

eHealth: The Foundation for Health System Transformation

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Introduction

The information age has finally arrived for the health enterprise. For many years, health care has lagged behind other sectors, such as banking, manufacturing, and retail, in the use of networked information systems to support business practices. To be sure, much work still needs to be done to achieve a comparable level of familiarity, widespread use, acceptance, and integration. But as a nation^{1,2} and state³⁻⁶ we now realize the increasing role information systems must play if we are to greatly improve the quality and safety of health care, increase the pace of innovation and adoption of evidence-based practices, and improve the health of individuals and our communities. eHealth provides the foundation for this transformation.

eHealth has been defined as "... an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader

sense, the term characterizes not only a technical development, but also a state of mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology."⁷

Embracing the eHealth theme, this issue of the *Wisconsin Medical Journal* is devoted to electronic health records. From the cellular and genetic level to communities and populations, this month's contributors provide a wide-ranging snapshot of ehealth and information system applications evolving and supporting Wisconsin's health enterprise. Ms Swanson and her colleagues at the Medical College of Wisconsin and Froedtert Memorial Lutheran Hospital (Preimplantation Genetic Diagnosis: Technology and Clinical Applications. *WMJ*. 2007;106(3):145) provide an overview of the process and information needs supporting preimplantation genetic diagnosis. This is a method of testing in-vitro fertilized embryos for single gene and chromosome abnormalities prior to transfer to significantly improve the chances of having a healthy child.

Mr Wright and his co-authors (Clinical Decision Support Systems Use in Wisconsin. *WMJ*. 2007;106(3):126) assess the extent of clinical decision support systems currently used by Wisconsin physicians. They found that while nearly 40% indicated their facilities had these

systems, a much smaller percentage of systems were computer-based, leaving room for considerable strategic growth for computerized systems in Wisconsin.

In a study sponsored by the Wisconsin eHealth Care Quality and Patient Safety Board, Dr Foldy similarly examines the current landscape of electronic health information exchange in Wisconsin (Inventory of Electronic Health Information Exchange in Wisconsin, 2006. *WMJ*. 2007;106(3):120). Although the end goal of universal adoption of electronic medical records is necessary, it is not sufficient to complete the eHealth picture. Health information exchange is vitally important if clinicians are to have a comprehensive understanding of the patient they are treating. Today, patients typically receive care and have relevant health information generated from multiple organizations, such as hospitals, clinics, laboratories, pharmacies, and therapists. Our mobile society requires that an individual's health information follow them to wherever they seek care. Dr. Foldy's research underscores the distance Wisconsin will need to travel in order to achieve secure health information exchange supporting patient care everywhere.

Two papers focus on public and population health. Mr Landis and colleagues from the Wisconsin Division of Public Health describe the Secure Public Health Electronic Record Environment (SPHERE)

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(SPHERE: Tracking Public Health Improvement with Electronic Records. *WMJ*. 2007;106(3):116). Part of Wisconsin's Public Health Information Network, SPHERE is used to document and evaluate public health activities and interventions for 3 major public health programs: Maternal and Child Health, Family Planning/Reproductive Health, and Children and Youth with Special Health Care Needs. Finally, Mr Tuan and his co-authors from the Center for the Study of Diversity in Health Care at the UW School of Medicine and Public Health examine Wisconsin neonatal mortality trends by race and ethnicity, birth weight, and prematurity (Possible Factors Illuminating Increased Disparities in Neonatal Mortality in Wisconsin from 1991-2005. *WMJ*. 2007;106(3):130). By accessing a public use, population health database (the Wisconsin Interactive Statistics on Health [WISH] system) and using advanced statistical modeling techniques, a comprehensive picture has been developed on the differential risks and disparities for this birth outcome.

While these manuscripts provide a clear view of the current state of their respective information domain, they also provide hints to a future, informatics-integrated health enterprise.

eHealth: The Once and Future Network

Medical informatics, the intersection of medicine and information sciences, supports a spectrum of health data and is generally described by 4 domains: cellular/genetic/proteomic, imaging, clinical, and population health.⁴ Though the spectrum can be seen as a continuum, the information systems supporting these domains have historically developed with little regard for one other. In part due to the nature of professional specialization, it is also due to technology limitations of the past. Less than 10 years ago, routine, secure, high-vol-

ume and high-speed data exchange was unthinkable because the infrastructure did not exist. Today, it is commonplace, and data standards now proliferate to insure systems integration capability.⁸

There are essentially 4 major users of the spectrum: clinicians/health care professionals, researchers, public health, and the individual or consumer. Unfortunately these user groups have similarly developed their own systems or views into the medical informatics spectrum, again creating islands of information and disparate computer applications that do not readily talk to each other.

