User-Friendliness of Epic Technology in Healthcare Clinics

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

In 2020, urgent healthcare clinics saw an increase in patient visits by 58% due to Covid-19 related procedures (Siwicki, 2021). The Centers for Disease Control and Prevention stated that 41% of U.S. adults faced delayed medical procedures which led to health conditions getting worse (Czeisler, 2020). In general, clinics have witnessed an increase in healthcare inefficiencies due to a large patient influx. A similar issue was experienced by the University Physicians of Charlottesville (UPC), a primary care clinic within the UVA health system that serves patients in Charlottesville. Located in Suite 2100 at the UVA Fontaine Research Park, the clinic consists of seven providers who treat patients of various health issues. Emerging from Covid-19, the UPC healthcare clinic has put emphasis on improving the patient flow to reduce patient wait times. UPC believes this will also help with reducing the stress on providers, nurses, and staff so that the clinic's efficiency is maintained overall. This research is valuable in the healthcare field because it not only provides structured insights for the staff at the clinic, but also develops a methodology on understanding the UPC's processes.

Similar to many other clinics and hospitals, UPC uses the Epic Systems healthcare technology to record patient information. The Epic charting system includes features such as health templates, medical history of patients, and referrals, to ensure that healthcare providers deliver the best patient care (Epic EHR, n.d.). Additionally, Epic is a shared server with data centralized in a single location that everyone working in the clinic has access to. Since this technology shapes the patient's clinic experience, it is crucial that all aspects of it assist the care providers and nurses. However, there are certain processes and terminology that make Epic's accessibility hard. In my project, my main research question is: how user-friendly is Epic Systems healthcare technology in local UVA clinics?

To tackle this question, I will first dive into my project background to give the audience an understanding of the social groups impacted by my work, the STS frameworks my work incorporates, as well as the STS methods that exert an influence. Then, I will elaborate on the past research work conducted in this area to provide readers with some insight on the progress being made on my research. Next, I will explain the methodology behind my research including the project's timeline and the steps I followed to acquire data. Continuing from there, I will delve into my recommended solutions along with their benefits and limitations. Following that, a discussion of the future research in this field will conclude the paper effectively.

Project Background

Since this is a clinic related project, the relevant social groups for this project include nurses, doctors, scheduling staff and patients. Recognizing these groups is simple because they are the ones in almost direct contact with either using the Epic technology or being impacted by it. While some clinics and hospitals may not have issues with Epic, I hope this project can highlight underlying accessibility problems in others.

Social groups are the key target audience that have a key relationship with the Epic technology (Vilardo, 2016). Their interaction with Epic is crucial to understand if Epic is serving its purpose or not. Nurses are defined as individuals who room the patient, check their vitals and review medication to update their chart information so that their records are up to date for future purposes. Doctors are care providers who address the patient's specific health condition and recommend what medicine or procedure will make them feel better. They are also most aware of their patient's medical history and keep in mind their past medical conditions to ensure that they aren't prescribing anything harmful to them. Scheduling staff never really comes in direct contact with patients, but they are responsible for communicating to patients their appointment

time and details based on the provider's availability on that day (Department of Health & Human Services, 2015). It is critical to learn their interaction with Epic to see how much access they have to the technology. Patients are those who are in need of health assistance and have pain or discomfort in their body. Since the Epic technology provides a more streamlined process of care to patients, understanding them and what they feel about the duration of their visit can be useful too.

While these aforementioned groups are in direct relationship with Epic, there could be more doctors and practitioners who are included in this network but don't have as direct of an interaction with Epic. Radiologists, translators, cardiologists, etc are also significant people who interact with patients and maybe even Epic. Collecting knowledge on their experience can allow our team to make better recommendations on how Epic's user-friendliness can be improved, which will make the overall health system more reliable and smooth.

