allowing improperly trained medical staff to send refill prescriptions, which may increase the likelihood of error.

Table 4: Frequency of e-prescribing Problem Types Involved in PEER Reports

E-prescribing Problem	Frequency (n=455)*	Percentage**
SIG or Directions	114	25%
Quantity selection	84	18%
E-prescribing contains conflicting information	52	11%
Dose selection	46	10%
Drug selection	43	9%
Dosage form selection	27	6%
E-prescribing contains missing essential information	21	5%
E-prescribing data fields are used inappropriately	21	5%
Legibility/font/unsafe nomenclature or other system design feature (hardware/software) that increases risk for error	10	2%
Route selection	9	2%
E-prescribing for a controlled substance	8	2%
Data transmission error	8	2%
Incorrect patient	7	1%
Data fields too small to record all information input by prescriber	3	1%
Date selection	2	0.4%

*Subjects had the option of selecting more than one problem for each report

** Percent may not equal 100 due to rounding

As shown in Table 5, SIG problems were the most frequent type of error that is common for the top five pharmacy systems involved in the reports received through the PEER portal (no statistical significances found).

Table 5: Top three e-Prescribing Problems for five pharmacy systems

Pharmacy System		
McKesson Pharmacy Systems	<i>SIG or Directions</i>	33 (43%)
	e-prescribing contains conflicting information	19 (25%)
	Quantity selection	15 (20%)
QS/1	<i>SIG or Directions</i>	25 (37%)
	Dose selection	15 (22%)
	e-prescribing contains	11 (16%)
PDX Pharmacy systems	<i>SIG or Directions</i>	10 (35%)
	Quantity selection	7 (24%)
	Dose selection	5 (17%)
Speed Script	Quantity selection	10 (48%)
	<i>SIG or Directions</i>	3 (15%)
	Drug selection	3 (15%)
Cerner Etreby	<i>SIG or Directions</i>	9 (53%)
	Quantity selection	4 (23%)
	Dosage form selection	2 (12%)

This study revealed problems with the patient matching process used by some e-prescribing systems. Box 1 presents some comments regarding incorrect patient errors in electronic prescribing. Respondents indicated that patients' demographic data in pharmacy systems and prescriber systems are often different, which makes patient matching difficult. Some pharmacy systems do not allow the linking of incoming electronic prescriptions to the patients' current pharmacy profile if validation is not completed using the Social Security Number. However, Social Security Numbers are not easily collected due to current social environment and concerns for patient privacy. Without an exact match, the incorrect patient can be easily selected; such a mistake may go unnoticed by pharmacy staff. In addition, it seems that prescribers often select the incorrect patient when sending an e-prescription.

It was also found that some pharmacies often received e-prescriptions that read as emails where data are outlined in different formats depending on the system sending the prescription. This situation made pharmacy staff spend more time finding and verifying prescription information. Additionally, participants indicated that many prescriptions are sent without prescribers' license

information or phone number. Finally, some pharmacies were not receiving allergy information on the e-prescriptions and therefore additional time was spent gathering such data.

Box 1: Examples of “wrong patient” e-prescribing errors reported to the PEER portal

“In counseling the patient on how to use the medication, she said she was not to have anything for gout as she doesn't suffer from gout.”

“The technician was trying to fill the prescription and could not get the insurance to work. Upon calling the insurance, he found out that the insurance date of birth did not match the e-prescribing date of birth. The prescription was sent for the wrong patient!”

We faxed the doctor for a refill for Flonase for a patient and received back a prescription for Flonase for the patient's spouse. We contacted the physician and they chose the wrong patient in their system.

“We received an prescription for Tylenol with Codeine tablets for a 1-year old child. When we called to ask for liquid prescription, we found out the e-prescribing was sent for the wrong patient. It was supposed to be for a 32 year old woman who was waiting forever for her Rx!”

