Interoperable Electronic Patient Records for Health Care Improvement[*]

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Abstract. Pressing needs of cost-effectiveness in healthcare and opportunities of emerging electronic health record technologies offer unprecedented chance for progress. Ongoing health care improvement and patient safety initiatives demand new information collection and communication technologies (e.g., Centers for Medicaid and Medicare Services, Joint Commission, National Patient Safety Foundation, public health surveillance). Particularly, desire for faster action and cost-effective health care drive unprecedented investments in electronic patient records worldwide. Recognizing these opportunities, many countries and the World Health Organization have launched several major health care improvement initiatives that are driven by new electronic record technologies. In the United States, historic $19 billion investment is provided through the American Recovery and Reinvestment Act of 2009. Models of sharing electronic patient data and citizen expectations for personal electronic health records will be reviewed. Regional health information networks and other information sharing initiatives depend on the interoperability of systems. Ultimately, the recent flood of health information standards needs to be balanced with actual interoperability opportunities. It is anticipated that the current policy discussions on the "meaningful use" of electronic health records will have major beneficial technical and also reimbursement implications.

Keywords. electronic health records, CQI, patient safety, meaningful use

1. Introduction

Health care worldwide has an impressive history of innovation and improvement. However, it currently faces major concerns, particularly issues of limited resources, quality, costs and safety. In seeking solutions, information technology holds potential for transforming health care delivery in multiple ways. This chapter examines how information technology, particularly electronic health records, can be applied to promote innovation and improvement in the health care system.

Information technology has the potential to improve the quality of three major areas of the system: personal health management, health care delivery, and public health. We are assessing how technology applications contribute to improved quality of care, fewer medical errors and cost-effective health care.

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2. From Electronic Health Records to Shared Information

Ever since the Mayo brothers insisted on a single comprehensive health record for every patient shared by all participating clinicians, electronic health records aspired to become similarly unifying information source for everyone. The World Health Organization (WHO) underscores that the electronic health record should reflect the entire health history of an individual across his or her lifetime including data from multiple providers from a variety of healthcare settings. Recently, WHO released its Electronic Health Records Manual for Developing Countries [1].

The Regenstrief Institute's medical informatics group was recently designated as the world's first WHO Collaborating Center for Medical Informatics. The United States is one of nine charter members of the new International Health Terminology Standards Development Organization. It has acquired Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT) from the College of American Pathologists. Such standard terminologies should open up new opportunities for international collaboration in research and public health surveillance.

In recent years, the sharing of electronic information through regional health information organizations (RHIOs) has become more prominent. Certainly, there is more than enough electronic information to share and integrate. In most health care settings, drug data, laboratory data, coded diagnoses and many patient identifiers are already electronic and ready to be shared. Regional health information network can provide a variety of services that facilitate information sharing and build on its advantages. In the evolution of electronic health records, a synergistic trend is the appearance of personal electronic health record systems include those promoted by major commercial vendors like Google Health, Healthvault and others.

3. Information Systems in the Prevention of Health Care Errors

The threat of health care errors is increasingly recognized risk factor of morbidity and mortality. Patients seek healing in the health care system and preventable adverse events are contrary to good science and high professional standards. Medication Error is defined as "any error in the process of prescribing, dispensing, preparing, administering, monitoring drug therapy regardless of whether an injury occurred or the potential for an injury was present" [2].

Government agencies, professional associations and healthcare systems are increasingly focused on the prevention of health care errors. For example, the Centers for Medicaid and Medicare Services (CMS) listed eight hospital-acquired conditions as "reasonably preventable" complications (never events): foreign objects left in the body after surgery, air emboli, infusion of incompatible blood, falls and traumas, catheter-associated urinary tract infections, mediastinitis after coronary-artery bypass grafting, certain infusion-associated infections, and pressure ulcers. Later, CMS added poor glycemic control, deep-vein thrombosis or pulmonary embolism associated with knee or hip replacement, and certain orthopedic and bariatric surgical-site infections. For example, the Joint Commission that evaluates and accredits more than 16,000 health care organizations and programs in the United States has numerous patient safety initiatives. Similarly, the National Patient Safety Foundation and the Institute for Healthcare Improvement are also very active in the field.

At the root of most health care errors, information and communication failures can be recognized. A recent retrospective medical record review of 5434 randomly selected patients showed that the rate of failures to inform or to document informing the patient was 7.1% (135 failures divided by 1889 clinically significant abnormal results). Most interestingly, the use of a "partial electronic medical record" (paper-based progress notes and electronic test results or vice versa) was associated with higher failure rates [3]. The consequences of health care errors are very significant. For example, potentially preventable surgery related infections increase in hospital death rate by 3.1%, readmission rate by 7.7% and the average additional payment was nearly $20,000 [4].

