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EXPLORING THE ADVANTAGES AND DISADVANTAGES OF UNIVERSAL ELECTRONIC MEDICAL RECORDS

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Lee Honors College Thesis

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Introduction

An electronic medical record (EMR) is a digital collection of information regarding an individual's medical history (Zhu, 2021). In the United States today, as well as many other countries, EMRs are owned and operated by privately ran businesses and institutions. Only the private institutions that have access to the EMR can input new information and view previous history. As Burdorf (2021) points out there are currently over 638 EMR vendors servicing healthcare facilities in the Unites States which poses serious challenges with interoperability. When viewing this current system that is in place today, it could certainly be more streamlined and efficient with a universal system. A universal EMR would provide universal access to health care information across multidisciplinary lines allowing for faster and easier transfer of patient information (Levy, 2010). There are many things to consider when converting to such a system, such as costs, impact on patient care, time savings, and convenience to patients and providers. Zhu (2021) mentions that a universal system can reduce healthcare costs and increase access to healthcare diagnostics. Janett & Yeracaris (2020) make the claim that although there is no perfect EMR system, there are features of different systems that have been shown to improve certain things such as reliability, quality, and efficiency over time. Therefore, if a universal system were to be implemented, it may be of use to incorporate different aspects of many different systems to provide the best platform possible.

Costs

The US currently has the most expensive healthcare system compared to other countries with an annual cost of $11,072 per capita (Zhu, 2021). The effect of universal EMRs could be significant by removing the need for health care institutions to invest in decentralized, provider-based IT systems and infrastructure; in turn reducing administration costs and healthcare costs as
a whole (Zhu, 2021). Gamal, Barakat, & Rezk (2021) suggest that with a universal centralized system there would be no fear of domination from private agencies, and costs would remain fair between providers. Ideally congress would develop an EMR system that is designated as universal and requires compliance from all healthcare providers (Burdorf, 2021). This would allow for a fixed price (or tax) for providers to use the system, while private health IT companies would not have the ability to weigh in. According to Burdorf (2021), the government would need to partner with one or more private industries in the information technology sector, as well as pharmaceutical and medical-device companies, to both fund and structure such undertaking. Without the knowledge of a company that has already been in the industry, it may be doing more harm than good for the government to try and figure this out on their own.

The technological advancements of the universal EMR system could reduce costs by decreasing manual printing and scanning, faxing of documents, paper and ink, the maintenance of associated machinery, and employment of staff (Davidson, Durkin, & Subburamu, 2016). Universal EMRs allow for real-time health information exchange (HIE) for primary care providers (Gamal, Barakat, & Rezk, 2021). The article (“Universal health records - Will they ever happen?”, 2013) highlights that savings are somewhat mitigated when systems cannot communicate with one another, causing patients to still rely on paper forms to request records from one doctor to give to another. Although it may not seem significant with a few pieces of paper and some ink, it quickly adds up with millions of people across the nation; along with employees being paid to handle these types of situations.

With a universal health records system, multiple providers are able to see what other providers have done and what tests they have ordered, allowing for less wasteful medical tests to be performed (Green, 2018). With the current system, records may take too long or be too much of an inconvenience to have sent from the previous provider, so charging the patient to perform
the test again saves time and hassle. Green (2018) explains that this scenario happens a lot when a primary care physician (PCP) performs a test and then refers their patient to a specialist that will need the same test, but doesn’t have access to the same EMR. These types of inefficiencies have been estimated to cost the healthcare system more than $8 billion annually (Emam et al., 2011). Hieb (2010) explains that “there are substantial associated costs relating to duplicate testing, time spent searching for data, and errors and complications that result from incomplete knowledge about the patient.” In Australia they have converted to a universal system which estimates saving them $300 million per year by reducing errors and duplication of effort (Gunter & Terry, 2005). Having significantly more people living in the United States savings can only be of greater magnitude.

