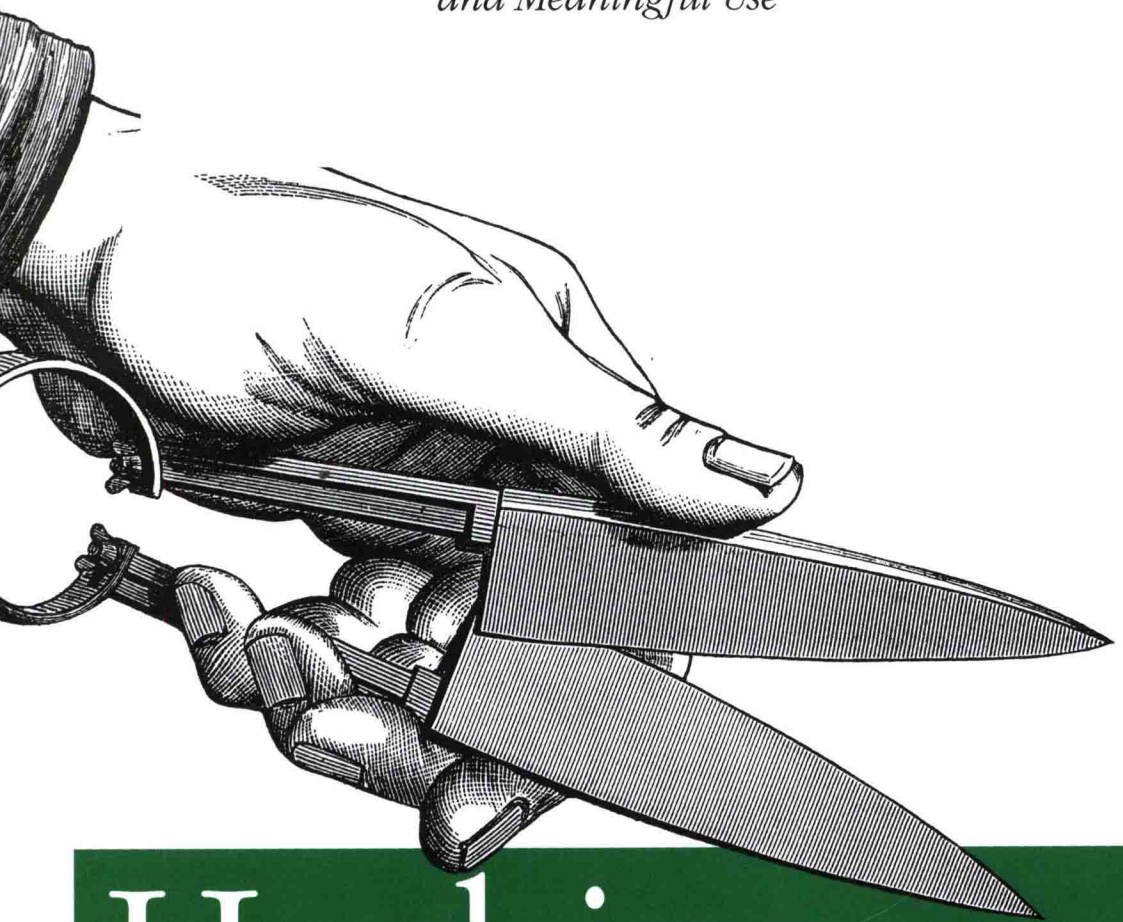
A Guide to Standards, Workflows, and Meaningful Use



Hacking Healthcare

Fred Trotter & David Uhlman

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Preface

Thousands of computer experts seek to enter the field of healthcare information technology (health IT or HIT), and they are needed. In December 2009, the U.S. Department of Health and Human Services estimated that computerization just within the healthcare industry will add a need for 50,000 new IT staff.[1] These recruits to healthcare will bring valuable lessons learned through work in online commerce sites, financial institutions, or large corporate and university campuses, but they will be fundamentally bewildered during their first year or so at a hospital or clinic.