“We received several prescriptions for a male patient, one of which was for Raloxifen which did not make sense so we decided to call the patient. After contacting the patient to ask if he was expecting prescriptions he said “no”, and neither was anyone else in his household. We then promptly faxed the physician (it was a Saturday) for clarification. To our surprise, they contacted us the same day via fax reconciling their mistake is selecting the wrong patient. We changed the name of the printed hard copies and processed the prescriptions under the correct name.

It was noticed that some systems do not facilitate the compliance of e-prescriptions laws for controlled substances, thus prescribers are still sending e-prescriptions that do not meet regulations.

It is evident that the system auto-fill capacity allows providers to select incorrect medication. A common mistake found in this study was the inability to discriminate between different salts of the same drug. Also, it was revealed that some systems do not contain updated formulary information; often these formularies contained drugs that are no longer available on the market or whose name has changed. See Box 2 for specific examples.

Box 2: Examples of “wrong drug” e-prescribing errors reported to the PEER portal

“Omacor was selected as the drug, however the name has been changed to Lovaza for years now.”

“The prescription was written for amoxicillin 400mg chewable but it is no longer made in this strength.”

“We received e-prescriptions for both metoprolol tartrate and succinate.”

“We receive electronic prescriptions that do not distinguish between forms of these two drugs: diclofenac sodium or potassium; and hydroxyzine HCL or pamoate.”

“The prescriber ordered oxycontin 30 instead of oxycodone IR 30mg”

“The prescriber ordered doxycycline monohydrate, he really wanted doxycycline hyclate.”

“We received a prescription for hydrocortisone 0.2%. The patient was previously on hydrocortisone 2.5% from a different dermatologist. We contacted prescriber to find out if they meant to change and they did not. The individual entering the prescription (which was NOT a physician or person licensed to prescribe) couldn't find the correct product in the system so she picked what she thought was closest. Well, 0.2% is not anywhere close to 2.5% and a physician would have known that.”

Another common problem faced by pharmacies is duplicate claims, which created additional work for staff. In some occasions, prescribers transmitted the same prescription via several different conveyance methods to ensure delivery (i.e., e-prescription plus either and fax or phone). Prescription insurance will sometimes detect these duplicate claims but if patients pay cash they could get multiple fills of the same medication. Electronic prescriptions sent to the wrong pharmacy were also a concern for respondents in this investigation. See Box 3 for specific examples received through the PEER Portal.

Box 3: Examples of “duplicate drug” e-prescribing errors reported to the PEER portal

“A prescription was sent to multiple pharmacies. [...]. They either don't know the patient's pharmacy and send it to multiple ones, or they send it to the wrong pharmacy and then when patient calls they just send it again and never call the other pharmacies to cancel the Rx.”

The pharmacy had requested a refill of diclofenac for this patient. We received authorization via return of that fax. Then 13 minutes later, an e-prescribing was also sent. It is a waste of pharmacy time to receive duplicate Rxs. There is also the risk that one Rx will be directed to the wrong pharmacy, resulting in active Rxs for the same med at two pharmacies.

“On 1 patient we received 14 extra electronic orders that had already been processed.”

Time of resolution

In the PEER Portal respondents were asked to estimate the time elapsed from when the e-prescribing issue was identified until it was fully resolved if the report was a “near miss” event or an incident that reached the patient. As displayed in Table 6, the majority of the issues were resolved in less than 30 minutes. However, almost a quarter were resolved in more than 8 hours which can be translated as a significant amount time that patients have to wait for their prescriptions.

