Clinical Decision Support Systems – An Economic Evaluation

Nicholas VanderLaan

Follow this and additional works at: http://scholarworks.gvsu.edu/cistechlib

Recommended Citation
http://scholarworks.gvsu.edu/cistechlib/160

This Capstone is brought to you for free and open access by the School of Computing and Information Systems at ScholarWorks@GVSU. It has been accepted for inclusion in Technical Library by an authorized administrator of ScholarWorks@GVSU. For more information, please contact scholarworks@gvsu.edu.
Clinical Decision Support Systems – An economic evaluation

It is hard to go anywhere these days without noticing the critical role that technology plays in modern America. Making deposits to your bank account is now possible with a cell phone application and getting anywhere has been made possible with GPS. Arriving where you need to be with your health has also become easier and with higher success due to the use of technology. As hospitals have begun to switch over to electronic health records the physicians and nurses have become extremely reliable on technology. There has been some reluctance on the behalf of hospital employees because many believe that computers create a higher chance of error. The increase of technology in the medical world has researchers interested in the pros and cons of these systems. It seems to be obvious that by going electronic the physicians would save themselves a lot of time and stress. Something that may not be so easy to ponder is the way that the financial aspect of such technologies plays into the larger picture on their benefits. As many heath care systems are completing their stage 1 and stage 2 meaningful use requirements, the value these systems bring will become increasingly important. As many hospitals have put millions of dollars towards implementing new information technology, deficiencies, as well as return on investment must be discovered. Although more research needs to be done concerning this specifically, the analysis that has been done thus far shows that implementing clinical decision support systems (CDSS) saves both hospitals and patients money.
As health information technology (HIT) continues to evolve and become more incorporated with medical practices, hospitals, and patient care, it is not only important to take a look at how HIT affects patient care, but also the effect it has and will have on health care cost. This article will focus on the financial benefits of implementing these types of systems when it comes to prescribing prescriptions as well as ordering these prescriptions. Medication errors can become a financial burden to both the physician as well as the patient receiving care. Errors at the prescribing phase often lead to adverse drug events (ADEs) which can be extremely costly and dangerous; it has been shown that an estimated 770,000 people are injured or die in hospitals from injuries related to drug use commonly referred to as ADEs (Kaushal, 2003). In less severe cases, patients who have received the wrong medication end up having to pay for continued medical care because their diagnosis was not accurate the first time around. With the implementation of medication computerized physician order entry (CPOE), medications can go directly to a pharmacy through Electronic Prescribing (E-RX) which many times can fill a prescription prior to the patient getting to the pharmacy as well as the patient does not need to stop at their provider’s office to pick up a prescription. In a hospital, these E-RX systems are extremely important as crucial medications are needed quickly and need to be prescribed accurately, thus E-RX CPOE systems reduce medical error in hospitals. Due to the economic decline, there are many people who do not have health insurance and these medications can become very expensive especially when they seem to be prescribed on a trial-and-error basis. Computerized physician order entry (CPOE) and clinical decision support systems (CDSS) have been analyzed in their effects on
decreasing the rate of such events. An example of how CPOE and CDSS medication systems can help save patients money is through implementing formulary checks, which is when a medication is ran through a patient’s insurance to determine the coverage, and if a brand versus a generic medication is covered. The difference between prescribing a brand name medication and a generic medication can be a huge difference, sometimes hundreds of dollars, to a patient with a specific type of insurance. These formulary checks can also check pharmacy policies and contracts with medications.

It is known that medications can help to increase patient health but what many people do not realize is how difficult it can be to accurately prescribe these medications. When human error is incorporated into the picture at the point of prescription writing, ordering, and filling, the process of becoming prescribed to the correct medication in the correct dosage becomes complicated. A few examples of these costly errors that occur prior to medication CPOE include incorrect dosages, prescribing medications that a patient may have an allergy for, and prescribing a medication that was taken off the market. When errors in medication occur they often come with injuries, that result in lawsuits, that could be prevented with the use of CPOE and clinical decision support (CDS) which, in turn, will lower medication related costs (Kuperman, 2007). Implementing these systems can be difficult for providers because they have to understand what type of CPOE they need in order to support clinical decision support. A common example of a CPOE, CDSS system that has been adopted in a majority of health care systems is that of a Drug-Drug, Drug-Allergy check system. In order to achieve the goals of decision support systems and to see the financial benefits of implementing them,
healthcare systems must make sure that the knowledge underlying their systems is reasonable (Kuperman, 2007).