In terms of finding solutions, electronic health records offer much more than just support for the retrospective review and exploration of health care errors. There are many information technologies that can make a difference. In a medical intensive care unit, bar-code-assisted medication administration, reduced the rate of medication errors by 56% after implementation (19.7% versus 8.7%) [5]. Clarity of communications and standardization of information exchange have much room for improvement. Our systems need to answer simple questions, like what can be called drug associated liver injury or liver disease.

Computerized physician order entry systems (CPOE) are often viewed as the most important tool in detecting potential erroneous orders and preventing health care errors. However the road to using CPOE systems has not been without bumps as several applications failed to meet expectations in recent years. Certainly, standardization of information sharing and processing appears to be essential. Inconsistent information within the same prescription can be a major threat to patient safety and prevention of health care errors (e.g., mismatch between the structured template and the associated free-text field). In a sample of 55,992 new prescriptions, 532 (0.95%) were reported to contain inconsistent communication and 20% of them could result in moderate to severe harm [6].

4. Electronic Health Records at the Intersection of Professional Cultures

According to classics of anthropology, culture is the way of living that includes belief, values, behaviors, norms, artifacts and institutions [7]. In the overall culture of health care many subcultures coexist. Members of these subcultures share common beliefs, driving values, professional norms, tools and other artifacts and institutions like government agencies, professional associations and research institutions.

As an example, the public health community believes that major indicators must be improved in the interests of the community (e.g., life expectancy, morbidity, prevention of infectious and non-infectious diseases). Members of this professional community attend public health meetings and often consult with each others. There are many written and unwritten rules of public health work. Public health professionals also have their reporting systems and share many investigative methods. They interact with other health professionals as they relate to public health.

When health informatics is applied for health care improvement, several subcultures interact:

- Continuous quality improvement (CQI) community is focused on measurable improvement of care processes to meet accreditation standards and outcome expectations.

- Patient safety community is focused on analysis, prevention and management of health care errors.
- Public health community aims to improve health status at the community level.
- Health insurance community is most concerned with cost-effective health care and efficient reimbursement.
- Clinical community is focused on providing quality patient care that also meets the expectations of the above listed subcultures.
- Medical informatics is at the intersection of all these subcultures by focusing on the methods and technologies of information processing in support of the above communities.

The corollary of this is that no matter in which culture you are located, you have to set goals that make sense for the other cultures and you need to learn about the other cultures. If health informatics wants to meet the needs of diverse subcultures, it is important to attend their professional gatherings, interact with diverse professionals and learn their priorities.

5. Meaningful Use of Electronic Health Record Systems

One of the most elusive subjects of health informatics is the actual use of electronic health record systems. As Prof. Alan Pryor of the University of Utah listed among his famous rules, "capture everything and we'll sort it out later." While computers are becoming ubiquitous in health care institutions and the systems process many patient data, the actual level of computerization is difficult to assess and certainly available system functionalities cannot be equated with actual use or beneficial impact on patient care.

To address this issue and make sure that taxpayer resources are invested appropriately, the office of the U.S. National Coordinator for Health Information Technology leads a discussion about meaningful use of electronic health records. The policy development started with the provision of the recently passed stimulus bill that defers to the secretary of Health and Human Services to set specific guidelines for determining what constitutes a "qualified electronic health record (EHR)." The stimulus bill does not go into details but it does specify that e-prescribing, electronic exchange of medical records, and interoperability of systems will be determining criteria. Starting in 2011, providers meeting the criteria of "meaningful use" of EHR systems will be eligible to receive $40,000 – $60,000 in incentive payments paid out over five years in the form of increased Medicare and Medicaid premiums.

6. Discussion

Health information technology is about quality of care. Health information technology is not an end in itself, but a means to better quality, safety and effectiveness. Increasingly with the help of information technologies we can identify quality, measure it, and reward it. We can also prevent errors and improve cost effectiveness. Ultimately, quality improvement and patient safety needs to become our goal in guiding health information technology endeavors.

Consumers, patients should always be at the center of the health care enterprise and also health information technology. In this era of evidence based medicine, we need to focus more in developing advanced EHRs which advanced decision support systems that can help in guiding physicians to accurately diagnose and treat patients. Duplication of patient service should be eliminated and fragmentation of the health care processes should be avoided at all possible levels.

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