Such technical research involving many social groups often obtains support from social frameworks that provide conceptual insights into various interdisciplinary fields of inquiry (Hess & Sovacool, 2020). A social framework that is most closely related to my healthcare technology project is the Actor Network Theory (ANT). ANT is defined as a theoretical and methodological approach to social theory that delves into the interactions and relationships humans have with inanimate objects (Cresswell et al., 2010). In my project, I look at the association humans have with technology specifically. I also pay attention to the social effects generated due to the relationships between the different users of Epic. Epic is used in the healthcare realm, which makes doctors and nurses the main audience. Since Epic is a technology that makes transfer of information convenient between the different social groups, the way these social groups interact with Epic is key to proving its relevance. When the patient's appointment process starts, nurses

are the first ones to enter information into Epic, and instead of communicating the information to the provider, Epic acts as the mediator and relays the details to the provider via its technology. A social effect of this is a sense of trust established between the nurse and provider, which keeps the clinic smooth sailing.

The relationship between the social groups and Epic is a two-way street, and thus Epic is programmed to show different information to each of the constituents of the social group based on what they want to view. Nurses view the patient's chart and input information related to their vitals and medication, while doctors use this information to understand their history and also update it with what prescriptions they need. Even though both groups use the same technology, their interaction and user-friendliness with Epic is only limited to their role. Hence, Epic's influence is dependent on the actor's requirements of Epic. Nurses and providers use this technology to collect, store, and analyze information on Epic, and this supports patients in getting timely care. Not just that, but for the entire actor network theory to work successfully, the actors need to establish strong connections primarily.

Moreover, sociotechnical studies require methods that will best help interpret the technology. For this project, ethnography or talking to people, will be the method of most influence (African American Heritage & Ethnography, n.d.). Even though this project deals with technology, people are ultimately the ones using this technology, and getting their perspective will help find problems in Epic's functions. The goal of my project is to ensure that Epic is convenient for its users. Since Epic's user-friendliness is subjective to the user's purpose, conducting open-ended interviews with these users will help us form a more cohesive picture. Interviews, containing specific questions that are easily understood, are useful in collecting more information. I want to emphasize the efficiency of Epic's use and any insight I can obtain from

these conversations will give me a better grip on the problem to be solved. The people working at the clinic are my best resource since they have undergone training and are daily users of Epic. It is important to establish trust with Epic users to understand their point of view and hear their concerns. Moreover, creating different sets of questions for different use cases, will assist my research in capturing all user cases.

Past Analysis

Since this project started before I got involved, I familiarized myself with the importance of Epic by examining past research. This route helped me in analyzing Epic's user-friendly options better. I found that a critical part of Epic is the data collected by Epic's electronic medical record (EMR) timestamp data, as well as Cadence reports which contain information on appointment scheduling of patients. These time stamps were recorded in the following instances: when the nurse picked the patient from the waiting room, entered the room, logged into Epic on the computer, logged out of Epic, left the room, when the doctor entered the room, and finally, when the doctor exited the room. However, certain discrepancies in the timestamp data revealed that some nurses logged into Epic to get the patient chart ready before they received them, while other nurses only logged into Epic after they received the patient. This, along with other areas where nurses followed contrasting steps in relation to Epic are of interest to me.

According to past research, this timestamp data correlates with the dotting system within Epic. Doctors and nurses use colored dots to indicate what stage of the appointment the patient is in (Hauptman, 2018). A yellow dot represents that the patient has checked in and is in the waiting room. Green dots means that the nurse has completed checking vitals and medications with the patient, and the patient is ready to be seen by the provider. A black dot indicates the patient's completion of appointment. White dots mean that the patient has missed their

appointment, blue dots mean there are some pending orders to be expected from the nurse, and finally a red dot indicates that the patient needs radiology care. Since there are multiple dots with different purposes, keeping track of them can be confusing.

To solve this, past work indicates that they implemented a standardized dot system guide which was installed at each computer workstation to ensure that both nurses and providers had a reference available (Dozier et. al., 2022). This served to minimize dot misclassifications within the EMR system. However, human entry discrepancies and improper data recording within Epic continued to exist that served as major hindrances when analyzing the time stamps. With many invalid check-in and check-out timestamps, my research team had to filter and manipulate the data through complex analysis.

My analysis of the Epic technology draws on some of the similar concerns as those mentioned above. I will focus more on the user-friendliness of Epic and how all the data collected from it can be more convenient to look at and easy to analyze. After performing data computations on the Epic data, I have found several data storage complications that can be removed to make it more easy to work with. My motivation to look into Epic's convenience grows from the difficulty I encountered in understanding the meaning of the data collected and accessing them on different analysis platforms such as Python, R, Excel and even Tableau. I hope that by finding the root problems and potential solutions, future teams will be able to perform analytical computations with ease.

