Towards ICT Revolution in Healthcare: Present and Perspectives for Electronic Healthcare Record Systems

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Abstract This chapter will describe and discuss the applications and solutions under development or implemented in the e-Health care systems, from the technological, social, organizational dimensions. A survey of the present status in relation with e-Government will cover the leading countries (and not only) in ICT-based developments in these sectors. The major implemented solutions will be outlined regarding their actual implementation and administration. Key aspects will be outlined for Electronic Healthcare Record Systems as core systems in present or future national or regional health programs.

1 Background

Healthcare regardless of it's geographical location and sociopolitical environment, can be viewed as consisting of three stakeholder groups (providers, supporting industry and governance) sharing the common aim of providing the best services to a fourth stakeholder group—the patients, as beneficiaries of these services. Each of these stakeholders will have shared values, expectations, needs, and challenges, which will finally form the growth drivers—or opposers—to the enablement of a common practice in these services. Cost savings, improved patient safety and improved access to care are made possible through ICT investment in areas which have a well-proven business case, such as Electronic Transfer of Prescriptions, Clinical Decision Support, Electronic Health Records, and Chronic Disease Management Systems, all sustained by a modern IT infrastructure. As world's population is ageing healthcare system should support the current and future needs of the population it serves.

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The information provided in this chapter covers mainly the last decade focusing on last years. Current status, problems, solutions, advantages or disadvantages, future trends or new advances are described for Electronic Healthcare Record Systems.

2 Electronic Healthcare Record Systems

Electronic medical records (EMR) manage the clinical operations of healthcare providers and lie at the center of any computerized health information system. Without EMR other systems such as decision support systems cannot be effectively integrated into routine clinical workflow. The multi-provider, multi-specialty interoperable, multi-discipline computerized medical record, which has been a goal for healthcare professionals, administrators and many politicians for the past two decades, is about to become reality in many western countries.

Electronic medical records will tie together a patient's health information from numerous systems (like clinics, doctor's offices, hospitals or pharmacies) to provide one coherent record in a structured format. That way, anyone who has authorization to view it, gets a complete and accurate picture of the health status of the patient.

Related terms to EMR that can be used both interchangeably and generically include electronic health record (EHR), electronic patient record (EPR), computer-based patient record (CPR) etc. [1].

An EMR generally contain a whole range of data in comprehensive or summary form, including the patient past medical history, personal stats, medication and allergies, physical assessment, physical examination, daily charting, nursing care plan, referral, symptoms, diagnoses, treatment, laboratory test results, radiology images, procedures, discharge, diaries, immunization status etc.

Worldwide, in North America, Europe, Asia/Pacific, Australia and New Zealand sustainable efforts are made to implement integrated EMR systems each zonal entity usually having its own approach. Important steps to implement national EMR systems are also taken in developing countries such as from Eastern Europe (Poland, Czech Republic, Slovakia, Romania etc.). For example projects over 40 million euro have been recently granted from EU grant for the implementation in Romania of the electronic prescription and electronic patient data sheet with deadlines 2011 and 2012, respectively [2].

3 Problems Identified, Solutions and Current Status

Due to the lack of standardization for EHR systems in US in early 2000s, the amount and the quality of stored data largely depended on software implementation: some of them included virtually all patient data, while others were limited to specific types of

data, such as ancillary results and medications. While some EHR systems provided decision support (e.g., practitioner reminders and alerts, alerts concerning possible drug interactions), others did not. Also, most EHR systems were enterprise-specific and few of them provided powerful support for communication and or interconnectivity across the providers within a community [3].

One solution was the adoption of a standard according to US Institute of Medicine report [3] based on eight core capabilities that every EHRs should possess.

Health Level 7 (HL7) version 3 for message transferring and Integrating the Healthcare Enterprise (IHE, www.ihe.net) is a standardized approach to sharing of clinical documents that became the principal messaging standard for clinical data in the U.S., and possibly, in the world.

With the most of the standardization problems resolved, the top remaining problem is the cost of implementation: a full EHR system, including a picture archiving and communication system (PACS) can cost tens of millions, especially if future upgrades are expected. Other technology problems include: the lack of a standard code of generally accepted practices and protocols, poor user interface design, lack of appropriate vocabulary and data transmission standards, difficulty in creating a migration plan from chapter to EHRs. Training costs have to be added: many practitioners are not accustomed to creating and using electronic care records and have to have the literacy in using the system, performance data entry as well as information retrieval. Even implementing an EHR system is a significant undertaking for any healthcare organization, most of them include among their highest priorities the goal of compliant evaluation and management (E/M) coding. [4]: "problems arise from software systems that (a) may have coding engines that fail to account for medical necessity; (b) may have designs that automatically guide physicians to create records with high levels of documented care for every visit; (c) may have shortcut documentation tools that create "automated" documents, identified by Department of Health and Human Services (HHS) as "having the potential for fraud and abuse"; and (d) therefore consistently derive and recommend submission of high-level E/M codes for almost every patient encounter". The analysis of [5] shows that similar critical areas exist in the various countries. Strategic, organizational and human challenges are usually more difficult to master than technical aspects.