Meaningful use is the focus of this book because it is the term used in the Health Care Reform and Health IT Stimulus Act (HITECH, part of the American Recovery and Reinvestment Act of 2009) to encompass a vision of improved healthcare through computerization and digital networks. There's a great deal of nervousness among U.S. healthcare providers about meaningful use. Can they push their organizations into the twenty-first century vision it represents? Will their IT systems really support it, and even if certified for meaningful use this year, will the systems support it in the future? And even if hospitals and clinics adhere to the letter of the law, will they really reap the benefits promised by health IT?

So meaningful use, for us, stands for much more than a set of requirements in a particular set of U.S. regulations. It represents a form of care that empowers the patient, that does not harm her, that promotes long-term health, and that is affordable for everyone. To realize this vision, IT staff in hospitals and clinics have to understand how their particular institutions work and what roles they play.

This book, so far as we know, is the first candid attempt to bridge the gap between clinicians and IT staff. It explains the factors that make healthcare settings different from other jobs and academic settings that computer staff may have come from—and that make the healthcare settings different from each other—so that readers enter these settings with a deep respect for their practices. We will not be reticent about sources

1. Help Wanted: Skilled Health IT Workforce to Modernize Health Care A Message from Dr. David Blumenthal, National Coordinator for Health Information Technology (*http://healthit.hhs.gov/portal/server.pt/community/healthit_hhs_gov__university_training__facts_at_a_glance/1430*), December 24, 2009.

of resistance to new computing opportunities. But we will give you a starting language for discussing the path to and beyond meaningful use.

We don't delve too deeply into technical details here, because they are fast changing. If we explained how to set up S/MIME for a direct email gateway, you might find that better options already exist when you get into the workplace. If we explained how to interact with the fields of a CCD, you would probably find that these fields are undergoing constant change and that much of the data you deal with requires a different format. So this is a different type of technical book: a book that gives you a context for choosing and implementing the right technology for your organization.

Audience

We've directed our writing mostly at computer professionals, but this book can still be valuable for doctors, other clinicians, and other staff at healthcare institutions as well. We occasionally use terms from computer science and programming that will be familiar to people from those fields and might not be known to other readers. But we think that even the general reader can skip over technical details that he or she doesn't understand, and learn a lot about how to talk to other people about computers and networking in healthcare.

Organization

The chapters in this book are as follows.

Chapter 1, Introduction
: An overview of the topics of this book, a discussion of differences between medical settings, and an overview of meaningful use, which will be fleshed out later in the book

Chapter 2, An Anatomy of Medical Practice
: The wide variety of ways healthcare settings deal with patients and staff, and how workflows vary

Chapter 3, Medical Billing
: A candid investigation into how providers charge for care and how they get paid

Chapter 4, The Bandwidth of Paper
: An explanation of how deeply embedded paper records are in U.S. clinical settings, and what you need to do to migrate to electronic records

Chapter 5, Herding Cats: Healthcare Management and Business Office Operations
: A review of what happens just outside the doors of the treatment room where administrative and IT staff perform traditional business operations

Chapter 6, Patient-Facing Software
: A detailed look at how patients can use technology to become participants in their own care, including such notions as personal health records, online communities, and the quantified self

Chapter 7, Human Error
: A discussion of the most pressing problem in healthcare: avoidable errors, and how electronic records can both help and exacerbate the problems

Chapter 8, Meaningful Use Overview
: A concise breakdown of the requirements for becoming meaningful use compliant

Chapter 9, A Selective History of EHR Technology
: It is not possible to cover every important event in the history of a technology, but this discusses some of the highlights.

