Chapter 16
Electronic Medical Records (EMR):
Issues and Implementation Perspectives

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ABSTRACT

For many years the electronic medical record has been the holy grail of hospital system integration. Hundreds of millions of dollars have been spent in attempts to develop effective electronic medical records (EMR) to provide clinical care for patients. The advantages of an EMR are listed as reducing error, streamlining care, and allowing multiple people to provide simultaneous care. Unfortunately, most current EMR implementations are developed without completely understanding the processes that are being automated. In some implementations, there is an effort to first outline the process, and then try to create software that will facilitate the existing process, but this effort is not typically done systematically or with the discipline of an engineer. We will discuss the areas that management systems engineers can facilitate the design and implementation of the EMR, reducing the errors in the current processes and preparing the healthcare system for further improvements.

INTRODUCTION

An electronic medical record is the data repository for clinical information regarding the diagnoses, treatment and outcomes for patients in a healthcare system. They range in complexity from a series of scanned images indexed to a patient's name to huge data tables with thousands of pieces of encounter information, each indexed and cross-referenced. The primary purposes of an EMR are to store data in an easily retrievable form, provide clinical data about a patient from other parts of the healthcare system, such as the lab or radiol-

ogy, and to assist with the management of their treatment. Additionally, a well-designed EMR can serve as a conduit for research and data extraction to measure outcomes.

As an EMR is developed, the usual method is to try to follow the path of a patient during treatment, understand what the interactions with the patient need to be, and provide a system that automates as much of the current care process as possible. This method will work well for some inflexible and narrowly focused clinical areas. This style of EMR implementation may speed up the process of care, but rarely positively affects the improvement of the care, since the old processes remain essentially in place. In other implementations, there is the recognition that current processes will no longer be required, or even desired, in the world of electronic medical records. Both of these development choices are partially correct, but have shortcomings. Although many of these implemented systems offer small areas of improvement, on the whole they end up creating problems that are not anticipated.

If one were to consider the entire healthcare delivery system in a hospital or medical system as an integrated unit, however, the crucial role of the electronic medical record can easily be understood. Correctly identifying a patient, ensuring the proper tracking of information from previous hospital visits and synchronizing records, integration of current clinical data with past clinical data, viewing of radiologic studies, reviewing results and tracking of trends are all possible with an electronic medical record that is designed correctly. In a few years, intelligent systems will be able to assist in the diagnosis and treatment of our patients, although that is still an area in its infancy.

Despite the shortcomings of the current systems for electronic medical records, this area of hospital system integration remains an extremely promising one. The entire healthcare system requires the transfer of vast amounts of information from one caregiver to the next. A simple exam for a patient may have over 100 data points, and the need to document the exams, results and clinical decision-making for patients to be paid for the work that the clinicians and hospital systems are providing becomes more important as the health care dollar becomes the target of ever-increasing scrutiny. Administrative costs for billing are huge, and can be greatly assisted by the systematic application of management engineering design principles in integrating the clinical and administrative electronic records.

I suggest that the implementation of electronic medical records, usually described as a cooperative effort between information technology (IT) departments, administrative personnel and clinicians, would benefit from the management systems engineering approach. Principles of management systems engineering are applicable to any description of the processes that occur within hospital systems and outpatient systems, with examples including project management, measurement of processes, process mapping, descriptions of variation, descriptions of handoffs, information transfer, and process control and financial modeling to support redesigns. Lean systems thinking, error reduction techniques, and andons are all tools that are ignored in EMR design and implementation. The standard work for clinical staff, a term easily understood by the management engineer is not understood by the IT staff, resulting in even more confusion as the IT department tries to fit their systems into the clinical environment. Process mapping, basic to the average management systems engineer, is inconsistently used in the design of software for clinical and healthcare applications. Even the layout of computer equipment is done without flow mapping or an understanding of the labor involved in making the system function in the clinical environment. This inability to understand the role of IT in the system of care in the hospital results in error and waste, but is largely unquantified. Only recently

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