Table 6: Time Elapsed Resolving e-prescribing Problem Types Involved in PEER Reports

Elapsed time	Frequency (n=124)	%
Less than 30 minutes	48	39
1 hour to 8 hours	33	27
More than 8 hours	30	24
30 minutes to less than 1 hour	13	10

To estimate the financial burden for pharmacies resolving e-prescribing problem, participants reported their estimated time spent “on task” resolving an e-prescribing issue. Table 7 shows that in more than two thirds of the events respondents resolved problems in less than 25 minutes. The median of the time spent was 10 min (IQR=10). Using the pharmacists’ national mean hourly wage for 2010 (\$52.59 no SD reported)⁸ we estimate that the median cost of pharmacist time resolving e-prescribing issues was \$9.00

Table 7: Time “on task” Resolving e-prescribing Problem Types Involved in PEER Reports

Elapsed time	Frequency (n=124)	%
Less than 5 minutes	40	32
10 minutes to less than 25 minutes	37	30
5 minutes to less than 10 minutes	34	27
More than 25 minutes	13	11

Discussion

A total of 308 reports were submitted to the PEER portal during the study period; most of the reports were submitted by pharmacists. The fact that pharmacists were the most frequent submitters was not surprising because PEER portal availability was more heavily marketed to pharmacists through various channels. However, the number of reports was much fewer than expected for a national study.

Several factors may have contributed to this estimated underreporting of e-prescribing error identification. First, while many state and national Pharmacy Associations advertised the PEER portal availability to their members, additional advertising may have been beneficial. The investigators addressed this issue by writing an editorial on the PEER portal. A copy of the editorial that scheduled to be published in the next issue of the Journal of the American Pharmacists Association appears in Appendix D. However, it was not published in time to impact this report. Second, it is unknown if chain pharmacists are reporting to the PEER portal. In the past, this has been an issue as several chains require their pharmacists to use internal reporting systems only. Third, reporting takes time and pharmacists who are already over-burdened with distributive and patient care responsibilities may have been reluctant to take time to report e-prescribing problems to the PEER portal. Fourth, while an effort was made to ensure the PEER portal was user-friendly, it is possible that modifications may increase response rates. Portal users have suggested edits such as clarifying which fields are required and altering the portal to allow multiple reports without reentering user information.

The data gathered during this investigation are in line with other e-prescribing intervention evaluations that concluded that while e-prescribing may be able to improve the safety and effectiveness of patient care, the still-emerging technology can pose threats to medication safety.³

One possible contributor to e-prescribing problems may be that electronic prescribing software is a relatively new tool in community practice and significant variance exists in how it has been implemented in many pharmacies and physician practices. A steady stream of new prescribers are experimenting with this technology and software vendors continually upgrade and alter their systems. In such an environment, it is not wholly unexpected for the number of errors to initially increase after implementation of new technology.⁹ Prescribers may be more likely to make prescribing errors when using software or software options with which they are unfamiliar.

Rates of prescribing problems requiring intervention would be expected to decrease as these skills are developed and further evaluation in this area is needed to determine whether this expected effect occurs.

A second contributor to e-prescribing problems may stem from systems issues on the vendor or administration level. Therefore, the PEER portal will remain open after grant funding ends. The investigators will continue to solicit reports and to advertise portal availability. We plan to collaborate with other Patient Safety Organizations (PSOs) that are collecting similar data to discuss the possibility of concatenating our data to add power and validity to the results. In addition, we intend to work with Surescripts to compare our data with what they have collected in order to develop best practice recommendations and to work with technology vendors to make system improvements.

The most commonly reported e-prescribing problem was SIG/direction on the e-prescription. Specifically, the problem was related to the variability of how SIG can be sent electronically which forces pharmacists to ask for clarification and the inconsistency between SIG routes with drug routes (e.g. Nasal spray SIG populated as inhale two times by mouth daily). The SIG auto-population features of systems may cause these problems. It also appears that when SIG is changed, the quantity is also erased without prescribers noticing it. This situation may explain why some e-prescriptions of refills are sent with missing quantities. Standards to increase the consistency of prescription directions and medication names (Structured and Codified SIG and Rx Norm) may also help to decrease the percentage of missing prescription information transmitted to the pharmacy when they are implemented.

