E-Prescribing Implementations a Journey from Manual to Digital to Increase Patient Safety

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Abstract

The purpose of this study was to evaluate the implementation of electronic prescription use to improve patient safety in drug administration. In its implementation, the use of an electronic prescribing system in prescription writing has been proven to decrease the number of prescribing mistakes. Treatment errors such as the mistake of writing the name of the drug, determining the dosage, and using the right type of medication for the patient can be prevented. The cross-sectional survey design was used, data and information from a hospital that has been using electronic prescriptions collected. Evaluation is also done to the doctor to know the doctor's acceptance of the implementation of the electronic prescription system, by providing an evaluation form of the use of electronic prescriptions. The results of this study found 8 incidents that decrease significantly (40%), 5 incidents increase significantly (25%), 1 stagnant (5%), 1 incident increase insignificant (5%), and 5 no measurable incidents (25 %). Declining incident trends occur in E1 (p-value (0.33)> 0.05), E3 (p-value (0.3)> 0.05), E4 (p-value (0.056)> 0.05), E8 (p-value (0.26)> 0.05), E9 (p-value (0.12)> 0.05), E20 (p-value (0, 07)> 0.05), there is also a decrease trend on E2 (p-value (0.81)> 0.05) but this trend should still be analyzed further. A rising trend may be because the use of electronic prescriptions is not a factor that has had an effect on this incident.

Keywords *- electronic prescribing, prescription, medication error, pharmacy, patient safety*

I. INTRODUCTION

Patient safety is a high priority issue for all healthcare professionals. One topic that is still widely discussed on various occasions in the field of healthcare is about medical errors. Medical errors can occur in various aspects of providing health services such as; medication errors, surgical procedures, diagnoses, equipment outcomes, and laboratory results can potentially lead to a medical error. The Medical error itself is an adverse event that can be prevented by the existence of current medical knowledge[1].

Medication error defined a failure in the treatment process leading to or potentially leading to, harm the patient [2,3]. Medication error as a mistake in the treatment process that is still under the supervision and responsibility of the health profession, patient or consumer, and should be prevented[4]. In addition, medication errors may be defined as all events that may cause inappropriate treatment or which may harm a patient where the treatment procedure is still under the control of a health practitioner[5], this definition is close to the definition of the National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP). One of the most commonly used definitions of medication error is the NCC MERP which defines medication error as a preventable event, which may lead to or lead to inappropriate drug use or harm to the patient, the treatment is given in the supervision of a professional health service, patient or consumer. Such events may be related to professional practice, health care products, procedures and systems, including prescribing." [6].

To improve patient safety today many health organizations focus on safe drug delivery to avoid medication errors. The Institute of Medicine (IOM) reports that 32% -69% of medication errors are preventable events[1]. Medication errors often occur in public practice as well as in hospitals[7]. Such errors are partly due to prescription errors and prescribing errors due to incorrect medical decisions. Errors in prescription writing are the main cause (70%) which impact on safety and health quality of patients[8].

A number of interventions have been developed in the prevention of medication error events. The selected ones include computerized intervention, namely the implementation of electronic prescriptions[9]. The definition of electronic prescription (E-prescription/E-prescribing) is an electronic way to write prescriptions through the process of data entry automatically using certain software with internet network connected in hospital pharmacy[10].Another notion of electronic prescriptions is an electronic process that generates and sends electronic prescription requests from physicians to be sent by the provider to a pharmacy computer that is wanted directly from a doctor's office. Doctors do not need to write a drug that will be given to patients with handwriting on prescription paper, but directly write it on the computer[11,12]. There is also a mention of E-prescribing or electronic prescribing is electronic technology that allows physicians and other medical practitioners to write electronic prescriptions (e-prescriptions) and send it

to the desired pharmacy computer incorporated in the e-prescribing network, directly from the doctor's office or place of care[13].

Electronic prescriptions provide assurance of prescription readings and completeness, providing information on the drugs to be given, dosage, delivery mode and recommended frequency. The system initially aims to reduce medication error by increasing the ease of prescription readings and reduce the incomplete information in prescriptions. Today many electronic prescription systems are equipped with medication decision support, a system that helps healthcare avoid the occurrence of medication errors and adverse drug events[14].By using this electronic prescription system, it is expected that the incidence of medication error can be reduced and prevented so as to improve the health service and quality of life of the community.

