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**A CURRENT ENGINEERING TOPIC AND RELATED TECHNOLOGY. WHAT DO I THINK?**

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**MEDICAL RECORDS AND THEIR USE**

Medical records are very important in the field of healthcare. Every human has a different background but to diagnose a condition correctly, it is necessary to know the history of each individual patient. Medical records speed up the diagnosis of an illness, alert doctors to impending medical conditions, and can help prevent future sicknesses among the general population. Nearly all medical professionals use them and it is in the best interest of the patient to keep their medical record up to date; that is why people go to the doctor for “checkups”.

So what exactly is contained in a medical record? Everything from observations at birth to current medical impediments. This means age of course, date and time of every vaccination, all illnesses more serious than a cold, height and weight trends, serious conditions that may run in the family, allergens, current and past medication, previous and future operations (if applicable), date and time of blood tests, urine sample results, and much more.

Many people believe that manual medical record management is effective, but as can be imagined, keeping track of each individual medical record could potentially turn out to be very difficult. Because medical records are very complex and numerous, I believe hardcopy medical records are extremely inefficient and that electronic medical records should be used instead.

**WHAT IS THE PROBLEM WITH HARD COPY MEDICAL RECORDS?**

Hard copy medical records, records that are hand written by doctors and filed away in vast filing cabinets, allow for an unfathomable amount of waste in money, time, energy, and ultimately efficiency. However unfortunate, medication errors happen frequently [1]. They are described as “any error in prescribing, dispensing or administration of medication,” [1]. In a study done by the Skaggs School of Pharmacy and Pharmaceutical Sciences, 70% of prescription and medication errors were attributed to prescribing inaccuracies while the other 30% were attributed to documentation, dispensing, and monitoring deficiencies [9]. These kinds of errors are costly and can add up over time. Not only are the effects of these errors at the expense of the quality of the United States healthcare but the national estimated annual cost of medical errors resulting in injury is between $17 billion and $29 billion and are often preventable [10]. In fact, over half of the reported errors in the study conducted by Skaggs School of Pharmacy and Pharmaceutical Sciences could have been prevented using enhanced technological monitoring and dispersion systems [9]. This means that there is room for improvement in communication between physicians and pharmacists; and the use of an electronic documentation system may be beneficial. So, how can we improve efficiency and quality while reducing error and waste?

**ELECTRONIC MEDICAL RECORDS (EMR) AS A SOLUTION**

The best and most prevalent solution to this problem came with the introduction of electronic medical records. They differ from hard copy medical records in the fact that they are made and uploaded to a server which can be accesses by all the necessary medical personnel. BMC Medical Informatics and Decision Making describe it as “a secure consolidated record of an individual’s health history and care, designed to facilitate authorized information sharing across the care continuum,” [3]. In a research article by Alexander Singer and Roberto Duarte Fernandez, it is proven that the use of an EMR in a local clinical situation drastically increases communication between pharmacist and prescriber which significantly decreased error and “[suggested] that EMRs improve prescribing safety [1]. They also found that, without the need to clarify prescriptions as often, workflow could be greatly improved—increasing efficiency [1]. Marcia Mickle, a nurse practitioner at Northwestern Medical in Chicago, IL, says that without messy handwriting, information can be shared and interpreted at an instantaneous rate; and she agrees that EMRs have helped to improve healthcare delivery [7].

Since EMRs have spread across the country rather rapidly, select healthcare providers have started allowing patients to view certain aspects of their own medical record online [6]. This means that patients can see their test results, doctor’s notes, medication directions, and more, allowing them to more closely monitor their health.

**EPIC—AN ELECTRONIC HEALTH RECORD SOFTWARE**

One of the best electronic medical record systems currently available is called EPIC. They claim that the name, like a glorious story of a nation’s events, encompasses the chronicle that is “the story of a patient’s healthcare over time,” [11]. The system is the most widely used across the nation and aims at simplifying the filing/prescription filling process. For example, according to Electronic Health Record Intelligence online, University of Pittsburgh Medical Center ranks in the top 10 biggest EPIC EMR implementations in the United States, running “nearly 20 academic, community, and specialty hospitals and over 500 doctor’s offices and outpatient facilities,” [12]. That means that a patient could visit any of the 20 specialty hospitals or any of the 500 doctor’s offices and their medical record will be up to date and instantaneously accessible at each and every one.