Methodology

To analyze the user-friendliness of the Epic technology more comprehensively, some of my specific questions include 1) do the primary care providers and nurses have enough similar training and experience of the technology being used? 2) Is the Epic chart, that keeps track of patient health during every doctor visit, easy to navigate through? 3) Does the dotting system, used to keep track of patient progress during the appointment, capture the patient's stage timely and accurately? And finally, 4) Is the data generated from Epic easy to interpret and reflect everything it needs to? These sub questions are important because it helps me break down the problem into more simpler parts, so that I can thoroughly understand where the problem lies and ensure no possible issue is left untouched. It will also give me a better understanding of what solutions to implement in hopes for a more targeted solution.

I began to gather data on the convenience of the Epic technology while shadowing nurses at the UPC clinic from September through February. The nurses expressed concerns on specific terminology being hard to understand, and glitches within the software that made it difficult to accurately record timestamps. Looking into this further, I found that Epic has faced problems with a number of delayed discharges that have impacted patients (Hirsch, 2015). The nurses reported that a lot of patient information would disappear from records. Such scenarios can jeopardize Epic's accuracy, and pose a serious risk when patients' health status is on the line. Not just that, but when analyzing the data recorded by the technology, nurses and providers were unable to interpret what the data fields meant. The clients sent us the Epic data to analyze, and through my own personal experience, I learned that there are many data fields that have the same field headers, leading to confusion of what each field means. For instance, there are two fields called '*VISIT END DTTM'* and '*CHECKOUT DTTM'* that technically have the same meaning

but contain different time stamps. Another example is the fields '*SIGNIN DTTM'* and *'BEGIN CHECKIN DTTM'* which inherently could represent the same stage of patient flow, but according to the data collected, their timestamps differ. Hence, this data shows the need for research into the user-friendliness of the Epic technology.

Results

In an effort to improve the user-friendliness of the Epic healthcare technology, my recommendations include 1) simplifying the medical terminology to make it more universal 2) clearly indicate what data is being collected by having meaningful field names 3) communicating changes regarding patient stages in person and through Epic's dotting system.

While Epic is a healthcare system that is mainly used by nurses and providers who have obtained training on medical terminology, my interactions with clinic staff have proved that there are still some keywords that are hard to interpret (3Back, 2013). This leads to confusion when entering data and can lead to inaccurate data collection as well. Not just that, but with training processes changing often, it can be hard for nurses and providers to keep up with old medical vocabularies. In order to have one set of terminology that can capture the broad spectrum of medical knowledge, it is best to have the wording be universal so nurses and providers of all backgrounds, regardless of their level of expertise, can feel comfortable in using Epic. When considering some of the limitations of this solution, using a universal terminology can also lead to confusion and make certain keywords less specific. It can also be hard to settle on some words that are expected to be correctly interpreted by nurses and providers of all backgrounds. Not just that, but training can still be required and teaching the staff different terminology from what they learnt in their college and medical school training can be disruptive. Hence, in order to moderate

the negative effects of this solution, having nurses and providers reach a general consensus on what terminology works best for them will be ideal.

While the user-interface of Epic is one part to improve on, I also believe that the storage of data needs to be refined to clearly indicate the time stamps being recorded. Although nurses and providers don't check the data collected that often, there could be instances where they need to analyze the performance of their clinic. Similarly, research analysts like my team and I, would find it beneficial to have clearly labeled data points to make data interpretation easy. This can also avoid confusion because someone might mistake the time a patient signed-in for the time the patient was checked-in to their room if both data fields say 'Sign-in'. This mistake could convey a different conclusion about the flow of patients and could falsely overlook the delay in the process. Hence, this recommended solution also goes along with the previous one, where declaring a universal terminology that is comprehensible by nurses and providers alike, will subside instances of error. Apart from the benefits that accompany this solution, it also carries disadvantages. Epic is a trusted technology that has been around for almost 50 years and holds records of 280 million patients (About Epic, 2023). Due to the amount of confidence clinical care companies and hospitals have placed in Epic, changing its interpretation methods can be difficult. It will require the system to be down for a few weeks, which can potentially endanger lives of patients. In order to mitigate this negative impact, a possible solution might be to create a data dictionary that gives a couple sentences of explanation on what each field stands for.