II. LITERATURE REVIEW

A. e-Prescribing

Two of the three patient visits to the doctor will end with prescription writing[15]. Prescriptions are written requests from doctors or dentists, to pharmacists, whether in paper or electronic form to provide and deliver medicine to patients according to the prevailing regulations (PMK No. 58 of 2014). Medication is given to the patient on a piece of paper that needs to be taken to the pharmacy. At the pharmacy, the patient has to wait for the finished medication. The patient's waiting time for drug delivery services increases when the prescription is unreadable, the possibility of drug interactions when a drug may react with other drugs so that the drug's performance will be affected or the effect of the drug is reduced, increased or even no effect, or when the drug in Such prescriptions are not available. In such a situation, the pharmacist should contact a doctor, await a doctor's response via an advanced phone call or send a new prescription. These cause the waiting time for drug delivery to be high. Between hospitals and doctors, medicines are among the top three categories of health expenditure in Canada[16].

To reduce medication errors a safe drug delivery system needs to be developed to ensure that patients receive the best-protected services and administration of the drug. This is due to the increased medication variation, as well as the number and type of drugs written per patient.The responsibilities of pharmacists and nurses in dispensing and drug delivery are greater due to the availability of more drugs for a disease, increasing faster expiration time of drugs, and the number of new drugs prescribed become larger. Increased drug use may increase the risk of errors in drug administration.The selected onesis the computerized intervention, the implementation of electronic prescribing[8].

The electronic prescribing system (e-prescribing) is software designed to facilitate the prescribing of drugs from the prescribing stage, transcribing stage, dispensing stage (preparation to prescription delivery by pharmacists), stage administration (a process of drug use) and monitoring [17,18]. The whole works in a systematic way connecting various information between physicians (prescriber), dispensers, pharmaceutical managers, financials, and health plans either directly or indirectly[18]. An electronic prescription is a service tool that will help eliminate the paper process because the world around us is getting ahead in electronics. It is defined by Health Canada[19] "as a means of simplifying the prescription process by allowing prescriptions to be made, signed and sent electronically."

In the last 10 years, the use of e-prescribing has grown because it can improve efficiency and reduce errors caused by handwriting, but according to estimates in 2012, only 44% of doctors' offices use paperless prescriptions [20,21,22].

B. Benefits of e-Prescribing

Some of the benefits of electronic prescriptions: Electronic prescriptions are expected to replace manual prescriptions, non-printed prescriptions or computer faxed prescription [23].The use of electronic prescriptions is considered better than manual prescriptions. Some of the advantages or benefits of electronic prescriptions quoted from several Journals:ePrescribing will allow the pharmacist and provider a safer and more efficient means of communication. It will support the clarification needed to help fill a prescription. Not only is ePrescribing aiming to reduce fax and phone activities, it supports a safer and more efficient dispensing and monitoring programme. The National Council for Prescription Drug Programs (NCPDP) defines ePrescribing as, “the ability of a physician to submit a ‘clean’ prescription directly to a pharmacy from the point of care.”5 Allowing the provider to write a prescription at the point of care will help eliminate errors made from re-transcriptions. By providing alerts about patient’s drug coverage, interactions of other medications, and relevant dosing and drug information, the provider can more effectively prescribe a medication[24].According to Putu Kusumariniet al, quoted from Costa A, De Oliveira M [25,26].Table 1 shows the advantage of electronic prescription than manual prescription.

Electronic prescribing is expected to reduce medication errors in the prescribing stage, transmit stage (prescription readout for dispensing process), dispense stages (preparation until prescription delivery by pharmacists) and the administrative stage (a process of drug use) and monitoring stage (monitoring) [18]. E-Prescribing has a number of benefits that are not the occurrence of the risk of misreading, appropriate drug dosage, rapid data input, paper and practical paper [25].

