E-PHARMACY: BENEFITS AND BARRIERS

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ABSTRACT

Various versions of E-Pharmacies will be implemented in the future to lower costs, improve customer satisfaction, and improve patient care all of which offer up their own unique barriers and benefits. Discussed in this paper will be the various methods by which e-pharmacy and e-prescribing take place. Barriers are presented and solutions are discussed needed to overcome regulatory and institutional impediments. Additionally, the impact of implementation of Electronic Health Records (EHRs) by hospitals and it impact on E-pharmacy will be discussed.

Keywords: Electronic Pharmacy, Computerized Physician Order System, Tele Pharmacy.

INTRODUCTION

Electronic Pharmacy (e-pharmacy) brings to mind many different ideas for the average patient. A seemingly simple concept has so many applications, complexities and ways to achieve that even the most informed community may ask what exactly is meant by an e-pharmacy. E-pharmacy is the automation of the process needed to prescribe medicines, order, inform, and deliver medicine to patients using an information system. It includes the interaction of doctors, pharmacists, patients, hospitals, clinics, insurance companies, families, and many more stakeholders. It will impact not just record keeping but indirectly influence social change.

Patient data must be accurate, timely, complete and sufficient to prevent issues when prescribing a drug. Barriers include illegible handwriting, improper dosages, eliminating adverse drug events (ADE's), implementation times, burdens of implementation on prescription staff and many more. The Institute of Medicine (IOM) estimated that 44,000–98,000 Americans die each year due to medical errors in hospitals and many of those are medication errors or preventable ADE's [1]. E-Pharmacy process improvements are a way to overcome logistical, medical as well as social problems. The implementation of e-pharmacy will bring about improved care for patients as long as the new problems created by them can be adequately overcome. Successful implementation will require altering attitude towards implementation, education on processes and systems as well as proper selection of design and implementation of an e-pharmacy solution. Thus this paper seeks to uncover areas where additional research and understanding are needed to properly implement E-pharmacy solutions.

Fax/scan based electronic pharmacy

There are manual procedures in place that people use called "runners" to take orders for prescriptions and hand-delivering them to the pharmacy or using tube systems or faxing orders to the pharmacy. There are many problems with this manual system that include delays in hand

delivery that is dependent on timely runners, lost tubes, lost orders, problems with fax machines working properly or bad quality of the transmissions of the faxes. One solution was RightFax [2]. This process did a good job of communicating orders but there were software issues. First, the fax came in via email, so the pharmacist still had to manually enter information into systems to track the orders. Comments also had to be entered into the system which takes time away from filling orders and being efficient in the workflow. Second, only two pieces of information where able to be stored. Third, the system was doing refreshes periodically that used server resources that slowed the system down for order processing. This is bad because the prescriptions normally need to be entered quickly so the healthcare provider can move on or because the order is a rush order for medication and can't be delayed because of issues such as this. Fourth, the process that was used to archive the information was slow [2]. As a result of this implementation, the standardization of the application eliminated the problems with the manual process.

Computerized Order Entry Systems

An important component in many of the e-pharmacy solution is the Computerized Physician Order Entry (CPOE). This is the computerized entry of patient medication by the prescriber for the patient. This along with a Computerized Decision Support (CDS) systems have shown to be very effective in reducing errors. A 2003 study found that 3% of new prescriptions in chain pharmacies were associated with dispensing errors. This data suggest that more than 45 million dispensing errors occur annually when filling new prescriptions. These errors can occur in the medication-use process, and the Institute of Medicine has ranked medication errors among the leading causes of preventable death in the United States.