**Patient Care and Convenience**

When health care providers face the issue of missing or delayed information retrieval due to a system that is not universally connected it can have negative effects on the patients themselves. For example, in an emergency, where a patient is unconscious, how are the medical staff supposed to know what conditions the patient may have or what things they are allergic to (Green, 2018). A survey involving a broad range of individuals, 18 years and older, found that on average the number of different doctors seen by participants was 18.7 (Fusion, 2018). Seeing almost 19 different doctors and not expecting information to get lost or miscommunicated would be hard to believe. Fusion (2018) also found that almost 200,000 deaths a year occur from preventable medical errors, partly because information is not readily available to specialists and emergency rooms. A universal EMR would ultimately lower these numbers by allowing healthcare professionals to have the tools they need to exchange in real-time important patient health information (Gamal, Barakat, & Rezk, 2021). Additionally, findings by Adams et al. (2021) suggest that health care providers “inability to obtain information from external
organizations resulted in an information gap that delayed care or resulted in potentially lower quality care.” Having access to a patient's full medical record can also decrease the problem of drug seeking; reducing the amount of inadvertent hospital assisted drug overdoses (Green, 2018). Gamal, Barakat, & Rezk (2021) explain, traditional health information systems (HISs) create “islands of information” that hinder the ability for providers to view current and past medications.

Along with quality of patient care, convenience for both providers and patients could increase with a universal system. Currently, accessibility to information for both patients and providers is a major healthcare issue (Zhu, 2021). With every healthcare provider keeping separate paper or electronic EMRs for each patient, there is no ability to integrate information between the various systems (Emam et al., 2011). It can be very difficult for patients as well as providers to keep up on the procedures, tests, medications, and care that has been performed in the past. As Green (2018) explains, before you are given any type of treatment, you will most likely have to think back on your entire medical history, including any prescriptions you take, surgeries you have had, allergies and reactions you have experienced, and any previous complications that were encountered. As age progresses, this can start to become a lot of information to remember in the case of an emergency. A system that would allow for the electronic movement of clinical information among health care information systems seamlessly could alleviate this problem (Emam et al., 2011). The ability to request and receive patient information in a matter of minutes eliminates a significant amount of wasted time that the current system creates. Adams et al. (2021) pointed out that parents having to complete permission forms and faxing information every time they met with a new provider was inconvenient, inaccessible, and should no longer be utilized. Therefore, a technologically up-to-date system
allowing access and participation across the nation would represent a huge step forward (Hylock, 2019).

**Privacy and Security**

Healthcare providers must protect patient information to eliminate privacy and security risks. Patients may be wary of how information about themselves is used for research purposes (Gamal, Barakat, & Rezk, 2021). In some instances, information used for research may be of significant benefit. For example, a large database that a universal EMR would provide could be used to examine new and established therapies being used in clinical settings to see if they are truly successful in improving outcomes (Hylock, 2019). McClanahan (2007) notes another potential issue with a universal system is for criminal exploitation of unprotected medical records. Further exemplifying that “a person suffering from a terminal illness could be targeted by a criminal, seeking access to his or her estate, or a married person who contracted a sexually transmitted disease could be vulnerable to blackmail.” Gamal, Barakat, & Rezk (2021) in contrast point out that discreetly made improper disclosures from paper records can conceivably occur as well without anybody ever knowing. Under a universal system Emam et al. (2011) explains that each patient could be given a Unique Patient Identifier (UPI) which is a non-changing alphanumeric key that's associated with every health record belonging to that patient. Paired with a system that can be designed to include disclosure tracking logs providing an electronic record of to whom any disclosures of personal health information (PHI) were made can eliminate many of the privacy and security concerns (Hylock, 2019). This type of system many may refer to as the growing idea of blockchain technology. Gamal, Barakat, & Rezk (2021) acknowledge this idea, stating that a Universal Health Information Network (UNHIN) solves any security problems by using decentralized computing to establish an open, secure, and
universal network based on blockchain technology that collects and manages health information securely.

With health care fraud accounting for nearly 3 to 10 percent of all health care costs, or 80 to 120 billion dollars of loss per year, it is no wonder why so many individuals are wary about making such a significant change in systems (Emam et al., 2011). Medical records contain significant amounts of information vulnerable for identity theft: the patient’s social security number, birth date, and even credit card information. By using a UPI, most of the information associated with identity theft (names, address, and SSN) can be eliminated. Separating health record information and financial records information, each person has a single and unique identifier that follows them throughout their lives and is used only for health records (Emam et al., 2011). Green (2018) also agrees with the idea of using a unique identification code and brings up the idea of changing them often to ensure that any data is not misused after a specified time. Many private projects have explored these ideas of UPIs. The Voluntary Universal Healthcare Identifier (VUHID) project integrated with the HIEs and Regional Health Information Organizations (RHIO) to facilitate the actual sharing of information among independent provider organizations (Davidson, Durkin, & Subburamu, 2016). Davidson, Durkin, & Subburamu (2016) explain this project found many successes, but the main issue was getting enough organizations to participate and implement this new system into their existing.