Other studies mention the benefits of implementing e-prescribing, which include [27]:

- Increased efficiency of pharmacies. The delivery of electronic prescriptions eliminates the possibility of misinterpretation of the doctor's handwriting and shortens the time in prescribing reading to allow pharmacists to prepare prescriptions more quickly.
- Accelerate reception of prescriptions at the pharmacy before the patient leaves the doctor's office so that when the patient arrives at the pharmacy, the waiting time becomes shorter.
- Promotion of adherence to drug formularies.
- Improved rectification errors made by doctors. The pharmacy software can examine the exact drug prescribed at the right dose in many cases so that medication errors can be minimized.
- Reduction of drug reactions that potentially harm patients. In the e-prescription also listed data/history of allergy patients, past bad experiences with certain drugs, and identified potential drug interactions.
- Identify dose errors, mainly due to differences in pediatric formulations and adult dose rates. It can also be part of the assessment done electronically before the pharmacist prepares the prescription.
- Decreased risk of drug interactions. Many of the software used in pharmacies have been able to examine the patient profile (assuming that patients only buy drugs in certain pharmacies) to raise the pharmacist's alertness to the potential interactions of several co-administered drugs.
- Prevention of risks to hazards and reductions in health costs. Warning signs are given to doctors to reduce the likelihood and severity of adverse reaction reactions
- Increasing the quality of service and reducing malpractice claims against physicians. It confirms that e-prescriptions may reduce drug-induced use and reduce errors made by doctors and pharmacists. Much of this depends on the vigilance and professional concern of pharmacists in interacting with software designed for clinics/hospitals.

Table 1. Advantages of electronic prescriptions with manual prescriptions

Activity	Manual Prescription	Electronic Prescription
Prescription	Time to prepare old prescriptions, often have to repeat the work The dose of a parenteral solution is calculated manually Doctor's writing is sometimes illegible	Reduces prescribing time (especially in patients receiving a prescription for the second time) The dose of a parenteral solution is calculated automatically Exactly in determining drugs It is possible to repeat the prescription in the same situation
Prescription order	Recording of prescription manuals at the time of booking Possible errors at the time of recording Recording by assistant Drug codes are written manually It takes a long time in the recording	Automatic drug ordering No assistant used Drug codes automatically It is possible to seek medicine with a computer Right in the medication reading Short drug order time
Distribution	Handwriting can cause errors No labels required	Data is automatically logged in No need to take notes The drug code is checked from the prescription code Labeling with barcode
Transportation	The time of distribution in a certain period Manual systems are potentially conflicting The absence of a structured information technology system	Booking automatically an Automated system with few people involved More accurate and transparent

C. e-prescribing Implementation

To implement e-prescribing, appropriate strategies are required, including user-friendly software development from certified providers, user-specific training, and cooperation support from pharmacies/pharmaceutical depots working together in the implementation of e-prescribing, as well as control systems performed by government agencies regularly to oversee drug trafficking. Internet access and comfort levels with behavioral changes in work environments using advanced protocols and technologies are also key to the successful implementation of e-prescribing[28].

Implementation of e prescribing should be

accompanied by service training for affected personnel, especially doctors, to improve the implementation of e-prescriptions. To inform the public about e-prescribing, public service broadcasting should discuss practices on national media sources. Furthermore, to eliminate problems with e-prescription software systems, it is critical that the pharmacological properties of all commercially available drugs are included in this system, including prescribed drugs and dosage. To monitor this implementation process, e-prescription software must be integrated into hospital pharmacies and information systems[29].

To ensure the quality of e-prescribing services, a good control system is required. In 2010, The Drug Enforcement Agency (DEA), a drug controlling agency in the United States, revised regulations to provide physicians with electronic prescription options through software from certified providers. In addition, the DEA makes specific regulation of e-prescribing of certain drugs whose use is under strictly controlled by law. This is an important step to prevent drug abuse through e-prescription. DEA expects doctors in every country to adopt and use the technology control system[27].

Several studies reveal some problems about e-prescribing. Most of the problems reported in this study are related to the direction and quantity selection, indicating that appropriate software system changes and prescriber training are required to reduce or eliminate the problem [28].

III. METHODOLOGY

The type of this research is observational descriptive study. This research is a quantitative research that is comparative, that is research which aims to compare the quality of pharmacy services to the application of electronic prescription in order to find the difference or influence through hypothesis testing so that it can be drawn the conclusion about the meaning of data obtained. The population of this study was taken from an outpatient prescription, consisting of a population of electronic prescriptions. The average prescription for the outpatient pharmacy is 250 prescriptions per day. Samples were taken at the stage where prescribing began to be applied, then compared after 5 months of e-prescribing, followed by re-comparing post-application of the next 3 months. Samples were taken as many as 5100prescriptions in the first month of application of 5540 electronic prescriptions in the fifth month and 5200 prescriptions in the eighth month. And as a population is a prescription before and after the use of electronic prescriptions taken at random. The 20 routines reported incident variables are Prescription unreadable, Wrong patient, Wrong drug, Incorrect dose / Strength / Frequency, Incorrectly Compounding / Shape, Incorrect Route/Granting Way, False Time of Giving, False Quantity, False Label / Instructions, Contra-indications, Incorrect Storage, Not Get Drugs / Compliance, Expired Drug / Damage / StabilitySide, Effects of Drugs, Drug Interaction / Incompatibility, Duplication, No Indication, No Policy, Wrong Billing, Field Condition.

