

# Ageing Poorly: What's in the Future for the EHR?

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**Abstract – The Electronic Health Record (EHR) has been around for over half a century. It has evolved mostly from home-grown efforts to a commercial market dominated by just a few vendors. Within the last decade, thanks to incentives, its use has increased from 4% to over 90%. From an initial use to document care and provide documentation for billing, the new opportunities for the EHR have not been adequately addressed. Clinical users are unhappy with existing EHRs. New technologies and new requirements have not been largely incorporated.**

## I. INTRODUCTION

The primary role of the Electronic Health Record (EHR) has been to document care. The focus was on the input of data into the EHR with little attention to the presentation of the data. In fact, the technical community (mainly engineers and computer scientists) watched clinicians practice medicine and duplicated what they saw on the computer. Laboratory results, for example, were presented as paged reports with a set of tests as in the paper system. Computerization did have value in that the data could be available in several different locations, problems of lost charts were resolved, and legibility was no longer a problem.

Data was largely stored in the manner in which it was collected. The focus was on the single patient. In most cases, the input was by a third party, and physicians did not have to interact with the machine. The need for collecting data from several internal groups, lab and pharmacy for example, was recognized and standards were developed to facilitate the transfer of data from one system to another. As requirements to look across patients arose, designs were changed to accommodate.

Increased clinician use of the EHR was motivated by incentives offered by the American Recovery and Reinvestment Act of 2009. Functional requirements were defined through several phases of “meaningful use”. The almost forced use of the EHR has been met largely with dissatisfaction from the clinical community. Clinicians claim a loss of productivity, difficulty of finding and accessing data, interruption of physician-patient relationship, and too little value for the effort.

Most of the dominant commercial EHR systems are built on architectural infrastructure almost 40 years old. Technology and its impact on all facets of health are not being incorporated into the commercial systems.

## II. WHAT'S CHANGING

From the initial purpose of largely documenting care, potential uses of the EHR have expanded significantly. The

concept of the patient-centric EHR requires not only integration of data internally, but also the aggregation of data from other sites at which a patient make get care. Further, the mobility of people means that a patient's data should be available anywhere in the world. EHRs need to accommodate new and different types of data – behavioral, social and economic, environmental, and genomic data. EHRs have expanded from kilobytes to petabytes or more. Decision support algorithms need to be incorporated into real time use. With every new input of data, hundreds of algorithms need to be executed to see if a patient's status has changed. Data derived from these CDS algorithms need to be stored back into the EHR. Data visualization and geographic presentation of data should be integrated into decision making. Patient reported data need to be integrated into the EHR. The use of the EHR for pragmatic clinical trials must be accommodated through enhanced quality and trust.

Digital Health and mHealth are changing where and how health care is delivered. Not only must the design of the EHR accommodate the input of data but also support the delivery of data to a varied group of users.

Big Data as the aggregation of data across regions, states, and even nations provides new opportunities to understand health and disease to new levels. Early recognition of beginning epidemics will allow a much quicker response. Use of Artificial Intelligence and Machine Learning will derive new knowledge from these aggregated (federated and centralized) data sets. Precision Medicine and Population Health depend on new knowledge.

Conversations with many clinicians suggest that the kind of clinical data in which they are interested are typically not included in today's EHR. Additional functionality exists outside the EHR with no data flows between external sources of data and the EHR.

## III. POSSIBLE SOLUTIONS

Momentum makes it difficult to accommodate change. With thousands of customers, significant changes in the functionality and content of the EHR would take a decade or more. Further, in spite of standardization, many differences must be accommodated but in a standardized way. Specialization in today's EHRs is difficult.

First, some simple problems must be solved – unique patient identifier that permits finding a patient's record anywhere. Second, adopt a common set of data elements that include metaknowledge.

To accommodate the rapid advance of technology, the EHR itself serves the purpose of data storage only. It functions only to take data in and data out. The storage strategy defines data at the finest granularity and is stored independent of the source. What is contained or not contained is instantly known. All data is contained within the EHR. All functionality is external to the EHR.

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