Dispensing errors are believed to be on the rise because of increasing prescription volumes per pharmacy, pharmacist fatigue, frequent workflow interruptions within pharmacies, and an increasing number of sound-alike and look-alike medications. Dispensing errors in the e-prescribing clinic were reduced by about half when prescriptions were electronically transmitted to pharmacies versus those prescribed with CPOE alone. This suggests that electronic transmission of prescriptions to pharmacies has error preventing benefits beyond CPOE alone, such as the removal of handwriting misinterpretations [3]. This suggests that the CPOE and CDS together drastically limit adverse patient outcomes patients, leading to the conclusion that an electronic prescribing process is an essential part of the future of e-pharmacy.

The cost for implementing CPOE for an e-pharmacy can range from $8.0 million to $11.8 million. For a 500 bed hospital, it can cost around $1.35 million in annual maintenance [4]. This cost may be too much money for smaller hospitals to consider, leading to low adoption rates of a system that clearly has benefits. One study shows that the mean medication turnaround time was reduced by 23% while also reducing composition-to-verification turnaround time by 61% [4]. This leads to hospital staff being more efficient in their use of time as they are able to get quicker turnaround from the system.

ELECTRONIC HEALTH RECORDS

Electronic Health Records (EHRs) are mandated by federal law impacting not just patient records and the recording of patient prescriptions but how drugs might be controlled as a result of EHR widespread implementations. Drug abuse and drug trafficking are major social issues.

It is estimated that 3.5 million people have tried heroin once in their lifetime. Canada on our northern border faces similar problems with drug abuse. In recent years, there has been a major shift in drug abuse from illegal drugs to prescription drugs altering traditional drug pipelines and markets. Electronic Health Records (E.H.R.'s) allow pharmacists and physicians to communicate via electronic means, which completely removes the patient from the medical process. Some of the problems of e-prescribing are electronic prescription forgery, the diverter, doctor shopping and illegal prescribing. One solution is the mandatory e-prescribing of the pharmacy process [5].

The issues surrounding prescription forgery have been around as long as prescriptions have been written. If an e-pharmacy solution is implemented, mandatory usage would allow doctors and pharmacists to create feedback loops to verify patient and professional relationships. The diverter asks for a prescription to be filled at a pharmacy that is closed and then asks for another one to be filled at another pharmacy. Because the two pharmacies cannot communicate, they would both fill the prescription. Similarly, doctor shopping allows a patient to play the field with doctors and get more medication than is needed from multiple sources. The real time impact of an e-pharmacy system promotes communication between pharmacies and physicians. This means that the prescription drugs would be more closely regulated in a way that reduces costs, better serves the patient, and has a positive impact on a major social issue.

Implementation Solutions

According to Brannock (2010), electronic pharmacy solutions are comprised of four basic components [6]. They are: (1) computerized physician order entry (CPOE); (2) drug delivery and packaging; (3) electronic medication and treatment administration records (eMAR and eTAR); and (4) reporting, communication and dashboard. The CPOE system should have alerts for problems such as allergies and drug-drug interactions, over/under dosing and if something is routed incorrectly for administrative purposes. CPOE also decreases time-delay in order completion, reduces errors with handwriting or transcription, allows order entry at point-of-care, provides error-checking for duplicate or incorrect doses, and simplifies inventory and posting of charges. eMAR/eTAR should be able to link tasks like vital signs, pain scores, administration and treatment. With a system this complex however, there are staff issues that must be addressed.

The barrier to overcome is lack of system knowledge or just understanding changes to traditional workflow. In order to overcome this, users must be educated to properly use e-pharmacy systems but also educated in way systems are designed to prevent users from inadvertently negating the benefits of automation. As with all things medical, there is the possibility of harm or loss of life if something were to be prescribed incorrectly as a result of improper system usage. This would suggest that a trainer should have a period of time to shadow new users to be able to observe after training and instruct as needed. Also, since all scenarios cannot be anticipated, high level resources must be available in real-time in order to not delay delivery of care.