Another commonly reported reason for pharmacist e-prescriptions interventions was quantity selection, which is consistent with previous research.¹⁰⁻¹³ For example, the prescriber may accidentally prescribe 30 month-supply packages of medication when they mean to prescribe only a 30 days supply. It is evident that improvements need to be made to the system or that proper training needs to be provided system users.¹³

Dose problems were identified as another frequent reason for pharmacist intervention and is consistent with previous research.^{5,10,12-14} Although the ability to provide prescribers with point-of-care decision support such as dose checking is considered to be one of the greatest potential advantages of e-prescribing, it appears that the systems for achieving this potential are imperfect or are not being properly used.¹³

Communication with the prescriber is often required to resolve e-prescribing problems. Traditionally, such communication has occurred via telephone or fax. However, some prescriber offices that have transitioned completely to e-prescribing have ceased faxed communications altogether. This has led to a delay in problem resolution. Giving pharmacists the ability to electronically query the prescriber via the e-prescribing transmission standard has been suggested as one possible solution.¹⁵ A task group within National Council for Prescription Drug Programs is currently designing the functionality of such a transaction. In theory, this should facilitate communication and decrease intervention-related time and costs for both the prescriber and the pharmacist. Further quantifying or subcategorizing the mode of communication with the provider (fax, phone, or bidirectional electronic) was beyond the scope of this project, but the authors plan to address this in subsequent studies to assess the extent of communication still required through traditional communication forms.

Conducting interventions to resolve problems on e-prescriptions required a median of 10 minutes of the pharmacist's time, resulting at an estimated cost of \$9.00 per problematic e-prescription. Such costs are not trivial in an industry characterized by very small margins. This study did not estimate the additional cost of processing duplicate e-prescriptions or e-prescriptions sent to the wrong pharmacy which add to the aforementioned costs. Dispensing costs must be balanced against cost savings generated by e-prescribing that have been noted in the literature. A recent study concluded that efficiencies resulting from e-prescribing resulted in savings of \$0.97 for new e-prescriptions and \$0.37 for refills/renewals when compared with conventional prescriptions.¹⁶ The results of this study serve as an indication of the types of problems that pharmacists are encountering with e-prescriptions. This information should be used to alert pharmacy managers and staff to common e-prescription problems on which they may need to intervene. Software vendors and health information exchange partners could use this information as part of a process to improve the quality and usability of programs and services.

Pharmacies are paid a dispensing fee for dispensing medications but often this fee is based on an efficient dispensing system. The time it takes to intervene on problem prescriptions is usually not compensated by the dispensing fee because the time it takes for the pharmacist to intervene on a problematic prescription and the costs associated with this intervention often exceeds the dispensing fee even though it is probable that these interventions have a positive impact on patient health and safety. This provides rationale for increasing the national average cost of

dispensing, since the current fee does not take into account time spent for interventions. Other potential solutions may be to pay pharmacies for the intervention itself or to pay the pharmacy a portion of the money saved when a potentially problematic prescription was not dispensed. Regardless, mechanisms need to be created to encourage and reward pharmacists who add measurable value to patient care.

Limitations

This research had several limitations. The reporting methodology required pharmacists to recognize they were making an intervention and take the time to document the intervention. Given the notoriously hectic practice environment of community pharmacy, it is not unlikely that underreporting occurred in this study. Because this study was conducted entirely within the pharmacy, it is not known whether some problematic e-prescriptions were identified by clinical systems at the prescriber site or by an intermediary (e.g., claims processor) before their receipt by the pharmacy. Additional research to quantify the true incidence of prescribing problems occurring with e-prescriptions should consider this in their measurement methods.

