

NATIONAL INSTITUTE OF TECHNOLOGY
RAIPUR

ASSIGNMENT 02

Evolution of Health Care

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1 Introduction

Health systems have evolved significantly with technology throughout the years, with each innovation aiming to reach a higher level of transformation, efficiency, and interoperability than the last. Nowadays, we are seeing a shift toward Real-Time Health Systems (RTHS), in which relevant data is being shared in real-time between devices, people, and workflows.

1.1 Traditional Server-Based EMR systems

New computer technology such as desktop computers to enter, and local servers to store data laid the foundation for the first Electronic Medical Records (EMR) system, developed in the early 1970s. EMR technology was one of the essential starting points for the future development of RTHS's within the healthcare industry. EMRs emerged as a solution to eliminate the errors and inefficiencies resulting from paper charting. The traditional EMR system is a digital version of a patient's charts. Patient data is stored on an internal server, containing patient medical history, diagnoses, medications, consults, orders, laboratory test results, and more. Although patient information is consolidated in a central location, there is still a delay in accessing and retrieving relevant patient information creating a new set of problems. For example, a clinician must log into the system, search for the right patient, and navigate through a myriad of screens before locating the relevant information.

An advantage to paper documents, traditional EMR systems strive to provide standardized patient records across hospitals to eliminate inconsistencies in information. The goal of an EMR is to enable faster and easier access to more accurate patient information for clinicians. However, traditional server-based EMRs lack complete and seamless interoperability with other hospital systems. The advantage of consolidated patient data exists, but traditional EMR's still fall short in the need for immediate access to patient data when it is required for clinical workflows across facilities. With this older technology, the data from disparate health systems remains disconnected, leaving little room for healthcare staff collaboration and better patient care.

Traditional EMRs have minimal cost advantages, as they provide little efficiency in clinical workflows. However, more modern evolved EMR systems are seamlessly integrated with the hospital's clinical information systems. These EMRs make some aspects of remote management and monitoring in real-time possible. With this level of integration, the potential for transcription and entry errors are reduced as more single point of data entry streamlines the input workflows, creating consistent and standardized documentation of data.

1.2 Web-Based EMR Systems

Web and browser technology emerged in the 1990s, allowing faster and easier access to information online, paving the way for online health information, and eventually to the development of web-based EMRs. There are several key differences between a web-based EMR and a traditional server-based EMR. As mentioned, traditional EMR systems store patient data on local, internal servers. Web-based EMR's are cloud-based and store data on external servers that can be accessed from any device with an internet connection that has the required security access. Web-based EMR's offer many advantages to physicians. Due to being hosted on the cloud, users are not impacted by system failures due to power outages, or hardware and software issues.

Additionally, clinicians now have broader access to patient information anywhere they go. Patient charts and other information will be readily available on their mobile devices and can be accessed in any hospital or care facility. The web-based IoT enabled models are transforming the healthcare industry by sharing data at a much more rapid pace. With these systems, reports and charts are generated automatically from all the information that the EMR collects - giving time back to healthcare providers to spend with their patients. That is the goal after all - to improve the quality of patient care.

These connected devices enable the digital collection of data, allowing clinicians a historical view of patterns in patient health. However, hospitals using an EMR connected with IoT devices still have static workflows, as there is no insight into the workflows or fluidity to change based on the context of the situation.

1.3 Digital Twins/Real-Time Health System

Fast-forward to the Smart Hospital Digital Twin - a technology that achieves a seamless interconnected real-time health system. Digital Twins have evolved rapidly over the past few years. Smart Hospital Digital Twins connect previously disparate systems to give clinicians and patients an overview of the bigger picture. Unlike other solutions, Digital Twins present a holistic approach, looking at the entire hospital environment combining data from various subsystems to provide new insights in real-time, based on the interactions between people, processes, and connected things.

Powered by IoT devices, AI/ML, and a range of other technologies, Digital Twins enable a context-rich overview of the entire hospital environment, examining data, workflows, patients, and clinicians. For example, previous workflows around transporting patients around a facility relied on systems with much less transparency. The systems lacked visibility into the state of the porters: where they were, their avail-

ability, their estimated time of arrival, etc. Through ThoughtWire's Digital Twin-enabled Portering and Housekeeping application, all staff involved in the patient transport workflow become immediately aware of who accepted the request, when the porter is expected to arrive, and if additional equipment, such as a wheelchair, is needed and available. Better yet, staff can leverage the application to pre-schedule transport requests and can even navigate the best route to assets and locations.

1.4 Conclusion

Real-Time Health Systems are continuously evolving to create better outcomes for hospitals, their staff and clinicians, and most importantly the patients. An RTHS utilizing Thoughtwire's Digital Twin unlocks true interoperability and actionable real-time contextual information, enabling a smart hospital environment. In a world that has been so heavily impacted by COVID-19, now more than ever is the right time to invest in Digital Twin technology.

As an organization that serves many industries such as healthcare, commercial real estate, and corporate real estate organizations, we empathize deeply with what our customers are going through at this moment. We're a technology organization, but for us people have always come first. If you need advice on where to start or how you can make the changes your organization needs to be prepared for the future, get in touch. Community is important now more than ever.