Quantitative Analysis of Electronic Prescribing Quality Related-Incidents

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Introduction

- Electronic prescribing (e-prescribing) facilitates the transmission of prescriptions between health care organizations and pharmacies, with much greater precision than was possible with paper prescriptions.
- In 2014, 96% of US community pharmacies and 70% of US physicians used Surescripts' e-prescription network.(1)
  - Surescripts is an e-prescribing network provider-which processes over 6 billion transactions annually.
  - Technology itself has introduced new types of errors which poses a significant barrier to even wider acceptance and implementation of the e-prescribing systems.(2) (3)
  - Surescripts provides recommendations regarding patient information and pharmacy for better quality of e-prescriptions.
  - However, it is still unknown the extent to which adoption of these recommendations has impacted medication safety and workflow in community pharmacy.

Purpose

To:

1) examine the frequency, type, and contributing factors of e-prescribing quality events reported to the Pharmacy Quality Commitment (PQC) System and the Pharmacy and Provider prescribing Experience Reporting (PEER) Portal; and
2) determine the potential impact of Surescripts e-prescribing "ideal prescription" guidelines adoption in preventing e-prescribing quality problems and errors.

Methods

Data Collection:

- This was a retrospective analysis of extracted e-prescribing related events reported to PQC and PEER Portal between January 2010 and January 2015.
- A combined PQC and Peer Portal dataset was created to estimate frequencies and percentages for variables that were collected using similar taxonomies in both reporting portals.

Data Analysis:

- Frequencies and percentages were estimated for the variables event type (i.e., incorrect drug, strength, directions, quantity, or patient) and whether or not the event reached the patient.
  - For aim 1, descriptive statistics were calculated for variables of interest from each data source, PQC and PEER portal, independently.
  - For aim 2, a random sample of the combined PQC and PEER dataset was analyzed.

Two independent reviewers determined whether each event that would be preventable if the prescriptions were compliant with the elements of the "ideal e-prescribing order."

Pairwise agreement on the preventability classification between the two investigators was estimated.

Results

- A total of 589 events were reported to the PEER Portal from 2010 to 2015.
- In 2010, most of the e-prescribing problems reported to the PEER portal were categorized as unsafe conditions (56.6%) or near misses (39.7%), only 3.7% (n=5) reached the patients. (Table 1)

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

Year	Incident/error n(%)	Near miss n(%)	Unsafe n(%)	Total n(%)
2010	5 (3.7)	54 (39.7)	77 (56.6)	136 (23.1)
2011	22 (6.8)	150 (46.3)	152 (46.9)	324 (55.0)
2012	6 (15.8)	18 (47.4)	14 (36.8)	38 (6.4)
2013	19 (22.6)	56 (66.7)	9 (10.7)	84 (14.3)
2014	0	3 (75.0)	1 (25.0)	4 (0.7)
2015	2 (66.7)	1 (25.00)	0	3 (0.5)
Total	54 (9.2)	282 (47.8)	253 (43.0)	589 (100)

Incident or error (event reached the patient), Near miss (event did NOT reach the patient) Unsafe (unsafe condition or comments), PEER (Pharmacy and Provider eprescribing Experience Reporting)

- The frequencies and percentages of four types of problems reported to both the PEER portal and PQC systems. SIG/Directions is the highest reported issue, 38.0% (n=553) to the PEER portal and 41.8% (n=306) to the PQC system. (Table2)
- The contributing factor categories reported to the PQC system are pre-defined in the portal and reporters had the option to select one or more category. (Table 3).
- The highest number of events, 74.5% (N=410), were reported for problems that related to human factors, slips and calculations

Table 2: Selected Events Types Reported to the PQC & PEER Portal

Type of Error	Data Source		Total (N=859)
	PEER portal n(%)	PQC n(%)	n(%)
SIG/Directions	210 (38.0)	128 (41.8)	338 (39.3)
Incorrect drug	96 (17.4)	81 (26.5)	177 (20.6)
Incorrect dose	89 (16.1)	33 (10.8)	153 (17.8)
Incorrect quantity	158 (28.6)	64 (2.1)	191 (22.2)
Total	553	306	859