Recommendations

Several recommendations can be made to improve the safety of e-prescribing in the community practice setting. First, prescribers should perform their own e-prescription data entry or at least carefully review e-prescriptions that are entered by support staff before transmission to the pharmacy in addition to obtain sufficient training in system use. Second, prescriber-side decision support software should be enabled and routinely used. Third, e-prescribing system safeguards and decision support should be improved to more closely scrutinize new prescriptions to prevent commonly occurring errors. Fourth, when developing decision support systems for e-prescribing, special emphasis should be given to dosing error prevention and Rx Norm implementation. Finally, it is necessary to develop a process that averts duplicate e-prescriptions submission, or subsequent e-prescriptions modifying initial one should be labeled in such way that will not allow pharmacists to process previous prescriptions.

Based on the reports received, we recommend deleting the category “e-prescriptions contains conflicting information” from the PEER portal because this was overlapping with the other categories and does not provide additional information. Instead, we suggest adding the option of “duplicate e-prescription” because this is an emerging issue and it needs to be quantified to estimate the financial burden for pharmacies.

Conclusions

The PEER Portal showed to be a successful tool to report e-prescribing problems. It allowed health care personnel to report weakness of prescribing systems. This research showed evidence that there are a variety of issues regarding e-prescribing. The majority of the issues reported in this study were related to SIG and quantity selection. System changes are required to decrease or eliminate some of these issues.

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Appendix A: PEER Portal

Pharmacy & Provider ePrescribing Experience Reporting Portal (PEER Portal)

This portal collects your experiences with e-prescribing technologies in a confidential matter. All comments - whether suggestions for improvement or complaints about the process - are welcome. The purpose is to allow the Alliance for Patient Medication Safety (APMS), a patient safety organization, to gather detailed information that may be used to improve the quality and effectiveness of electronic prescribing technologies. There are 12 questions that can be completed in less than 3 minutes

Please read the following disclaimer

1. No personally identifiable patient information, otherwise known as protected health information (PHI), should ever be entered or provided in response to the questionnaire. Any questionnaire or response received that appears to contain PHI will be deleted and destroyed immediately in its entirety and will not be used in any manner.
2. APMS will only disclose the information in de-identified statistical or aggregate form or in the form of best practices or reports using aggregate data.
3. This portal is not a technical support site. Support issues, such as electronic prescriptions or refill requests not being received by the pharmacy or prescriber to which they were sent, should be reported to the appropriate prescriber or pharmacy technology vendors. However, if the support issue can affect the quality or safety of patient care, the user is encouraged to report the issue. For example, if the system makes it difficult to distinguish between numbers and letters (e.g., 1 and l), which could or did result in a medication error, that information should be reported to improve the quality of care.
4. Reporters should not expect a personalized communication from APMS in response to the information they provide. Reports will be used to identify trends and systems improvements to improve the overall quality and operation of the e-prescribing. Feedback to reporters may be made in the form of best practices in e-prescribing or systems improvements that could be disseminated through NASPA or posted on the APMS website, at APMS's sole discretion.

** Unless noted otherwise all fields are required.*

1) Type of report

- Incident/error (i.e., event REACHED the patient with OR without harm)
- Near miss (i.e, event did NOT reach the patient)
- Unsafe condition/complaints/comments for improvement

2) Reporter Information

- Pharmacist
- Technician
- Physician
- Nurse
- Medical office staff
- Nurse Practitioner/Physicians Assistant
- Student
- Other

3) Reporter's Practice Site

- Pharmacy (including retail, mail-order, outpatient clinic)
- Long-term care/skilled nursing facility/homecare practice
- Other:
- Medical Office/Clinic
- Hospital (inpatient setting)

Reporter's State/Territory: _____ Reporter's Zip Code (optional): _____

4) Name of pharmacy computer system, if known: _____

5) Name of ePrescribing system, if known: _____

6) Prescription Information: Prescribed Drug Name: _____

7) Type of electronic prescription (please choose one):

- Computer-generated fax to pharmacy
- Electronic prescription received directly into pharmacy computer
- Other: _____

8) Please categorize your issue(s) with the electronic prescription you are reporting on (check all that apply):