A study in 2003 focused on iatrogenic injuries, injuries caused by services provided by a medical provider, and the decreased rate of such injuries when using computerized physician order entry (CPOE) and clinical decision support systems (CDSS). As explained previously, these cases are common and they can be extremely costly to both the physician as well as the patient. The researchers evaluated trials that specifically focused on CPOE and CDSS and their relationship with medication safety. Five of these studies focused on CPOE, two of which showed a significant decrease in medication error rates. Another of these demonstrated an improvement in five prescribing behaviors while a fourth revealed improvement in corollary orders (Kaushal, 2003). Of the seven studies that focused specifically on CDSS, three displayed statistically significant improvements in the area of antibiotic-associated medication errors. In looking at the above studies, these researchers concluded that by using CPOE and CDSS substantially reduced the occurrence of medication errors (Kaushal, 2003). It was also determined that 28% of adverse drug effects (ADEs) are associated with medication error and can be prevented by the use of these systems. It is believed that these systems can help because of the preventable ADEs, approximately 56% occurred during the drug ordering phase (Kaushal, 2003). This is extremely significant because medication and drug ordering errors can become expensive for the patients receiving care. Some of the studies which directly observed how accurately orders were carried out found high error rates in administration of drugs. Because most medication and ADE errors occur in the
drug ordering phase, it has been determined that by the use of computerized physician order entry and clinical decision support systems many of these issues could be avoided.

A second group of researchers analyzed the financial outcomes of implementing antibiotic practice guidelines through computer-assisted decision support. After installing this system within their computer programs, they measured the use of antibiotics from the time of preoperative administration thru postoperative use. They then looked at the clinical outcomes which included adverse drug effects, mortality, length of hospital stay, and antimicrobial resistance (Pestotnik, 1996). The study period lasted for seven years and during that time the number of patients who received antibiotics increased from 31.8% to 53.1%. As the prescription rate of these drugs increased, the cost of pharmacies to acquire these drugs decreased from 24.8% to 12.9%. This directly cut the cost that patients were paying for prescriptions from $122.66 per patient to $51.90 per patient (Pestotnik, 1996). Clinical outcomes and antibiotic use improved throughout the study, the percentage of patients receiving preoperative antibiotics appropriately before surgery increased from 40% to 99.1% over the course of the study. Adverse drug effects related to antibiotics decreased by 30% as well. After reviewing the results of this seven year study the researchers came to the conclusion that these systems can help to improve antibiotic use as well as reduce the associated costs (Pestotnik, 1996).

When studied over a twelve month period in a primary care setting, an electronic prescribing system, which had been integrated with decision support, was proven to decrease medication costs when compared to a control. The main goals of this study were
to analyze the impact of clinical decision support systems (CDSS) on pharmacy claims and per-member-per-month (PMPM) expenditures (McMullin, 2005). Eight high-cost therapeutic prescribing behaviors were also evaluated due to the fact that they were frequently targeted by electronic messages to physicians. This was done in order to prove that the drug savings seen were due to the support system rather than another factor.

After the twelve months of follow-up by the researchers, it was shown that when clinicians implemented the decision support, and used it when 26,674 new prescriptions were made; $4.12 was saved on average per prescription when compared to the written prescriptions in the control group (McMullin, 2005). When the drug cost savings per prescription were analyzed they were at an average of $482 per prescriber per month (PPPM). A savings of $465 was seen when PPPM was based on per-member-per-month (PMPM) (McMullin, 2005). Pharmacy claims came with an average drug savings of $863 per prescriber per month and $873 when based on PMPM. The prescriptions which were a result of the high-cost prescribing behaviors targeted by the support systems were calculated to be 17.5% lower among the intervention group when compared to the control group (McMullin, 2005). High-cost therapeutic prescribing behaviors can affect patients as well as health care professionals. The conclusions of this analysis show that the high-cost therapies, which are commonly prescribed, can be avoided with the implementation of integrated decision support.