Implementation Challenges

Alongside the privacy and security issues that may arise, the actual act and process of implementing such a system may raise some additional concerns. The main questions that must be answered in order to successfully implement any national plan for EMRs are the regulation, funding, and control of information to develop and maintain such a system. When implementing
such a large-scale system it is hard to understand how much money or time you will need for successful completion. Estimates of the revenue required to create a national healthcare identifier system alone range from $1.5 billion dollars to tens or even hundreds of billions of dollars (Heib, 2010). Such a project could take upwards of five or more years to implement. With cost being the major inhibitor preventing the creation of a national individual healthcare identification system (Hieb, 2010). However, Heib (2010) makes the point that many analyses have indicated, even if a national identification system were to cost over $10 billion, the projected benefits in terms of eliminating duplicate testing, avoiding adverse drug events, improved operational efficiency, and better patient outcomes means that the costs could easily be recouped in less than a few years.

On the contrary, Gunter & Terry (2005) explain that if providers adopt immature systems that have not been sufficiently developed, they may face liability risks because of system deficiencies or insufficient training. Therefore, in order to be universal and efficient, EMR charting systems need to be as uniform as possible across different platforms; guiding providers through the necessary information that needs to be recorded. The best EMR system would be one that provides templates for essential information and the ability to click basic data quickly (Yao, 2021). Many physicians and small practice groups may have concerns about the costs and learning curves associated with universal EMRs. Although with the template style Yao (2021) explains above it seems cost and learning curves could be minimized.

There may also be questions on whether to convert records retrospectively or prospectively when changing to this type of system. It can be imagined that a prospective approach to this system would allow for a more seamless transition, but at the cost of not having all past records integrated into one system. Relating to this issue, Emam et al. (2011) brings up two types of errors in statistical matching that can be encountered when switching to such a
system: “false positives, in which there is a link to the wrong patient's records, and false negatives, in which not all of a patient's records are found.” Either way, when switching to such a system, these potential issues would have to be taken into consideration and carefully inspected before it being deployed.

Many sources have investigated and explained the potential benefits and drawbacks that may be faced when switching to a universal EMR system. This study is aimed at unveiling a better understanding of the feelings healthcare workers have for such a system. Considering they are the ones that use this technology day in and day out, it only makes sense to get their understanding and opinion on implementing a universal system.

**Methodology**

The goal of the research portion for exploring the advantages and disadvantages of universal EMRs was to get a better understanding of what firsthand providers think of such a system. Considering this system can be viewed with many different opinions, investigating these, and allowing for additional comments from people who are using our current system can assist decision-makers in improving it.

Qualtrics, an internet-based survey platform, was used to obtain the survey data. This platform allowed quick and easy survey creation, distribution, collection, and data analysis. Qualtrics also made it simple to quantify certain data to make the results more streamlined and understandable. Once the survey was created it was sent out to medical providers in the Kalamazoo Michigan area through email. The targeted population was Doctors of Medicine (MD), Doctors of Osteopathic Medicine (DO), physician assistants (PA), nurse practitioners (NP), and registered nurses (RN). It was intended that 60 surveys be sent out (distributed evenly) across the six positions. Participants were associated with one of three institutions which included Bronson Healthcare, Ascension Borgess Hospital, or Sindecuse Health Center.
The criteria for participation in this study was that the individual must be over the age of 18, have the ability to read and write English, and hold one of the positions listed in the previous paragraph. No specific demographics were asked about the participant such as gender or sexuality as that was irrelevant for the focus of this study. Although the participants were asked about their age and years of working in their profession.

For security and confidentiality during data collection the Qualtrics platform uses Transport Layer Security (TLS) encryption (also known as HTTPS) for all transmitted data; as well as a password to log into the site itself. Also, the email profiles used for sending and receiving the survey were protected by Duo’s two-factor authentication security.

