Chapter 1.3
The Effectiveness of Health Informatics

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ABSTRACT

Health care is complex and there are few sectors that can compare to it in complexity and in the need for almost instantaneous information management and access to knowledge resources during clinical decision-making. There is substantial evidence available of the actual, and potential, benefits of e-health tools that use computerized clinical decision support systems (CDSS) as a means for improving health care delivery. CDSS and associated technologies will not only lead to an improvement in health care but will also change the nature of what we call electronic health records (EHR) The technologies that "define" the EHR will change the nature of how we deliver care in the future. Significant challenges relating to the evaluation of these health information management systems relate to demonstrating their ongoing cost-benefit, cost-effectiveness, and effects on the quality of care and patient outcomes. However, health information technology is still mainly about the effectiveness of processes and process outcomes, and the technology is still not mature, which may

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lead to unintended consequences, but it remains promising and unavoidable in the long run.

INTRODUCTION

The Institute of Medicine (IOM) report, *To Err is Human: Building a Safer Health System* provides a landmark review of the functionality of modern health care delivery in the information and technology revolutions (Kohn, Corrigan & Donaldson, 2000). It concludes that health care is error-prone and costly, as a result of factors that include persistent major errors and delays in diagnosis and diagnostic accuracy, under/over-use of resources (e.g. excessive ordering or unnecessary laboratory tests), or inappropriate use of resources (e.g. use of outmoded tests or therapies) (Kohn, Corrigan & Donaldson, 2000). Health care is complex and there are few sectors that can compare to it in complexity as well as in the need for almost instantaneous information management and access to knowledge resources during clinical decision-making. An example of a comparable system of complex decision-making can be seen in air travel and is highlighted in the report on the factors contributing to the Tenerife air disaster on Sunday 17th, 1977. In the final summary on this disaster, Weick (1990) makes the following comments that could also be used to describe health care decision-making:

The Tenerife air disaster, in which a KLM 747 and a PanAm 747 collided with a loss of 583 lives, is examined as a prototype of system vulnerability to crisis. It is concluded that the combination of interruption of important routines among interdependent systems, interdependencies that become tighter, a loss of cognitive efficiency due to autonomic arousal, and a loss of communication accuracy due to increased hierarchical distortion, created a configuration that encouraged the occurrence and rapid diffusion of multiple small errors (Weick, 1990, pp. 593).

This major air disaster led to significant changes in air travel and reforms in the regulatory framework that have resulted in a higher level of safety and quality in this industry.

If we compare the changes that occurred in aviation to improvements in health care delivery following the *To Err Is Human* report (Kohn, Corrigan & Donaldson, 2000), which focused on documenting deaths due to medical errors in the U.S. health care system, then the changes have not been as significant. A number of studies have found evidence of a lack of improvement in health care delivery in the U.S. despite major public and private investments in technology. In 2005, Leape and Berwick (2005) reviewed the U.S. health delivery system five years after the IOM report was released. They found significant deficiencies and faults in nearly all aspects of health care delivery. For example, in patient diagnoses there remained significant errors in accuracy and delays. In attempts to evaluate a given diagnosis there were failures to employ appropriate tests (underuse), the continued use of outmoded tests or therapies (inappropriate use), and the failure to act on the results of tests or monitoring (ignoring medical alerts and reminders). In treatment protocols they reported significant errors in operations, surgical procedures, and tests. They also found evidence in the administration of medication, the continued administration of the wrong drugs, doses, and medications given to patients with a known allergy to the drug (also in Evans et al., 1998). Bates et al.(1994; 1997) and Rothschild et al., (2002) found the persistence of a high incidence of adverse drug events (ADE) and their associated costs during care delivery, and demonstrated a close relationship between the incidence of preventable ADE, costs and medical malpractice claims. Preventive care is also considered to be a significant area of health care where costs savings and better health outcomes can be delivered. Fries (1994) has estimated that healthcare cost savings of up to 70% can be achieved through the implementation of more effective preventive care measures. Other