Further evidence to support the decrease in prescription cost was observed a second time by the same researcher who participated in the twelve month study mentioned previously. This time around, the impact of evidence-based computerized
decision support systems were examined in their connection to primary care prescription costs. These systems provide the physicians with recommended prescriptions based on certain criteria that the patients meet. In this retrospective cohort study, clinicians using CDSS were pared with a control group based on three principles: pharmacy billed amount, number of patients treated, and the number of new prescriptions filled in a six month baseline period in which neither group used the system (McMullin, 2004). After these standards were met, the researchers were able to focus on their primary measure which was the difference in prescription costs between the two groups after CDSS was implemented in the intervention group. It was found that the clinicians who used the evidence-based suggestions within the support systems had significant lower prescription costs (McMullin, 2004). The intervention group had an average cost per prescription that was $4.16 lower than that of the control group; as well as an average cost of new and refilled prescriptions which was $4.99 lower than the control group. On the clinical side, there was savings of an estimated $3,450 on new prescriptions and their refills per clinician over a six month period when compared to the control group (McMullin, 2004). These outcomes further support the hypothesis that implementing these electronic, evidence-based decision support systems and using them during the prescribing phase can significantly decrease primary care costs.

The studies mentioned above all supply evidence that displays the positive aspects of implementing clinical decision support systems. They have been proven to save money for both the patients as well as the healthcare professionals when it comes to prescription cost. However, it is also important to look at the cost for healthcare systems to implement
and train their employees to use these programs. Healthcare systems invest a lot of their funds into these programs and the question of if the benefits outweigh the risks still stands. Generally, it is easy for companies to determine their return on investment (ROI) for certain products due to the wide-spread availability of financial analytical tools (Menachemi, 2005). When attempting to calculate the ROI on these systems in the healthcare world it is not as easily done because of the fact that IT generally does not produce direct income or a billable service like a CAT scan or other medical devices do. These clinical support systems are meant to improve the way that clinicians prescribe medications and to avoid high-cost treatments, not to produce a new billable product which makes it difficult to measure. Improved quality of care is often hard to measure financially and that is what companies and investors look for when they determine their ROI. These electronic systems take both time and money to implement and since it is not easy to visually see the effects of properly prescribing medications, it can take time before the healthcare professionals see the financial benefits of doing so. The economic effect of implementing CDSS and electronic health records (EHR) was examined in a 59-physician outpatient clinic and it was found that there was a direct correlation between EHR and a positive ROI (Menachemi, 2005). During the study period implementation of EHR resulted in reductions in spending and increases in revenue, specifically a $1 million dollar savings directly attributable to these systems (Menachemi, 2005). Multiple aspects of EHR contributed to the seen savings; a reduction in transcription savings of $380,000, improved revenue due to coding of $100,000, savings of $160,000 due to the elimination of patient charts and $248,000 in savings due to lower space requirements (Menachemi, 2005).
While a number of studies have been done which examine the positive aspects of implementing clinical decision support systems (CDSS) and computerized physician order entry (CPOE), many more need to be done in order to fully understand the financial aspects of such systems. The studies that this paper examined all seemed to come to the same conclusions, CPOE and CDSS save money in the prescription placement phase of healthcare. Electronic systems such as these help providers to avoid making common mistakes that often result in high-cost therapeutic prescribing behaviors. Most medication errors and adverse drug effects (ADEs) occur in the drug ordering phase and CDSS and CPOE focus on this area specifically. Errors in prescriptions and ADEs can be extremely costly to patients receiving this care and, depending on what type of health insurance they have, can lead to a significant decrease in their over-all health if they cannot afford to keep switching medications due to clinical mistakes. The benefits that have been determined through research show that these systems save money for both patients as well as healthcare professionals. Implementing these systems can be time consuming and costly but they seem to come with more pros in the long run due to the fact that they save the hospitals and smaller providers a significant amount of money.
Works Cited