Research data is analyzed by using linear trend which is used to see the frequency of each variable. Analysis of research data used to see the meaning of the relationship between variables with electronic prescription

IV. RESULT

There are 20 types of routine drug error incidents reported, can be seen in table 2. For the purposes of this paper, we observe all types of reported incidents.

Table 2. Incident reported category

No	Incident category	Code
1	Prescriptionunreadable	E1
2	Wrong patient	E2
3	Wrong medicine	E3
4	False dose / Strength / Frequency	E4
5	Incorrectly Compounding / Shape	E5
6	Incorrect Route/Granting Way	E6
7	False Time of Giving	E7
8	Wrong Quantity	E8
9	False Labels / Instructions	E9
10	Contraindications	E10
11	Incorrect Storage	E11
12	Not Get Drugs / Compliance	E12
13	Expired Drug / Damage / StabilitySide	E13
14	Effects of Drugs	E14
15	Drug Interaction / Incompatibility	E15
16	Duplication	E16
17	No Indication	E17
18	No Policy	E18
19	Wrong Billing	E19
20	Field Condition	E20

From the results of data collected, it is found that incident reports of drug delivery errors decreased after the use of electronic prescriptions. Indeed there is an increase in the number of incident reports in September from the month of observation that is June, this should be done further research to find out the implementation of electronic prescription will be more meaningful on what type of incident actually.Recapitulation can be seen in Table 3.

Table 3. Incidents Recapitulation

Month	Σ Incidents	Σ Prescription
May-16	217	5300
Jan-17	140	5100

Jun-17	53	5540
Sep-17	72	5200

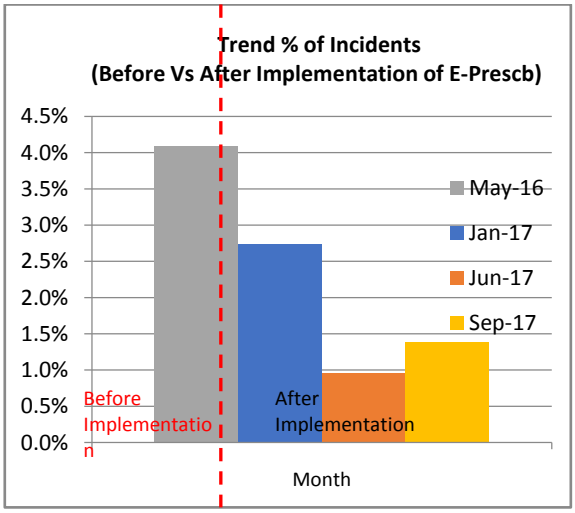

Fig 1. A Trend of Incidents Report Before and After E-Prescribing Graphic

When viewed from the graph of decreasing incidence in each variable, there was a significant decrease in the 8 variables measured but did not occur the same in the patient's wrong variable (E2). This indicates that the use of electronic prescriptions may not have an effect on the wrongpatient's variable[30].

