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Health Informatics in the Cloud

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*To Rowena, my wife and the
“real physician” in the family.
She has always kept me grounded
in the realities of medical practice
and the healthcare system and well
stocked with her world class
baked goods.*

Preface

This book is intended to help students and other interested readers gain basic proficiency in health¹ informatics, the application of computing to healthcare delivery, public health and community-based clinical research. This is distinct from the related field of bioinformatics, which explores the role of computing in understanding the genomic and proteomic processes within cells. I only mention this because the two are often confused.

The book is written for the non-technical reader and follows the approach I use in my Introduction to Health Informatics course at Georgia Tech. Chapters 1 and 2 discuss the US healthcare delivery system's unique structural, economic and policy issues. Chapter 3, the most technically intense, explains at a high level the core technologies involved in contemporary health informatics. Chapters 4-7 look at how these technologies are actually being deployed using some of what I consider the best commercial products as examples. Chapter 8 is my own personal speculation about the future of the field. I provide a glossary of some of the most common terms and acronyms you will encounter in the book and elsewhere should you further explore the field. I also provide some suggested reading resources at the end.

There are existing texts (*Medical Informatics* by Shortliffe, Perreault, Wiederhold, and Fagan; and *Guide to Health Informatics* by Coiera) that cover the field from a technical approach more appropriate for the informatics professional. Where possible, based on my far from perfect knowledge, I have acknowledged some of the early visionaries of the field to give the reader historical perspective. I apologize for any omissions I may have made in this regard.

You may be wondering what computing has to do with improving healthcare delivery. For the answer we'll go to the organization that, more than any other, has focused serious attention on our healthcare delivery system's problems and the role computing can help play to solve them.

¹I generally use the term "health" to include both the healthcare delivery system ("healthcare") and other activities (e.g. by the patient, public health) to maintain wellness and prevent disease.

Established in 1970, the Institute of Medicine (IOM) is an independent, nonprofit organization that works outside of government to provide unbiased and authoritative advice to decision makers and the public. It is the health arm of the National Academy of Sciences, chartered under Abraham Lincoln in 1863. Starting in 2001, with the IOM's pronouncement that our health "system"² is neither safe, effective or efficient [1] there has been increasing recognition that information technology could and, indeed, must play the same transformative role in healthcare that it has in other industries.

In 2004 President George W. Bush pronounced a national goal of universal adoption of electronic health records and health information exchanges by 2014. How could health informatics rise to a level of importance that merits being called a national priority in the most highly visible presidential address of the year? What does it have to do with solving the problems the IOM identified? These are some of the questions we'll explore.

In 2009 President Obama used the American Recovery and Reconstruction Act (ARRA, the "Stimulus") to set aside up to \$39 billion to fund adoption of electronic health records and to create health information exchanges along with a number of related programs to spur adoption and to pave the way for further development of the field. I feel it is also spawning a new wave of innovative entrepreneurial activity, most of it based in the cloud, the inspiration for the title of this book. Cloud computing has the goal of making computer resources available as they are needed somewhat like other utilities we all rely on such as electricity and water. When combined with the increasing utilization of wireless and mobile technologies it offers a truly transformative platform for healthcare delivery.

The massive ARRA funding seems to be leading to the eventual achievement of Bush's goal, although adoption will surely not be universal until a number of years after 2014. [2] However, there seems to be growing momentum. In June, 2012 the Department of Health and Human Services (HHS) said that more than 110,000 eligible professionals (around 20%) and 2,400 hospitals (nearly 50%) had received Meaningful Use incentive payments surpassing HHS' goal of 100,000 providers by the end of 2012. In July, 2012 the CDC's National Center for Health Statistics' (NCHS) 2011 survey of physician adoption [3] showed that 55% of physicians had adopted an EHR and around 75% of these said their EHR system was capable of achieving Meaningful Use. Even more positively, 85% of the adopters reported being somewhat (47%) or very (38%) satisfied with their system and 75% said that it had improved patient care.

There may be other forces for adoption. In Massachusetts by 2015, physicians must demonstrate proficiency in "computerized physician order entry, e-prescribing, electronic health records and other forms of health information technology" to maintain their licensure. [4] Medicare and the largest private health insurers are

² Hereafter, I won't put the word system in quotes when it refers to healthcare delivery in the US. I do so here to make a point – one of the central problems is that healthcare delivery in our country isn't delivered via a system if you accept most standard definitions of that term. Indeed it is a "complex adaptive system" as described by my colleague, Dr. Bill Rouse.

implementing new care models that virtually demand adoption for successful implementation.

Given these substantial changes in the nature of computing and in healthcare delivery I believe now is a particularly auspicious time for this book.

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