Results

After all of the surveys were received the data was organized and arranged using Qualtrics analyzing tools. From there the information was interpreted, making more in-depth observations on common themes and responses. There was a variance in the number of responses for each survey question with some having more than others. It appeared that some individuals started the survey without completing it.
Out of 25 responses for figure 1 there was a majority of 14 RN’s. Along with that there were 2 MD’s, 5 PA’s, and 4 other fields. The other responses consisted of an EMT-B assistant, two CMAs, and a CRNA. There were no responses from any DO’s or NP’s. Among these fields there was a wide range of specialties including Palliative Medicine, Pediatrics, education in medical surgical, Emergency Medicine, Internal Medicine, Family Medicine, Maternal child health, Medical Surgical, College Health, Psychiatry, and Orthopedic surgery.
Out of 24 responses there was a wide range in the number of years working in their profession; anywhere from 1.3 years to 43.8 years. The mean of these values came out to be 19.52 years.
Figure 3: Current age?

Between the 24 responses the age of respondents also varied greatly with anywhere from 21 to 63 years old. Most respondents happened to be 43 years of age or older with a mean age of 47 years old.
Looking at figure 3, most respondents felt that universal EMRs would have a very positive effect on duplicated tests and procedures for patients, patient safety, and the time healthcare providers must care for patients. Also, most respondents believed that universal EMRs would have a positive effect on overall healthcare costs. Very few respondents thought that universal EMRs would have a negative impact on these situations.
Figure 4: Do you think patient privacy would be a significant concern if the U.S. adopted a universal electronic medical records system?

From figure 4 it is clear most individuals think that adopting a universal EMR system would cause significant concern for patient privacy. However, 5 out of the 24 respondents had a neutral viewpoint on this issue, while 7 of the respondents did not think patient privacy was a significant concern.

Figure 5: How difficult do you think training would be for providers to learn a universal electronic medical records system?
As far as difficulty learning a universal EMR system there were only 3 individuals that thought it would be difficult. The majority thought it would be simple, or they were neutral on the topic.

Figure 6 asked individuals how difficult they thought it would be from a technological standpoint to convert to a universal EMR system. Out of 24 responses, 19 of them thought it would be difficult. Only 5 of them thought it would be simple or were neutral on the topic.

<table>
<thead>
<tr>
<th>Field</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std Deviation</th>
<th>Variance</th>
<th>Count</th>
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<tr>
<td>How long do you think it would take to implement a universal electronic medical records system?</td>
<td>1.00</td>
<td>15.00</td>
<td>5.67</td>
<td>3.65</td>
<td>13.31</td>
<td>24</td>
</tr>
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Figure 7: Please indicate how many years it would take based on the question.

Relating to figure 6, figure 7 asked individuals how many years they think it would take to fully implement a universal EMR system. The mean of the responses was 5.67 years with the maximum response being 15 years and the minimum being 1 year.
When respondents were asked if they were in favor or against implementing and using a universal EMR system, considering all the possible benefits and drawbacks, there was a strong majority in favor. 12 respondents were extremely in favor and 10 were somewhat in favor, while only 1 was against and 1 neutral.

**Discussion**

Overall, these surveys generated many interesting findings from a wide range of healthcare providers. Although there is no clear, straightforward opinion by all, this data as well as the comments received at the end of the survey can give us insight as to the advantages and disadvantages of universal EMRs.

From the results in figure 3 we can see that the majority of responses were on the positive end of the spectrum. In particular, many thought that universal EMRs would have positive effects for duplicated tests and procedures. As one individual stated at the end of the survey, there is way too much “duplication of services and non-communication regarding a patient, and their history.” They further go onto explain that medical errors happen all the time due to this
problem. When talking about medical errors it would be reasonable to assume that errors with a patient's history may raise safety concerns. That could be due to duplicated tests and procedures or giving the wrong medication to a patient that may have had bad interactions with it in the past.