- Incorrect Patient (e.g., wrong name, misspelled name, wrong patient)
- Controlled substance
- Dose selection
- Dosage form selection
- Quantity selection
- Date selection
- Drug selection
- SIG / Directions
- ePrescription contains conflicting information
- ePrescription missing essential information
- ePrescription data fields are used inappropriately
- Legibility/font/unsafe nomenclature or other system design feature (hardware/software) that increases risk for error
- Data fields too small to record all information input by prescriber
- Data transmission error that affects the quality or safety of patient care
- Other:

9) Who first identified the error, near miss or unsafe condition:

- Physician
- Nurse Practitioner/Physicians Assistant
- Nurse
- Student
- Pharmacist
- Patient / caregiver/family member
- Technician
- Other/Unknown
- Medical office staff

10) Description of issue encountered - please provide as much detail as possible

(Do not record the names of any individual, other patient identifiers or PHI)

Related Files: (optional)

If you have files related to this issue you can upload them here. Please do not attempt to upload files larger 1GB (1024 MB) in total size.

Questions 11 and 12 ask how this event has affected your time.

11) Enter the time in minutes (00-99 minutes) spent "on task" directly resolving the ePrescribing issue reported above:

Minutes: _____

12) Enter the total ELAPSED time (hours and/or minutes) from when you first identified the ePrescribing issue until the issue was fully resolved for that patient:

Hours: _____ Minutes: _____

By submitting this form, I understand that the information provided to APMS is confidential and will not be disclosed by APMS to the extent protected by law, except in a de-identified or aggregated form or in the form of feedback, such as best practices or systems improvements that could result in improved quality of care. To learn more about the confidentiality protections, go to <http://www.pso.ahrq.gov/>

Appendix B: PEER Portal Progress Report

PEER Portal Data Report

February 2011

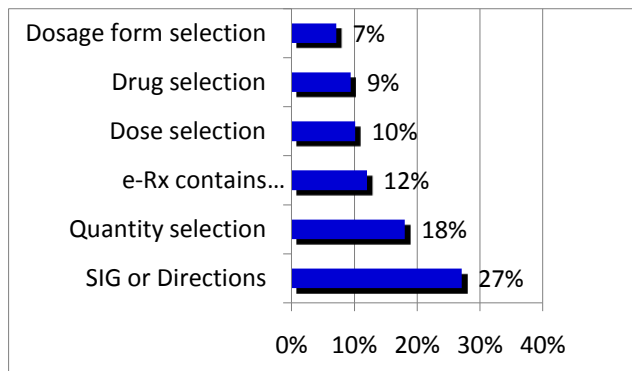


E prescribing PEER Portal Is Open for Business!

We have received almost 200 reports

But we need more!

- The pharmacist was the FIRST person to identify the error in 78% of reports
- The majority of reports involved problems with SIG/directions and quantity selection (See Figure to right)
- In 38% of the reports the incidents reported were “near misses” but in 5% the incident REACHED patients
- On average, reporters spent 12 minutes on task resolving each incident and the mean time elapsed from its identification until the issue was fully resolved was 8 hours.



Some comments received through Peer Portal:

“Wrong strengths, wrong quantities, wrong directions. We are also receiving multiple copies of the same script. This is costly and adding up.”

“ We received a prescription for the wrong patient. In counseling the patient on how to use the medication, she said she was not to have anything for gout as she “doesn't suffer from gout.”

Help us save lives ... Report eRx problems TODAY!

Appendix C: Letter to the Journal of the American Pharmacist Association (JAPhA)

Electronic prescribing errors: do they exist?

