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## Introduction

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James H. Bigelow, Ph.D.

A *patient trajectory* is the sequence of events that involves the patient with the healthcare system. As part of a larger study, “Using Information Technology to Create a New Future in Healthcare: The RAND Health Information Technology (HIT) Project,” we examined selected interventions in the healthcare system that affect patient trajectories and that should be facilitated by HIT.<sup>1</sup> We have identified four classes of trajectory-changing interventions and we have selected some important interventions in each class:

- Implement Computerized Physician Order Entry (CPOE) as a means to reduce adverse drug events (ADEs).
- Increase the provision of the following preventive services: influenza and pneumococcal vaccinations and screening for breast, cervical, and colorectal cancer.
- Enroll people with one of four chronic illnesses—asthma, chronic obstructive pulmonary disease (COPD), congestive heart failure (CHF), or diabetes—in disease management programs.
- Persuade people to adopt healthy lifestyles and estimate the health outcomes if everyone did so: controlled their weight, stopped smoking, ate a healthy diet, exercised, and controlled their blood pressure and cholesterol as necessary with medications.

We estimated the effects of each intervention on healthcare utilization (e.g., hospital stays, office visits, prescription drug use), healthcare expenditures, and population health outcomes (workdays or schooldays missed, days spent sick in bed, mortality). These interventions generally affect trajectories by improving health and thereby reducing healthcare utilization, or by reducing a costly form of utilization

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<sup>1</sup> Not all interventions affect patient trajectories. For example, an intervention might replace manual transcription of physician notes by computerized voice recognition. This intervention and many others that do not affect patient trajectories are discussed in Girosi, Meili, and Scoville (2005).

(e.g., inpatient stays) and increasing a more economical form (e.g., office visits to physicians, or prescription medications). For example,

- ADE avoidance among inpatients reduces lengths of stays in the hospital. In an ambulatory setting, ADE avoidance may eliminate some hospital admissions and some office visits to physicians.
- Vaccinations prevent some cases of influenza (flu vaccination) and pneumonia (pneumococcal vaccination). Some people, especially the elderly, are hospitalized with these diseases.
- Disease management is intended to reduce exacerbations of a chronic condition (asthma, congestive heart failure) that can put the patient in the hospital.
- Lifestyle changes can reduce the incidences (and ultimately the prevalences) of a number of conditions that consume substantial amounts of healthcare.

In general, HIT is known to facilitate these interventions in three ways. First, HIT can help identify the consumers eligible for the intervention. The provider of a disease management program, for example, can identify patients with the target disease by scanning an electronic database of medical records (if a physician operates the program) or claims data (if a payer operates the program). Second, HIT can help consumers and providers adhere to “improved care” guidelines—for example, by reminding providers and patients when particular services are due. Finally, HIT makes it easier to record and analyze the performance of an intervention, so that the intervention can be improved over time. For example, one can use data collected on today’s medical practices to develop still-better care guidelines.

The study has found, however, that there is not a straight line from installing information technology to reaping a benefit—not in healthcare (Scoville et al., 2005), and not in other sectors of the economy (Bower, 2005). Information technology is an *enabler*: It makes possible new ways of working and new processes (Hammer and Champy, 1993). But people do not inevitably adopt new ways of working just because they have a new information technology application. In this monograph, therefore, we have defined our interventions in terms of changes in the way the healthcare system behaves, and we have estimated the benefits of those changes in behavior. And as mentioned, we have discussed what roles HIT can play to facilitate these changes. But we know that implementing the “right” kind of HIT will not guarantee that the healthcare system will change in the ways we have postulated. Therefore, the reader should view our results as estimates of what *could* be, and not predictions of what *will* be.

## Organization of This Monograph

We used a common set of large, publicly available healthcare data files to estimate effects of the interventions listed earlier. Our primary source was the Medical Expenditure Panel Survey (MEPS),<sup>2</sup> one of a series of national probability surveys conducted by the Agency for Healthcare Research and Quality (AHRQ) on the financing and utilization of medical care in the United States. Chapter Two describes how we created a database of patient trajectories from several years of the MEPS, a survey of the civilian, noninstitutionalized population by households. For each member in each household surveyed, it describes utilization, expenditures, and health status.

In Chapter Three, we compare the MEPS with other sources of data on utilization and expenditures. There are data sources that examine utilization alone, or expenditures alone, or population health status alone; the MEPS is the only publicly available source of data that puts them all together. However, the other data sources are often considered more accurate within their specialized domains. Thus, we devised adjustments to align our MEPS-based estimates with them. As well, we devised adjustments that project our estimates of the effects our interventions would have in the healthcare system of the year 2000 into the context of a future healthcare system. It is, however, a healthcare system that has only changed in ways foreshadowed by present trends. Chapter Three also explores how the healthcare system might change, if not by following present trends.

Next, we describe how we used information from the research literature to modify the trajectory database and produce estimates of the potential effects of the interventions listed above. Chapter Four discusses implementation of Computerized Physician Order Entry (CPOE) as a means of reducing adverse drug events in both hospital and ambulatory environments. In Chapter Five, we estimate the effects of influenza and pneumococcal vaccination, and of screening for breast cancer, cervical cancer, and colorectal cancer. Reminders provided by Electronic Health Record Systems have been shown to increase the likelihood that patients receive these services. Chapter Six estimates the costs and benefits of enrolling people with chronic illnesses in disease management programs. Effective disease management requires that the provider maintain a patient registry, and that enrolled patients have the means to receive advice and support from the provider, and to send current symptoms and questions to the provider, all in real-time. These functions are best performed by information technology.

Chapter Seven estimates the potential benefits of a program of lifestyle change in which everybody controlled their weight, stopped smoking, ate a healthy diet, exercised, and controlled their blood pressure and cholesterol as necessary with medications. In the long run, the population would be much healthier and it would use sub-

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<sup>2</sup> Files and documentation for each year are available at <http://www.meps.ahrq.gov>.

stantially less healthcare. But for these outcomes to happen, consumers must come to see themselves as their own front-line caregivers. They need the information, the skills, and the confidence to keep themselves healthy to the degree they can, and to seek help when events slip out of their control. By itself, information technology will not bring about this transformation. But the transformation cannot happen without information technology.

Chapter Eight discusses what may be the most profound aspect of the HIT-mediated transformation of healthcare: requiring more of the patient or consumer (a person does not have to be sick to receive healthcare). Through disease management and lifestyle changes, healthcare ceases to be a commodity that healthcare providers deliver to passively accepting patients. Instead, it becomes an activity in which consumers and providers engage jointly and cooperatively.

In Chapters Four through Seven, we estimated potential benefits of our interventions. Chapter Nine compares the interventions in terms of their potential benefits, and the difficulty and likelihood of achieving the potential benefits in practice.