Related to safety in figure 3, the second set of responses generated an even more positive response for universal EMRs. One individual pointed out that “it can be dangerous when we are not able to access a patient’s medication list.” With a universal system this may not be an issue as it would provide “more comprehensive safe care” as one comment stated. Bringing together all of a patient's medical history from the providers they have seen in their lifetime could eliminate this problem of not being able to access valuable information for that person. Not to mention, if a patient comes into an emergency room unconscious or incoherent, being able to access their full history without relying on word of mouth could be very beneficial. Based on figure 3, the responses agree that this more streamlined approach could also reduce the time healthcare providers spent caring for a patient. The effect of a universal EMR system on healthcare costs was the last question figure 3 acknowledges. Looking at the results it appears that many think it would have a positive effect. Although some of the comments collected at the end of the survey bring up some interesting topics and concerns. One individual brings up the question of who would ultimately pay for this system to be implemented. “If the government pays for it, do they "own" the records? Would they pay for it in perpetuity, or would the cost transfer over to the hospital systems at some point?” If the costs were to transfer over to the hospitals system, would these costs then be transferred to the patient? If that were the case the data from figure 3’s question may not have as many positive responses. On the contrary, if lab tests, X-rays, or procedures are run multiple times unnecessarily “it can be costly to both the patient and insurance” another respondent mentions. Taking these benefits and drawbacks into
consideration, it would be interesting to see if the positive effects on healthcare costs would outweigh the negative ones.

Interpreting the data from figure 4, the effect on patient privacy is a topic that many providers have different levels of concern for. Although many responses believe that patient privacy would be somewhat significant, there were several responses across the spectrum. Many comments pertained to this issue of patient privacy as well. They brought up different aspects of where privacy would be vulnerable. In fact, one individual expressed that their “biggest concerns with a universal electronic medical records system would be the privacy of the patients.” While another stated that they “do not think that there would be a privacy issue if we were to continue to enforce HIPAA.” The transition process alone can raise concerns for providers as “pieces of information could get lost in the process.” Not to mention, if this system were to be implemented successfully, would patient privacy still be a concern? Would a significantly larger scaled, interconnected system like universal EMRs, be more venerable to cyber-attacks? With the growing problem of internet hacking as the world is shifting to more technology-based systems, it is only reasonable to question this type of large transition when important patient information is involved. All of these concerns should be evaluated carefully before considering the use of such a system.

Aside from patient privacy in mind, although extremely important, is the question of how difficult implementation and training would be for providers. Figure 5 is looking at the opinion of providers themselves on this topic. Looking at the spread of responses themselves, many believe that it would be simple or have a neutral standpoint, while three of the responses show that it could be difficult. There is no doubt that millions of staff would need to be trained as one comment points out, but how difficult this would be is the bigger concern. One individual set forth an interesting take that, although training healthcare providers has always been an issue
with electronic healthcare systems, “younger” providers are more “receptive.” Many would most likely agree with this viewpoint as the younger generation has been around technology for a larger percentage of their lifetime. Whether this would influence the difficulty of learning and training on a universal system, and not the willingness to accept the implementation of the system can be viewed as two separate concerns. Another concern brought up in the comments was who would manage things such as the software, upgrades, and services of such a system.

Figure 6 gathers insights on these questions more specifically. As seen from the graph, there is a majority that believe converting to a universal system from a technological standpoint would be difficult. Clearly there are still many questions and concerns that reside in these topics, but many may agree with one response that “implementation would be challenging but the reward would be worth it.”

Figure 7 provides us with more quantitative data we can use to gain insight on the advantages and disadvantages of universal EMRs. It poses the question to providers as to how long they think it would take to implement a universal EMR system. As we can see from these responses, similar to others, there is a wide range of opinions. The minimum time individuals believe it would take is 1 year, while others believe it could take up to 15. The average of these responses was calculated to be slightly over 5 and a half years. Considering all of the concerns investigated earlier, there is no doubt that fully implementing such a system successfully would take time and have challenges. There would need to be significant time requirements not only to create and structure how this system would work, but also to make sure spending, privacy, and training requirements were not jeopardized.

Overall, taking into consideration all of the possible overarching benefits and drawbacks of implementing a universal EMR system, figure 8 shows us that the vast majority of firsthand providers that participated in this survey would be in favor of this system. Although some of the
data presented had varying responses by the providers themselves, making it hard to draw a clear conclusion. I believe that many would agree with the statement that “whether it is going to be difficult or not to create and use a universal EHR, it is something we need to look at.”
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