Chapter 10, Ontologies
: Vocabularies, jargon, classification systems for diseases and treatments, and other elements of making sense of information

Chapter 11, Interoperability
: A review of the technologies to exchange electronic healthcare records and the processes and systems that enable the process

Chapter 12, HIPAA: The Far-Reaching Healthcare Regulation
: When is health data covered under HIPAA, and what does that mean for your technology deployments?

Chapter 13, Open Source Systems
: Several comprehensive and fully featured systems exist to permit meaningful use compliance while using only open source software; these offerings provide an important reference and public resource for understanding meaningful use in technological terms or for real-world use

Appendix, Meaningful Use Implementation Assessment
: A checklist to help you determine how close your institution is to becoming meaningful use compliant

Conventions Used in This Book

The following typographical conventions are used in this book:

Italic
: Indicates new terms and emphasis.

This icon indicates a warning or caution.

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Table of Contents

CHAPTER 1
Introduction

Advances in the delivery of healthcare have allowed Americans to live longer, healthier lives than ever before, but costs are out of control and medical errors are dangerously common. Such is the universal assessment of healthcare in the United States and it is widely acknowledged that healthcare information technology (health IT or HIT) can help. What's largely missing from the literature in the healthcare field is precise and actionable advice to IT staff and the clinicians who work with them to make the health IT transformation a reality. This book was written to start filling the void.

About the same number of people die each year from medical errors as from automobile accidents. Heart disease and cancer kill the most people in the United States, more than 500,000 each year. But stroke and lung diseases are each responsible for about 100,000 deaths each year—and scandalously, so are medical errors. Medical errors are notoriously difficult to track, given our litigious society, so we really do not know how many deaths that statisticians attribute to cancer or heart disease were also related to medical errors. But given the high likelihood that errors are implicated in some of these deaths, it is possible that medical errors could be the third leading cause of death in the United States.

In 2000, the release of a report titled "To Err is Human" by The National Academies (the country's leading research institute in medicine) highlighted the astonishing rate of medical errors. It was a wake-up call to the healthcare industry, but the problem is still little known among the public, and in the absence of organizational change and technical adoption, little has been done to fix the problem.

Cost now dominates the news about healthcare. Some estimates put healthcare in the United States at one sixth of the total national economy. Healthcare insurance costs that go up sometimes 15% or 20% a year are threatening to bankrupt many local governments and forcing them to cut back services in a poor economy. Other wealthy nations spend much less on healthcare, but still have similar or better levels of healthcare quality.

HIT, or more colloquially "software for clinicians," promises to address these two fundamental problems: to lower healthcare costs and improve patient safety.

The Veterans Affairs (VA) hospitals in the United States offer the most substantial example of systemic improvements in quality using health IT. Since the 1970s, the VA has gone from a system with a reputation as a low-quality provider to a system widely regarded as the safest and most effective healthcare delivery system in the world. VA hospitals almost obsessively measure the quality of the healthcare they deliver, and they have the numbers to back up the assertion that they are tops. The quality of the VA system, and its focus on health IT to deliver quality, is documented in the book *The Best Care Anywhere* by Phillip Longman. Rather than quote all of the quality statistics in that and many other books, we will relate two simple cases that show the power of leveraged health IT systems at the VA.

In 2004, the drug company Merck voluntarily withdrew Vioxx from the market. Vioxx had been used to treat chronic pain, but it had become clear, over time, that Vioxx had a dangerous side effect: fatal heart attacks. Evidence also emerged that by 2000, Merck had evidence that Vioxx was dangerous. The fact that Vioxx was approved by the Food and Drug Administration (FDA), and that it was used so long after it was known to be dangerous, has been the subject of intense scrutiny.[1]

But years before the healthcare profession as a whole was aware of the dangers of Vioxx, the VA discovered on its own that it was a dangerous medication. Data from the VA's electronic healthcare record, VistA, had alerted the VA that something was amiss with Vioxx. The VA took steps to ensure that Vioxx was prescribed only with careful monitoring and only in special circumstances, a drug of last resort. By doing so, the VA saved thousands of lives.