Table 3: Contributing Factors of Events as Reported to PQC system

Contributing Factors (N=550)	N (%)
Human factors/slips/calculations	410 (74.5)
Communication/Language barrier	45 (8.2)
Training/Supervision Factor	26 (4.7)
Pharmacy Factors (Culture/policies/staffing)	21 (3.8)
Patient Factor	7 (1.3)
Weights/ Measurement/high risk nomenclature	4 (0.7)

Results Continued

Table 4: Classification of preventability of events based on Surescripts' recommendations for elements of an "ideal e-prescribing order"

Element of Surescripts "Ideal prescription"	Description	Number of preventable issues for 411 reports* (n=437)
Drug Description	Elimination of "free-text" data	
	Standardized Drug Descriptions	94 (21.5)
Drug Identifiers	Accurate National Drug Code (NDC) and RxNorm drug identifiers	
	Consistent sending of RxNorm Clinical drug component RXCUI	8 (1.83)
Patient Directions	Complete and unambiguous patient directions	
	Implementation of Structured & Codified Sig format	91 (20.8)
Quantity/Quantity Qualifiers	Valid and appropriate prescription quantities	
	Metric and non-generic quantity qualifiers only	48 (10.9)
Days Supply	Accurate days supply information that is not conflicting with other prescription data elements	11 (2.5)
Coordination of Benefits	Accurate Patient Benefit information from the Health Care Eligibility Benefit Inquiry and Response	
	Inclusion of Pharmacy Benefits Manager (PBM) Unique identifier (ID)	-
Prescriber/Pharmacy Directories	Accurate and up-to-date prescriber and	
	Pharmacy information in the Surescripts directory	98 (22.4)
Duplicate Content/Message IDs	No duplicate e-prescription content or message IDs	2 (0.4)
Prescription (Rx) Change/Rx Cancel	Network-wide implementation of Rx Change and Cancel Rx messages	9(2.1)
Notes to Pharmacist	Codified data text strings	
	Free text restricted to pharmacist information only	7 (1.6)
Electronic Prescription of Controlled Substances (ECPS)	Full Implementation and Deployment of EPCS functionality	-
Other		69 (15.8)

*Percentages equal to >100% due to incidents falling into 1 or more variable categories

- A random sample of 411 reports of the 1,139 included in the analytic file from the combined PQC-PEER data set was independently reviewed by two investigators.
- Of 411 reports analyzed, there were 469 quality related issues, 93% (n=437) of which could have been prevented.
  - There was 89.3% agreement between the two investigators.
- There are four elements that if implemented, could have prevented over two third of issues. (Table 4)

Conclusion

- Most of the events were resolved before reaching the patient.
  - However, a large number (n=437) 93% of events required intervention of the e-prescribing staff, which may contribute to a considerable cost burden for the pharmacies.
- Software developers and vendors have the potential to greatly impact the number of e-prescribing related incidents by adopting three strategies in their systems:
  1) use of standardized drug descriptions;
  2) use of appropriate prescription quantities; and
  3) maintenance of up-to-date prescriber and pharmacy information in the Surescripts directory.

Adopting these standards may aid in reducing errors, creating better health outcomes, increased safety, and better patient relationships

Limitations

- The analysis was based on self-reporting of incidents.
  - Therefore, it is not possible to draw conclusions about events incidence or prevalence.
- Second, due to the spontaneous nature of the data capturing, it is possible that reports may not be representative of all potential safety issues related to e-prescribing.
- E-prescribing is a two-way communication system, thus it remains unclear what type of issues the prescribers' side experience with the technology.
- Finally, we used aggregated data collected since 2010.
  - It is possible that some of the quality issues have become less frequent or irrelevant as SCRIPT standards gain wide implementation.

Disclosure

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References

(1) April B. E-Prescribing Trends in the United States.
(2) Odukoya OK, Stone JA, Chui MA. E-prescribing errors in community pharmacies: Exploring consequences and contributing factors. *International Journal of Medical Informatics.* 6// 2014;83(6):427-437.
(3) Odukoya OK, Stone JA, Chui MA. Barriers and facilitators to recovering from e-prescribing errors in community pharmacies. *Journal of the American Pharmacists Association.* 1// 2015;55(1):52-58.

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