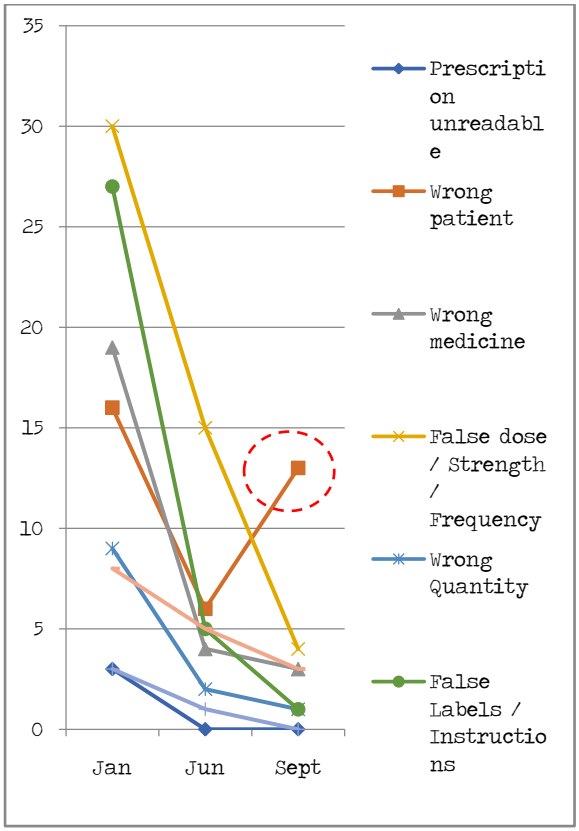

Fig 2. Graphic of Incidents Decreased Trend After E-Prescribing Implementation

Table 4 shows the trend of statistical analysis results conducted. The results show that changes in the system to electronic prescribing have a great impact on the quality of drug delivery and patient safety services. There are a number of incidents that the results of the analysis of this paper have decreased. Although there were incidents that rise, several factors that influence it should be further research.

Table 4. Incident ReportTrend After e-Prescribing

No	CODE	TREND	Difference in number of incidents across variable periods
1	E1	Decrease	Significant (p value (0,33) > 0,05)
2	E2	Decrease	Significant (p value (0,81) > 0,05)
3	E3	Decrease	Significant (p value (0,3) > 0,05)
4	E4	Decrease	Significant (p value (0,056) > 0,05)
5	E5	Increase	Not Significant
6	E6	Increase	Significant (p value (0,33) > 0,05)
7	E7	Stagnant	Stagnant Significant (p value (1)> 0,05)
8	E8	Decrease	Significant (p value (0,26) > 0,05)
9	E9	Decrease	Significant (p value (0,24) > 0,05)
10	E10	-	No Incident
11	E11	Increase	Significant (p value (0,454) > 0,05)
12	E12	Increase	Significant (p value (0,74) > 0,05)
13	E13	Increase	Significant (p value (0,33) > 0,05)
14	E14	-	No Incident
15	E15	-	No Incident
16	E16	Decrease	Significant (p value (0,12) > 0,05)
17	E17	-	No Incident
18	E18	Increase	Significant (p value (0,67) > 0,05)
19	E19	-	No Incident
20	E20	Decrease	Significant (p value (0,07) > 0,05)

V. DISCUSSION

Implementation of activities carried out by doing:

1. Ensure all computer and printer devices are available in the doctor's room practice.
2. Socialization to the doctor, nursing on how to use.
3. Socialization to the pharmacy for the use of electronic prescription in the pharmacy.
4. Visited during the initial implementation to the

field and made an evaluation sheet for the implementation.
5. Doctors fill out the evaluation sheet of electronic prescription use.

The result of satisfaction of the use of electronic prescription, the majority of doctors expressed satisfaction with the electronic prescription system. Doctors state that electronic prescriptions make it easy to make a prescription, look at previous patient's medical history, and change the prescribed prescription. But there are still obstacles that they think should be improved.

Some common obstacles in the location of electronic prescription use, after the evaluation is:

1. The old computer loading problem.
2. In the general polyclinics, not all registered patients appear in the patient's name. Because there is a bridging disorder with patient eligibility so there is often interference.
3. Doctors find it difficult to find a brand of certain drugs.
4. Doctor choice wrong patient.
5. Incoming data to the pharmacy cannot be saved and go straight into billing because it is still loading (almost 2 minutes every transaction) so that pharmacy still do manual input.

VI. CONCLUSION

There were 8 significant incident decreases (40%), 1 stagnant incident (5%), 5 significant incident rises (25%) 1 incident rise insignificant (5%), and 5 incidents could not be measured because there was no incident report (25%).

It appears that electronic prescription plays a very good role to decrease prescribing error mainly due to the writing process, wrong drug, wrong dose, wrong quantity, wrong label/instruction, duplication, and field condition. But it has not been seen in the wrong patient's incident (uncertain), although based on statistical counts decreased.

Electronic prescriptions can prevent many of the small errors previously identified and corrected by the pharmacist. Electronic prescription to be one effort to reduce the number of medication error, especially from the writing of an incomplete prescription. The application has been designed and tested and needs to be evaluated its shortcomings in order to the implementation of electronic prescriptions to be better, as expected in improving patient safety.

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