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Extrapolating Evidence of HEALTH Information Technology Savings and Costs

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Sponsored by Cerner Corporation, General Electric, Hewlett-Packard, Johnson & Johnson, and Xerox

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Summary

Health Information Technology[1] (HIT) is receiving a great deal of attention, and many would like to see it play an expanded role in providing care. The result of our effort to gain a better understanding of the potential of HIT to transform the provision of healthcare is documented in Hillestad et al. (2005), and the policy implications of that work are reported in Taylor et al. (2005). In this monograph, we expand on some of the quantitative aspects of the Hillestad et al. and Taylor et al. research, providing detailed supporting material on the following four related aspects of that research:

- **Extrapolation of savings to the national level and projection of savings into the future (Chapter Two):** The research in Hillestad et al. (2005) focuses on the benefits and costs that would accrue to and be sustained by the nation as a whole as a result of widespread adoption of HIT. Our first step is to provide a methodological framework to scale empirical evidence on the effect of HIT at the national level and to project it into the future. A key element of this framework is a projection for the rates of adoption of HIT in the inpatient setting and in the ambulatory/outpatient setting. This component is developed using models of HIT adoption and analysis of historical data found in Bower (2005) and Fonkych and Taylor (2005), and in work developed by Hillestad, Taylor, and others as part of the same project. Projections of HIT adoption can then be combined with data on specific effects of HIT at the provider level and on national expenditures to provide projections of future national savings in certain health sectors. An important lesson that emerges from this chapter is that realistic estimates of savings must take into account the relatively slow diffusion of HIT: Although large savings may accrue once adoption is almost complete, the

[1] We use Health Information Technology (HIT) and Electronic Medical Record System (EMR-S) interchangeably in this report. An EMR-S, as we use it here, includes the Electronic Medical Record (EMR), containing current and historical patient information; Clinical Decision Support (CDS), which provides reminders and best-practice guidance for treatment; and a Central Data Repository, which stores the EMR information. It also includes information technology–enabled functions such as Computerized Physician Order Entry (CPOE), which facilitates orders tied to patient-information and -treatment pathways.

average yearly savings accruing between now and that time are smaller, usually 50 percent smaller.

Clearly, the methodology developed in this chapter is useless without a set of empirical findings. Therefore, we also document in this chapter the extensive literature search we performed, seeking evidence on the effects of HIT at the provider level. An important conclusion from this section is that much of the available evidence is incomplete and cannot be scaled to the national level because key measures are lacking: Out of more than 1,400 screened articles, we were able to extract only 42 findings that could be used as input to our model of national savings.

- **Benefits of HIT (Chapter Three)**: The benefits we focus on in this document are efficiency savings that are enabled by HIT, whereas the HIT-related benefits discussed in Bigelow et al. (2005b) are in health improvement. In this context, *efficiency savings* are what results from the ability to perform the same task with fewer resources (money, time, personnel, etc.). From the evidence found in the literature search, we consider savings from 10 different sources: five for the inpatient sector (such as savings coming from reduction in length of stay or increases in nurse productivity) and five for the outpatient/ambulatory sector (such as reduction in transcription costs or drug expenditures). For each of these sources, we detail the nature of the data and the extrapolation procedure and report the *potential savings*—that is, the savings that would accrue if the HIT adoption rate were to jump to 100 percent overnight—as well as the mean yearly savings over the next 15 years. When we sum the savings over the 10 sources, we find a potential savings of about $80 billion, with a mean yearly savings of about $40 billion. Three-fourths of the savings are found in the inpatient sector, coming mostly from reductions in length of stay and increases in nurses' productivity. While these numbers are fairly large when compared with the cost of HIT adoption, documented in Chapter Four, we note that most of the effects of HIT are not very large: Typical reductions in expenditures are 10 to 15 percent, showing that the reason for the large savings lies in the large national expenditures, rather than in large HIT effects.
- **Costs of HIT (Chapter Four)**: The efficiency savings documented in Chapter Three need to be compared with the costs the nation has to incur in order to be able to realize those savings. We estimated these costs using a modeling framework analogous to the one developed for the extrapolation of savings. Our cost data were gathered through the literature or given to us by providers. For the inpatient sector, the data suggest that, in order to acquire an EMR-S, a hospital might spend between 1.8 and 3 percent of its yearly operating expenditures for an average period of four years. This puts the projected cumulative national expenditures on inpatient EMR-S between now and 15 years from now at $97.4 billion, with a mean yearly cost of $6.5 billion. By comparison, costs in the

outpatient/ambulatory sector are much lower, by a factor of almost one-sixth. The average cost per physician of an ambulatory EMR-S estimated from our data is about $22,000, which implies a cumulative cost over the next 15 years of $17.2 billion and a mean yearly cost of $1.1 billion.

- **Incentives for Adoption of HIT (Chapter Five)**: Even a cursory look at benefits and costs shows that the savings enabled by widespread HIT adoption are significantly larger than the expenditures on EMR-S that would have to be incurred in order for those savings to materialize. If we aggregate over all healthcare sectors, we project mean annual savings of almost $42 billion, while mean annual costs are about $7.6 billion. Obviously, these numbers would be larger if the adoption of HIT happened at a faster rate than is projected. Therefore, we studied what might be the effect of those financial incentives presented to providers that lower the cost of EMR-S and quicken the pace of HIT adoption. In particular, we considered per-encounter payments to physicians who adopt an EMR-S and percentage subsidies to hospitals. The estimation of costs and benefits of such incentives is particularly difficult, because it requires knowledge of how sensitive providers are to the price of EMR-S, something that has never been measured. Despite this uncertainty, relying on sensitivity analysis we conclude that, even under pessimistic assumptions, programs aimed at incentivizing HIT adoption can deliver benefits that outweigh costs. A general result that does not depend on the size of the behavioral response of physicians is that incentive programs are more likely to be cost-effective if they start early and do not last long, but are sizable. This result is intuitive and depends on the "contagious" nature of technology adoption: The number of new adopters is proportional to the number of current adopters. Therefore, a spike in adoption in one year has long-lasting effects, which propagate well into the future. This implies that, even if an incentive program lasts only one year, if it is sizable enough to produce a spike in adoption, it will lead to benefits that will accumulate over many years to follow, while the cost is incurred in one year only.

The chapters outlined above are followed by a summary chapter. Readers who are interested in the policy issues related to HIT adoption and/or who want to put this document in a more general perspective are encouraged to read Hillestad et al. (2005) and Taylor et al. (2005).

Throughout this document, we refer to a number of Excel spreadsheets that contain additional information and may allow the user to interact with some of our models. The spreadsheets are part of the online version of the monograph at http://www.rand.org/publications/MG/MG410 and are cited by their file names.