The Nationwide Health Information Network (NHIN) is a national effort to bring about integrated, universal eHealth adoption within the health enterprise. The effort is being led by the Office of the National Coordinator for Health Information Technology (ONC) in the US Department of Health and Human Services (DHHS). The goal is to unify both the informatics spectrum and its end users through a standards enabled interoperable system. The development and "use of this infrastructure will improve the quality, safety, and efficiency of health care and the ability of consumers to manage their health information and health care."⁹

But how do we get to there? Perhaps the most effective method is to form stakeholder collaboratives to answer 3 questions: How do we do our work now (business process analysis); how should we do our work (business process redesign); and how can an information system support our work (requirements definition)?¹⁰ For NHIN to realize its goal of interoperability and the promise of health system transformation, stakeholders from each of the 4 user groups must be engaged whenever applications are being designed for any user group. Otherwise we run the risk of only computeriz-

ing the first step for each user group, i.e. how we do our work now, and perpetuating the informatics barriers that currently exist between clinical care, public health, research, and personal health.

A national dialog has started for a number of critical NHIN areas. Work groups have formed on bio-surveillance/population health and clinical care connections; consumer empowerment; chronic care; electronic health records; confidentiality, privacy and security; quality; and personalized health care.¹¹ Considerable progress has been made, but much work must still be done to specify business process redesign and a full set of NHIN requirements definitions for each of these areas.

eHealth Progress and Opportunity

The literature provides growing evidence on the positive effects of health information systems. In the clinical setting, information systems have reduced medication errors,¹² demonstrated beneficial impacts in neonatal intensive care units,¹³ improved care for chronic illness,¹⁴ reduced inappropriate antimicrobial use,¹⁵ improved transfusion resource utilization in the intensive care unit,¹⁶ and demonstrated a return on investment.¹⁷ Informatics is also transforming public health practice by supporting standards based, automation of work methods.^{4,18} Information systems can and have improved patient participation in their own care and interactions with their health care professionals.¹⁹⁻²² Indeed, by a large majority, Americans want secure electronic personal health records to improve their own health care and to support public health efforts.²³ But new technologies also create a potential for new hazards,^{24,25} so we must remain vigilant and employ national strategies²⁶ to insure these innovations do no harm.

Transformation ultimately means

working in truly different ways, and these new opportunities are more clearly seen as we move toward the eHealth enterprise. Public health providing real time, epidemiological contextual information (situational awareness) to improve the performance of a clinical prediction model differentiating aseptic from bacterial meningitis is but 1 example.²⁷ One could easily envision extending this process of population health informatics feedback to clinical care for a wide variety of health outcomes, making it a new objective and priority for public health surveillance systems.⁴ But perhaps it is research and the rapid adoption of evidence-based innovation that stand to gain the most from eHealth: “using electronic health record (EHR) databases from millions of people could rapidly advance the US evidence base for clinical care. Rapid learning could fill major knowledge gaps about health care costs, the benefits and risks of drugs and procedures, geographic variations, environmental health influences, the health of special populations, and personalized medicine.”²⁸

Wisconsin’s eHealth Action Plan

Wisconsin’s eHealth Action Plan outlines steps that are underway to transform the health enterprise.⁶ Mindful of national developments, it employs 3 strategies for transformation: improve quality, safety, and value by establishing the eHealth technology platform to provide needed information at the point of patient care; encourage the development, alignment, and implementation of value-based purchasing policies and actions across the public and private sectors; and link Health Information Technology and Health Information Exchange plans to prevention and disease management activities. Wisconsin’s eHealth Implementation Summit was held on March 15, 2007, and it is available

on-line at Wisconsin’s eHealth Web site.⁶

Nationally, Wisconsin is in a unique position because of groundbreaking work being done by the Wisconsin Medical Society, the Wisconsin Collaborative for Healthcare Quality, the Wisconsin Health Information Organization, the Wisconsin Health Information Exchange, and the Wisconsin Hospital Association. Our state has a significant proportion of physicians in large group practices, with most of these already using electronic health records and associated technology. There is strong commitment to quality improvement and leadership in our health care sector, including the 2 medical schools and professional associations. And Wisconsin is home to 2 of the world’s leading companies in electronic health information and many other innovative companies working on health technology. In the public sector, Wisconsin is developing a sophisticated public health information network as well as other systems that can provide assets to a statewide eHealth technology platform. Finally, extensive work on privacy and security issues has been completed under the leadership of the HIPAA Collaborative of Wisconsin, providing a venue for diverse stakeholders to uniformly address critical issues.⁶

eHealth has been described as a ‘race to the starting line.’ But as we have seen, Wisconsin has gone well beyond this. In the near future, Wisconsin is poised to make significant eHealth progress with the continued participation of physicians, the public and private sectors, researchers, and consumers to support and guide Wisconsin’s eHealth Care Quality and Patient Safety Board.

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