A recent review of CPOE implementation in hospitals in seven Western countries (Australia, France, Germany, the Netherlands, Switzerland, United Kingdom, and US) revealed that implementation was slow, with adoption rates of 20% or less. Investigators found no

relationship between health care system organization and CPOE implementation. The cost burden of implementation often rests with the hospitals, despite the existence of national or regional incentives for adoption. Issues of professional autonomy, identity and conflict remain as barriers. In this environment, examples of successful CPOE adoption are critically important. To date, most examples are from academic medical centers, using systems created internally [7]. Given that the burden for implementation of these systems is put on the hospitals in order to comply with federal and state standards, it seems like the decision is between if they have the funds to implement such a system or are going to have to go with a system that is manual and inferior.

Pharmacists and other staff will have to alter the way that they work as systems become more automated. With both manual processes and the e-prescribing existing side by side, the majority of prescribing errors will be the result of the writing or typing of medication orders as opposed to the decision of what drug to prescribe. Ambiguous and incomplete medication orders can be virtually eliminated by e-pharmacy systems. The current problem of drugs being unintentionally prescribed and patient over medication could be partially solved by creating default frequencies for prescription medication. Second, a maximum daily dosage could be set for prescriptions. Also, standardization of dosing schedules for complex dosing could be created. Decision support could be a factor in checking drug interactions as well as duplications of drugs. Overall, it was found that an EP system reduced the prescribing errors at an expense of increased staff time[8].

However, CPOE brings on a new set of problems to be addressed. One of these problems is known as e-iatrogenesis which is defined as patient harm caused at least in part by the application of health IT. The system itself may not be the problem; however the design and implementation decisions will determine how these errors will be avoided in the future [1]. With the great power given through the abilities of a system, it is important to remember that humans have built the system. So testing is a major component of any system implementation.

With any CPOE, there should be a clinical decision support (CDS) component to the system. The system should be giving a number of alerts that are activated given a situation that needs to be brought to the attention to the user. When a prescriber is faced with a drug interaction alert, the prescriber can cancel the order or bypass the alert. If the order is canceled, many CPOE systems do not ask or require the prescriber to explain why the action was taken. Prescribers will often bypass alerts and provide little or no rationale for their decision [9]. This is a problem that can be solved through education and accountability.

Staff Attitude

One of the biggest barriers to implementation of any system is the attitude of the staff toward the system, change in general, and toward their jobs. Since the implementation of an EP requires positive staff moral to be implemented well, it is important to recognize that apprehension of the staff may stifle success because of problems transferring active orders, poor communication and feedback [10]. Attitudes of the staff play a major role in determining the success of a project. How else are negative staff attitudes overcome? Education is one of the most important parts of overcoming negative perceptions. Once those negative perceptions can be overcome, implementation will be better because each person is now trying to work towards the success instead of fighting it. There are many types of education that can be utilized. One would be

pulling out employees to give them classroom training. Depending on the size and complexity of the system being used, this may or may not be the best alternative. Another way is on the job training (OJT). This works best for many employees, especially high paid ones so that they do not have to take time away from their work as long to learn a system. Pharmacists would fall into this category. Education is one of the pieces that lead to improved compliance [11]. Iterative rollout enables users to overcome the initial anxiety associated with adoption. Intensive training and technical support facilitates adoption by users at all skill levels [12]. Leadership is also an important part of any implementation. Thus the key to successful implementation is a top-down addressing education and the adoption of new procedures and processes.

Benefits of CPOEs

Two studies, both in a pediatric setting found that the prescribing of I.V. drugs were the most common drugs involved in medication errors and adverse drug events (ADE). These errors for I.V.'s account for more than 54% of the total medication errors [13]. The most important part of the system implemented by Hilmas, et al., (2010) is the creation of a mathematical algorithm that will set the concentration optimizer to the desired amount. The automated process of generating limited number of concentrations will help to reduce and hopefully eliminate the number of medication errors further. The implementation of this system involved the assembly of a multi-disciplinary group of clinicians, including pharmacists, a nurse and two physicians. They were asked to create and implement a standard of concentrations across all pediatric units in the hospital. The complexity of the dosing and infusion rate had to be offset by the increased risk. Along with the complexity of the pharmacy compounding required in the process, this creates an infinite number of possible concentrations. For I.V.'s, this creates yet another huge barrier to implementation of an EP that focuses on the ordering of medication for the patient. The team in place developed a unique strategy using information technology to create the concentration optimizer and thus incorporating the standard concentrations into a CPOE system. This all used the mathematical algorithm that had already been developed.