The main challenges to implement a national EHR system remain: data transfer is expensive and difficult, lack of common standards for interoperability or data security, and lack of national IT architecture.

The Obama administration has promised to invest $10 billion per year over the next 5 years on healthcare IT. The administration's stimulus package provides incentives for implementing certified EHR systems, while those practices that don't adopt these systems by 2014 will receive reductions in reimbursement.

In Canada, Infoway is an independent, not-for-profit organization that invests in partnership with public sector to implement health information systems. According to its 2006–2007 Annual Report [6] "EHR… at the crossroads of success" the goal for Infoway is that "by 2010 every province and territory and the populations they serve will benefit from new health information systems that will help modernize

the healthcare system. Further, 50 % of Canadians will have their electronic health record readily available to the authorized professionals who provide their healthcare services". Canada's successes include the development of common architecture and national standards for interoperability, patient registries and the deployment of digital imaging while permitting local regions to implement their own ICT systems such as SWODIN- the Southwestern Ontario Diagnostic Imaging Network. Criticism to Infoway's large centralized technology systems claims that the focus should have been to start with primary care and add interoperability at a later stage [7].

World's first digital national EHR belongs to Finland: "Finland is the first country worldwide to offer such an innovative healthcare service to its population." (Anne Kallio, Development director, Ministry of Social Affairs and Health, Finland).

epSOS (www.epsos.eu) is the first pan-European project that provides cross-border interoperability of EHRs between European countries. Guidelines on eHealth interoperability (European Commission's publication in 2007) were a step before. Pilot eHealth infrastructure projects at the national level to implement interoperability standards and architecture that are compatible with HL7 are developed in England, Wales and Denmark (which has its own standard for messaging named MedCon), Sweden by Carelink: national organisation that co-ordinates the development and use of IT by medical professionals. Carelink also manages Sjunet, the Swedish national IT infrastructure for healthcare. In France the system SESAM-Vitale electronic health insurance (actually at its second generation called Vitale 2) uses two cards to electronically sign claim forms—the patient data card and a health professional card in the same reader—and the forms are sent directly to the patient's health insurance provider. According to Gemalto provider (http://www.gemalto.com/public_sector/healthcare/france.html) over 83.63 % of general practitioners are using the system, 99.65 % of pharmacists, 81 % of dentists (July 2010).

Also in Asia/Pacific area, Singapore government has announced that, the state will have a national EHR system by 2010 which is currently in the implementation stage. For the same year in Hong Kong was scheduled a pilot program for easier patient registration with the use of Smart ID Cards in hospitals and clinics, linked to clinical records. A major milestone in Taiwan's health industry was the successfully implemented "Smart Card" for healthcare. In New South Wales, Australia, one of the largest clinical information system implementations started in 2007. It implies developing and implementing EMR on a statewide basis, which include the Electronic Discharge Referral System. Also, New Zealand benefits from one of the highest rates of EMR adoption.

4 Benefits

Although its fundament is clinical information, the EHR is used except clinicians by potentially every other health professional who manages healthcare quality, payment, risk, research, education, and operations. Furthermore, EHR provide

ubiquitous access, complete and accurate documentation of all clinical details and variances in treatments, interfaces with labs, registries, more reliable prescribing, complete documentation that facilitates accurate coding and billing. Care delivery to remote or rural regions is improved and redundant tests and treatments are eliminated. Doctors and healthcare organizations using fully implemented EHR report lower cost and higher productivity. The study presented in [8] reveals that EHRs help to avert costs and increase revenue leading to significant savings for the healthcare practice in: drug expenditures (33 %), improved utilization of radiology tests (17 %), better capture of charges (15 %), decreased billing errors (15 %). Patients, too, benefit from increasingly gaining access to their health information and making important contributions to their personal health. Electronic referrals allow for easier access to follow-up care with specialists, patients have portals for online interaction with various providers; the need to fill out repeatedly same forms is reduced. EHRs serve as the foundation for population health and, ultimately, the potential for a national health information infrastructure.

The most widely EHR systems implemented are England, Denmark, Netherlands, and certain regions of Spain which are close to 100 % regarding to the use of ambulatory EHR. Also, Sweden, Norway are at 80 % and behind Germany/France are at 50 %. US is somewhere less 20 %, depending on EHR classification [9]. From the perspective of EHR using for inpatient, coverage is high in England, Sweden, Norway, Denmark, and Finland, followed by Germany and Spain (in mid-low tier hospitals). In the US, Computerized physician order entry CPOE adoption nationally is less than 25 % [9]. If interoperability is to consider Denmark has the most signification implementation of production EHR with over 90 % of encounters shared electronically same as some regions in Spain, English, and Sweden.

5 Conclusions

The entire world is facing a healthcare revolution: the need for better solutions according to ever growing needs for high quality services has driven health care institutions, government policies, software or hardware providers to embrace or to adapt the most valuable solution: e-Health. New national e-Health systems will be functional next years and the implemented ones will be in a constant development. The corresponding market for such services most probably will register a solid growth next years.

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