

Thesis Project Portfolio

Improving Patient Flow in a Healthcare Clinic Post COVID-19: A Data Validation and Exploratory Analysis Approach

(Technical Report)

User-Friendliness of Epic Technology in Healthcare Clinics

(STS Research Paper)

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Sociotechnical Synthesis

In my technical project, I worked with four other systems engineering students on improving patient flow in a healthcare clinic post COVID-19. This project holds a lot of value in the healthcare field, because since the beginning of the COVID-19 pandemic, healthcare clinics have faced increased inefficiencies due to an influx of patients returning to clinical care. The strain on nursing resources leads to long patient waiting times, which can lead to provider burnout and more stressful patient care. In our project, my team and I observed the clinic's nurses and providers for a period of five months at different times of the day, which helped us get a good understanding of the clinic. We focused on collecting timestamp data that signified different parts of the patient appointment process. In order to do so, we used a standardized data collection timesheet so that all of us collected accurate data.

Our purpose behind collecting observational timestamp data was to compare it with the electronic medical record (EMR) timestamp data from Epic to better understand the current patient flow at the University Physicians of Charlottesville (UPC) clinic, a primary care clinic within the UVA Health System. To propose a more efficient data-driven approach to reduce delays in this clinic, we implemented a two-phased analysis approach. The first phase involved cross-checking the EMR timestamp data with observed data to validate the consistency and reliability of the EMR timestamp data and thus allow us to confidently identify areas of improvement within the clinic, such as peak waiting periods. In the second phase, we used the validated data to analyze the distribution of delays during different appointment stages. Using a discrete event simulation, we recommend solutions that could improve the patient experience and reduce stress on medical personnel. The findings are further supported by graphical analyses of the delays in patient rooming depending on the time of day, length of the appointment, and provider. Overall, I enjoyed working on this project because it allowed me to apply data analysis in a healthcare field, while also learning about the Epic technology's functions.

For my STS project, I wanted to focus on the Epic technology used in my technical project. I was really fascinated by how each member of the clinic has access to Epic, and how it stores such large chunks of information. To give more insight, 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. Since this technology carries so much relevance in the patient's clinic experience, it is crucial that all aspects of it assist the care providers and nurses. But, there are certain processes and terminology that make Epic's accessibility hard. Thus, in my STS project, my main research question is how user-friendly is Epic in local clinics?

For this paper, I examined past research and found that a critical part of Epic is that the EMR timestamp data correlates with the dotting system which is used by nurses and doctors to indicate what stage of the appointment the patient is in. Through in-person observations by shadowing nurses, I began to gather data on the convenience of the Epic technology. I noted concerns on specific terminology being hard to understand, and glitches within the software that made it difficult to accurately record timestamps. Some other problems included evidence that a lot of patient information disappeared from records, as well as confusion on behalf of nurses and providers when interpreting what the data fields mean. In an effort to solve these issues, my recommendations focused on simplifying the medical terminology to make it more universal, clearly indicating what data is being collected by having meaningful field names, and finally, communicating changes regarding patient stages in person and through Epic's dotting system simultaneously.

Overall, the social relevance of this project gives importance to social groups such as nurses, doctors, scheduling staff, patients, and any other practitioners in the clinic. This also calls for support from social frameworks that give meaning to technical fields. The Actor Network Theory delves into the association of humans with technology specifically, and what types of social effects are generated due to relationships between the different users of Epic. Even

though Epic as a technology makes healthcare functions smoother, I would love to explore if Epic is even useful and if its use can be fulfilled by humans. I think there's a lot more to explore about Epic and I hope that my future research uncovers more about this technology.