While we have discussed the data storage and collection within Epic, a major constituent of this healthcare technology is the dotting system. It serves as a mechanism for nurses and providers to collectively keep track of the flow of patients in the clinic. As introduced above, each color in the system represents a certain stage of the appointment. A change in the dot color

indicates to the provider or nurse that the patient is ready for the next step in their care process and also indicates to the scheduling staff if new patients need to wait before they are called by the nurse. Even though this system integrates technology well with healthcare, it contains a lag that can delay the process or even cause miscommunication. As witnessed during my observations, different Epic servers reacted to changes in dot colors differently. For instance, once the nurse had changed the dot from yellow to green, it was expected that the doctor would see the patient as soon as they could. However, on the provider's end, there was a lag in the change of the dot, and it wasn't until thirty minutes had passed by that the dot color changed. This naturally delayed the patient care process and pushed back appointments made by other patients.

Hence, the solution of using in person communication along with the Epic technology to communicate changes in patient stages will avoid unnecessary delays, and allow nurses and doctors to hold each other accountable rather than suffering from technical errors. Since patient rooms and provider rooms are fairly close to each other in the UPC clinic, nurses can conveniently report the change to providers and vice versa. I believe that this way communication will be reliable and efficient, without technical lags causing disruption in the clinic. Not just that, but this will reduce the reliability of humans on technology and allow the clinic staff to take matters in their own hands. Even though preventing lags in patient care is a huge benefit of this solution, there are some serious drawbacks. This solution places a lot of trust in nurses and providers to communicate dot changes to each other in person. In the event of an unexpected event, staff can get involved in other matters and forget to communicate. Furthermore, even if the first individual does communicate timely, it could be that the second individual is too caught up in work and doesn't pay attention to the information conveyed. Thus,

such issues can be prevented if both nurses and providers follow a set method of communicating and respect each other's time.

Discussion

This project has helped me consider Epic on a much larger scale and has given me insight into what importance technology carries in a healthcare setting. As someone who considered technology to be an integral assist to humans, I hope to continue this research in the future to delve deeper into the ways Epic can make healthcare functions smoother. Every technology carries pros and cons and there are situations where having no use of technology is better than having it. The biggest question I want to explore in the future is, is Epic needed for healthcare? Are there ways in which some of the functions Epic performs can be performed better by humans? After all, Epic is mainly used to store patient information and communicate patient stages during the appointment process, but will filing information on a cloud platform in a more user friendly manner be beneficial? Moreover, Epic allows patients to view their medical transcripts and schedule appointments (Epic Interoperability, 2023). Hence, with patients being a huge part of this technology as well, I want to look into the ease of accessing Epic by patients with disabilities. Many patients have weak eyesight, mobility disadvantages, ADHD, etc, which can make it difficult for them to view information on Epic as normal patients can. Medical companies pay huge amounts to use Epic, and if it's causing more problems than it is helping, then its need has to be revisited.

Additionally, while I have only explored one clinic in my research, the UPC, I would like to expand my analysis to also consider other local clinics that use Epic. The issues I presented in this paper are confined to the UPC, but if more clinics have a similar sentiment towards the technology, then I can build a stronger case. Similarly, hospitals that use Epic will have different

issues as they will be on a larger scale, and understanding their pain points can give me more background on the benefits of the technology. They could have more pages to click through when charting information, smaller font, and more confusing terminology. Additionally, hospitals get more patients with more serious health issues, so it becomes more crucial to look at the convenience of nurses, providers, and patients when using Epic.

I also think that user-friendliness can be extended to include the user interface design. Since Epic is a confidential software because of the sensitive patient information it contains, it was not possible for me to investigate the interface and inspect the display. However, my research shows that Epic laid out each patient's records on the home page in a vertical manner. This forced nurses and providers to spend more time deciphering the content on the board instead of capturing an idea of the information at first glance (Epic User Interface and Notification Problem, 2019). This can be disruptive to a nurse's timely actions in the clinic and can even cause confusion. For a more concise user interface, I would like to look into what factors are required to be displayed on the home page and what nurses find more convenient. Overall, I am confident that future research in this area can shed more light on the user-friendly nature of Epic.

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