The second case is the level of integration experienced by VA hospitals. If a veteran receives treatment in one VA hospital for a decade and then moves to another hospital, even another state, he can expect a decade's worth of VA records to be available at the new hospital on his first visit. The VA has achieved near-complete health data liquidity for its covered veterans. In comparison, most other healthcare systems typically still use fax machines to exchange health information.

This is the stage that has been set for health IT. Medical errors are too common, costs are out of control, and effective deployment of computerized records and workflow can dramatically reduce these errors and lower costs. This book will discuss preventable medical errors in detail, and show how many different health IT functions, from health data exchange to different types of reporting, can help to address healthcare quality and reduce medical errors.

1. Vioxx, the implosion of Merck, and aftershocks at the FDA (*http://www.thelancet.com/journals/lancet/article/PIIS0140-6736%2804%2917523-5/fulltext*)

Health IT and Medical Science

Most of those who are deeply involved in healthcare IT have chosen this field as a mission or vocation, rather than merely a career. Many health IT professionals have historically taken substantial pay cuts compared with IT professionals in other areas (although this is improving now). Many of us work in this industry because we lost a loved one to a simple medical error, or some other failure of the healthcare delivery system. For many of us, this is our life's passion. To us, "reducing the costs and improving the quality of healthcare" is a dry and frail description of our ambition for health IT. To paraphrase Steve Jobs, we want to make a dent in the human condition.

Before we can talk about what that next stage will be like, we should acknowledge that it will not be anything like past medical advances. Pasteur's microorganism model of disease, Darwin's theory of evolution, Florence Nightingale's redefinition of nursing, Roentgen's X-ray, or perhaps even the discovery of DNA by Watson and Crick are examples of game-changing insights. These are classic examples of massive improvements in healthcare delivery that come from a new fundamental insight. The improvements to healthcare that happen because of computerization will not be a revolution, but an evolution.

Fundamental to the ambitions in the health IT community is a humble acknowledgment that these huge game-changing insights are rare. We can expect fewer and fewer of them as the science of medicine progresses. Instead, medicine must now begin the difficult work of chronicling the immense complexity of a single cell's DNA, proteins and other structures, and how that cell cooperates with other cells in the human organism. We can no longer expect that individual insights will leap medical science forward, but instead the medical community will make hundreds of thousands of small incremental advances on tens of thousands of diseases.

If we hope to continue the rate of improvement in healthcare we must find a way to coordinate the contributions of countless clinicians, researchers, and patients. To make any sense out of the genotype, we must have a understanding of phenotype —the manifest characteristics of individuals, such as their age, weight, medical symptoms, mental status, and many other measurable traits —than is several orders of magnitude deeper than it is today. We must be able to gather and parse a hundred times more data about each patient than we do today, and we must be able to compare that rich data among millions of patients. Today, the sciences and the software that support clinical trials, genomics, and standard clinical operations are separate and distinct, with infrequent overlap. Tomorrow, these disciplines will merge into a single enormous effort to improve healthcare. Science on this scale is impossible without mass high-quality computerization. There is no reason why all of this cannot be accomplished while respecting patient privacy and other basic notions of human dignity.

We hope to use technology to improve every aspect of healthcare. We hope to create information systems that help to turn medicine into a higher art and a higher science.

As you can imagine, with such ambitions, the health IT community frequently has delusions of grandeur. But we also suffer from frequent and stifling disillusionment. Although most of us agree that health IT has tremendous potential, progress in the field has been far too slow. We have a few good examples, like the VA with VistA, demonstrating that massive improvements to healthcare delivery are possible by leveraging technology. But we must admit that although we have a few good examples, we have countless examples of failure.

The authors of this book believe both that health IT has tremendous potential and that health IT is surprisingly difficult. As we discuss its difficulties, and the methods that have been used to successfully overcome them, we hope to avoid the pessimism that is all too common in health IT. Having said that, when pessimism and discouraging voices abound, it is often for good reason. There are real pitfalls in health IT, and this book should show you how to avoid many of them.