According to a study conducted by the Healthcare Fellow Project, when 73 physicians were asked if EPIC made it easier for them to do their jobs, 90% of them said yes and further stated that they “never want to return to a paper chart system,” [4].

**ARE ELECTRONIC MEDICAL RECORDS WORTH THE COST?**

Some hospitals would argue that EMRs are not worth the cost of implementation. According to Information Management Journal, implementing a EMR could cost just one physician around $163,765.00 [2]. Furthermore, as a Northwestern Medical nurse points out, using the systems have individual challenges such as “delayed charting, a complicated interface, and keystroke mistakes,” [7]. Other observed issues include “high initial cost, large training investment, hardware crashes and breakdowns, power failures, software glitches, sabotage of the system by disgruntled employees and hackers, unauthorized access, viruses, Trojan horses, [and] reluctance of physicians to use the tightly controlled format for notes,” [10].

To combat these issues, computer and IT engineers are currently working to make the system less vulnerable to hackers and viruses, and EPIC requires that everyone who uses their system be trained on how to use it [11]. This kind of approach limits the frustration when making notes or ordering medication, and even though there is a large initial investment in money and training, electronic medical records are more efficient and, after full implementation, save millions of dollars in inefficiency nationwide. Hospitals and physicians are also incentivized to switch to EMRs. The American Action Forum fount that over 30 Billion dollars were given to more than 468,000 institutions for implementing some form of an electronic record keeping system [2].

**ANTIMICROBIAL STWERDSHIP**

EMRs are not only good for saving money, time, and error, but they are also good to use as preventative measures in spread of illness. According to the Association for Professionals in Infection Control and Epidemiology, Antimicrobial Stewardship is “a coordinated program that promotes the appropriate use of antimicrobials (including antibiotics), improves patient outcomes, reduces microbial resistance, and decreases the spread of infections caused by multidrug-resistant organisms,” [12]. MRSA, methicillin resistant staphylococcus aureus, is a skin infection that antimicrobial stewardship programs combined with the functionality of EMRs intend to fight. This is how they do it:

Kaiser Permanente, a hospital group, spent nearly $4 billion implementing the Epic EMR system in their 37 hospitals. Currently they have “the largest nongovernmental digital depository of medical records in the world,” [5]. The Permanente Medical Group claims in a recent publication, that the inpatient mortality rate of patients with sepsis has decreased by 40% since 2008 in the Kaiser clinical setting [13]. Other tools such as “treatment algorithms, order sets, Best Practice Alerts (BPAs), and chart abstraction tools” were used to “screen and reliably provide effective treatments to hospital patients identified at risk for sepsis,” [5]. Using the EPIC database, Kaiser was able to identify trends in patients with sepsis and develop a stance on the importance of early intervention.

**IMPORTANCE OF EMRs**

For the aforementioned reasons, electronic medical records should be used instead of hard copy medical records. Not only do they make it easier for healthcare professionals to do their jobs, but by reducing error and wasted time, they enhance the quality of the care that the patient receives. To society and the United States as a nation, it means better healthcare for citizens, longer lifespan, and more time spent at home rather than in the doctor’s office. For engineers, it is an opportunity to expound on one of the most important and most thrilling technological advancements. This kind of technology aims to be implemented across the nation and the globe, directly affecting the lives of millions of people. As for me, it is a representation of the kind of world we are moving into— a dynamic shift from the way “things have always been done” to a new and revitalized era. Many people say that my generation has grown up in an electronically centered world and I am not inclined to disagree with them, but it is evident that society is still changing and from my perspective as a young student, it is intriguing to watch and facilitate that change.

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