The idea of removing human error can best be discussed by understanding that the infusion pumps that are used today are made with robust intelligence. They are able to be hardwired, wireless, have a drug library with safety software and store data as well. Patient safety is a primary concern of this automated process. The central intelligence infusion server must interface and be integrated with other information systems that will coordinate all of the data about a patient to give an overall view of the patient information. All of this information can then also be used for administrative tasks such as billing. The ideal system would have all aspects integrated to take care of each patient [11].

Tele-Pharmacy

The term tele-pharmacy is defined as dispensing of medication and information and the provision of pharmaceutical care to patients from a distance. It can be used to provide pharmaceutical care over a national scale from another location. Pharmacists' salaries are high, so determining whether the cost could be offset by automation and could also be associated with increased clinical interventions would be beneficial. At an estimated salary of $55 per hour and 30 hours of work weekly, the cost of the service would be $1,650 per week for tele-pharmacy services. The cost avoidance associated with the increased clinical interventions documented was

$23,422. Therefore, the tele-pharmacy service generated a saving of $21,772 for one week. If this saving were extrapolated to one year, the annualized saving would be $1,132,144 [14].

With a shortage of pharmacists and an aging population, it is crucial to find solutions to that will help the pharmaceutical field succeed. Inpatient hospitals are only providing pharmacy services at a mean of 106.1 hours per week. The pharmacy shortage is a concern especially in rural areas. Telemedicine allows a pharmacist to work from anywhere using a virtual private network (VPN) connection and hospital telephone access. This access allows them to access hospital servers and information systems to conduct their work. Written orders are scanned into the system and processed using an electronic medication-order management system. Calls would then go directly to the pharmacist at the remote location. The care would be transparent to both the customer and staff [14]. One of these challenges is to get secure access to hospital information systems for the tele-pharmacist. This requires the expertise of an information security department to secure data and information [14].

Today, the security of information is becoming one of the fastest growing areas of information technology. Hackers are more often stealing information from companies and creating all sorts of liabilities. Because health information is some of the most important information to secure, it is crucial to have this information locked down. With laws such as HIPPA, that require the secure transmission of secure data between any systems, it is important to make security a top concern when implementing tele-pharmacy. Overall, tele-pharmacy services are well received by health care [14].

CONCLUSION

The definition of a pharmacist-patient relationship is under question as the way that social media is used in the medical field. Health care professional have a general duty to care for their patients. To be liable for harm, there must be a breach of that duty. The law becomes hazy in that duty as the use of social media to inform the patient goes into the use of social media to inform a person of medical issues. There must be some kind of relationship present to be a duty to them [15]. So does communicating over social media constitute a relationship? This can act as a barrier to any EP that wants to look at using social media in the future as a form of pharmacy. Perhaps social media could not get you a prescription, but you can always get advice online. If that advice is coming from a labeled pharmacist, this could cause a barrier to implementation of a social networking solution to EP in the future. According to Clauson et al., (2010) it may require a combination of social media policies and guidelines developed by professional organizations and institutions along with good judgment to determine the course in this area.

The future is bright for the implementation of e-Pharmacies. There are a number of barriers and benefits to the use of an EP. If all of the key parts are implemented, it has a higher chance of success. CPOE and CDS are critical components to the successful implementation. Overall, there are more benefits than drawbacks. There are many new barriers the further into the implementation you go, however if you learn from others' past mistakes and you are willing to put forth the effort, these can be overcome, many times with an existing solution.