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The Institute of Medicine 1999 report “To Err is Human: Building a Safer Health System” highlighted the dangers and the costs of medication errors and the potential role of information technology in reducing such errors. However it is commonly accepted that new technologies may introduce additional challenges. Quality improvement techniques are an important and necessary component of medication error reduction. Specifically, techniques such as reporting near miss errors (those that are identified by the pharmacist before the prescription reaches the patient) can be used to identify systems errors and are indicative of the error types that reach patients. By capturing and analyzing these detailed data, industry-wide process improvements can be made, certification standards can be revised, and interventions can be initiated with prescriber and pharmacy technology vendors. The goal is to improve quality, safety and efficiency.

Studies have documented e-prescribing system issues. Pharmacists must intervene on electronic prescriptions as often as they do on hand written prescriptions because this technology still poses threats to both medication safety and effectiveness. One study conducted in 68 chain community pharmacies during three months found that, after reviewing 2,690 electronic prescription orders, pharmacist took action 102 times for an intervention rate of 3.8%. This study also found that the rate at which pharmacists identified problems on new e-prescriptions was nearly twice that of refills (4.1% and 2.2%, respectively). In another study, pharmacists reviewed 1,678 new electronic prescriptions and intervened on 153 (9.1%) over a 13-day period (Unpublished observations). Although research has found that electronic prescriptions may decrease the risk of errors compared to CPOE printouts given to patients, e-prescription error rates are not smaller to prescription error rates reported before the electronic era. In an study from 1992, Rupp et. al found that pharmacist had to intervene in 623 (1.9%) of 33,011 new prescriptions over a period of eight months.

The Alliance for Patient Medication Safety (APMS), a federally listed Patient Safety Organization, introduced the Pharmacy and Prescriber Electronic Prescribing Experience Reporting (PEER) data portal to identify problems experienced with e-prescribing. The PEER portal is a quick and easy way for pharmacists, technicians and prescribers to confidentially submit experiences encountered with e-prescriptions. The purpose of the portal is to identify e-prescribing issues in the community setting and to generate best-practice recommendations. The portal is available free of charge via the Internet (<https://www.pqc.net/eprescribe/disclaimer.aspx>).

We encourage community pharmacists and students to use PEER Portal to report their experiences with electronic prescribing.

Appendix D: Addition medication involved in e-Prescribing problems

Drug Name	N*	%**	Drug Name	N*	%**
Antithrombotic Agents	4	1%	Antineoplastic Agents	2	1%
Anxiolytics, Sedatives, and Hypnotics	4	1%	Antitussives	2	1%
Calcium-Channel Blocking Agents	4	1%	Contraceptives	2	1%
Sulfonamides	4	1%	Estrogens	2	1%
Vasodilating Agents	4	1%	Aminoglycosides	1	0.3%
Lancets and Syringes	3	1%	Angiotensin II Receptor Antagonists	1	0.3%
alpha-Adrenergic Blocking Agents	3	1%	Anorexigenic Agents and Respiratory and Cerebral Stimulants	1	0.3%
Antiprotozoals	3	1%	Antiemetics	1	0.3%
Antipsychotics	3	1%	Antiglaucoma Agents	1	0.3%
Antiulcer Agents and Acid Suppressants	3	1%	Antigout Agents	1	0.3%
Autonomic Drugs	3	1%	Antiparkinsonian Agents	1	0.3%
Bone Resorption Inhibitors	3	1%	Antirheumatic Drugs	1	0.3%
Cathartics and Laxatives	3	1%	Central alpha-Agonists	1	0.3%
Skin and Mucous Membrane Agents	3	1%	Cerebral Stimulants	1	0.3%
Tetracyclines	3	1%	Genitourinary Smooth Muscle Relaxants	1	0.3%
Urinary Anti-infectives	3	1%	Lincomycins	1	0.3%
Vitamins	3	1%	Local Anesthetic	1	0.3%
Angiotensin-Converting Enzyme Inhibitors	2	1%	Potassium-removing Agents	1	0.3%
Antidiarrhea Agents	2	1%	Progestins	1	0.3%

*N= Frequency

** Percent may not equal 100 due to rounding