Meaningful Use and What It Means to Be an EHR

Health IT has changed tremendously over the last few years. The biggest change in the United States has come from the simple phrase "meaningful use." The term is now solidly entrenched as the catchphrase for health IT in the United States. Most important, meaningful use represents reasonable first steps toward the long-term potential for health IT. For better or worse, the dreams and ambitions of the healthcare informatics industry are tied to the concept.

The phrase first appeared in the Health Information Technology for Economic and Clinical Health (HITECH) portion of the American Recovery and Reinvestment Act of 2009 (ARRA). ARRA defined that a substantial portion ($20 billion) of the money set aside by Congress to stimulate the United States economy after the financial and foreclosure crisis would go to doctors and hospitals who "meaningfully use" clinical software. The HITECH act was the first step in President Barack Obama's comprehensive plan for healthcare reform. Clinicians would receive the stimulus money to pay for software to improve the delivery of patient care.

The bill referred to that software by the currently popular term *electronic health record* (EHR) software. But software designed to improve the delivery of clinical care has been around for decades, under different names. Such software has been called computerized patient records (CPR), electronic medical records (EMR), electronic health records (EHR), and countless other similar names with corresponding abbreviations. Even more confusing, there was no set definition of what this class of software was supposed to achieve. Unlike software products such as word processors, spreadsheets, or database storage engines, which all have well-understood definitions, the software category of EHR has meant very different things to different people. Passionate users would assume that EHR software meant the features that they wanted. Developers assumed that EHR meant the set of features in the software that they had developed. Of course, different users and different developers rarely agreed on which features were

the most important. Dr. Ignacio Valdes (a medical doctor possessing a master's degree in computer science with a stellar reputation in the health IT community) has frequently said, "For decades, doctors had no idea what they wanted, and software developers have given it to them."

For clinicians, these terms served as a source of confusion and frustration. It was totally unclear what different names implied about the functionality of the software. Even a few years ago, when a doctor would say "I want an EHR!", the right response from a health IT software vendor would have been "Fine, exactly what do you mean by EHR?"

The meaningful use EHR certification requirements have finally dictated exactly what EHR software needs to do for the doctors, hospitals, and other eligible providers who purchase, use, and deploy the software to receive payments from the ARRA-HITECH stimulus plan. In fact this has made the meaningful use requirements even more important than the term EHR. What is an EHR? That which can be used by a clinician to achieve meaningful use.

Why So Late?

IT experts, as well as the general public, often fail to ask one simple question that will help focus any discussion of healthcare informatics: *Why did the United States healthcare industry need to be paid to computerize?* Every other industry computerized when, and to the degree that, computerization held intrinsic competitive advantages for members of that industry. Market forces compelled computerization, and companies that refused or resisted the move to computerization were squeezed out by competitors who were leaner and faster as the result of automated processes.

This has not happened in healthcare. Why not? It seems like such a simple and obvious step! Almost all hospitals and clinics already have some computers. They use them to type letters and send emails, to research on the web and coordinate schedules. They also automate some clinical tasks, most notably medical imaging, which is almost entirely computer-based. But, with few and notable exceptions, clinicians have not computerized the most central information resource they possess, the patient chart. The patient chart remains a paper record, usually a set of papers wrapped in a simple manila envelope.

For most information professionals (or clinical professionals with good information instincts), the use of computers to achieve standardization in data and work processes is a mantra. It is almost beyond question that computerized automation of processes and record-keeping would dramatically improve the performance of any industry. Still, healthcare has resisted computerization for decades.

In the answer to the question "Why hasn't this happened on its own?" we will find the heart of meaningful use. The reasons that healthcare has not computerized can be summarized as screwy incentives and a difficult domain. Specifically: