Research Article

Open Access CrossMark

The intra/inter-operability in healthcare: the implementation of electronic medical record (EMR) with the ultimate goal of an electronic healthcare record (EHR)?

Abstract

Healthcare is the one sector of the United States that has not embraced technology; healthcare organizations (HCO) had full autonomy when it came to running its landscape. Today with the invent of the Patient Protection and Affordable Care Act (PPACA), congress has "called to action" that the providers start to use technology to reduce medical errors, minimize wasted Medicare dollars and increase patient satisfaction. Through the use of information technology, the support of senior management and the cooperation of the organization, we will look at revising some business processes that are causing inefficiency in the coordination of care, sub-optimal patient care and thus, low quality measures. By defining the business processes that are the problem ACME Hospital Healthcare (AHH) can create a new business model that is in align with the new Healthcare Reform, e.g. the PPACA ,Pay-for-Performance (P4P), Meaningful Use, etc.

Keywords: interoperability, electronic medical record, electronic healthcare record

Ellen Bennett
DeVry University, USA

Correspondence: Ellen Bennett, DeVry University, 6955 Margaret Courtyard Tinley Park IL, 60477, USA, Tel 7082977125, Email llrph99@aol.com

Abbreviations:

HCO, health care organizations; PPACA, patient protection and affordable care act; AHH, acme hospital healthcare; P4P, pay-for-performance; FFS, fee-for-service; CMS, centers for medicare and medicaid services; AMI, acute myocardial infarction; HF, heart failure; IOM, institution of medicine; IS, information system; BI, business intelligence; NHIN, national health information network; CDR, clinical data repository; CPOE, computerized physician order entry; CMV, controlled medical vocabulary; CDS, clinical decision support; EBM, evidence-based medicine; POC, point of care; CDO, care delivery organization; MR#, medical record number; EMPI, enterprise master patient index; HIE, health information exchange's; RHIO, regional health information organization

Introduction

ACME Hospital Healthcare is a moderate size, i.e. six-hundred bed hospitals in a low-income, high-crime rate, urban setting. The patient population consists mostly of Medicare and Medicaid patients; with very little resources available to them, thus the hospital is used as a primary resource to these patients. This is a great hospital to look at because unlike hospitals that have a majority of their patient population on private insurance, mixed with a fraction of Medicare patients; AHH is just the opposite, making it more vulnerable to the PPACA, which can add up tomillions of dollars in penalties. And with each passing year, hospitals that house the Medicare & Medicaid cohorts will have increasingly more stringent IT regulations enforced on them in stages, e.g. stage 1, year one, which starts in 2015, stage 2, stage 3, etc., all the way to stage 7, which can equal up to a 5percent decrease in funding. AHH as a provider is very dependent on federal funding, thus not meeting these IT stages by the deadlines can lead to dire monetary consequences.

Discussion of the business problem

Gone are the traditional days of contracting for economical gain, as seen with "Fee-For-Service" (FFS). Congress is *calling to action* that healthcare providers are held responsible for billions of Medicare dollars wasted on hospital readmissions. In 2008, it was brought to congress' attention by the Medicare Payment Advisory Commission, that in 2005, 17.6percent of admissions were readmitted within 30days of discharge. The same year, readmissions accounted for 15billion in Medicare spending, of which 12billion was due to preventable readmissions. This issue has been specifically addressed in healthcare reform legislation, with the creation of the PPACA in March of 2010. Centers for Medicare and Medicaid Services (CMS) have been appointed by congress to oversee that wasted Medicare dollars by providers are penalized.[1] The landscape of healthcare has changed to a new business model, i.e. one of P4P, with monetary incentives by payers, for quality care and patient satisfaction, and disincentives for any negative patient outcomes while under the providers care. The three main patient populations that are being followed for outcome measures of mortality and 30day readmission measures by the CMS are those that present with: Acute Myocardial Infarction (AMI), Heart Failure (HF) and pneumonia.[2]

Example, if a patient is admitted for a surgery and succumbs to a nosocomial infection, e.g. pneumonia post-admission, the provider will not get reimbursed, if a patient comes back to the hospital within 30days for readmission for a duplicate presentation, the provider will not get reimbursed. These issues I speak of are only some of the clinical aspects of the new Healthcare Reform Act; there is a technology side to the new Act as well, which is called the HITECH Act. The HITECH Act, was Bourne out of the need to reduce medication errors,

The intra/inter-operability in healthcare: the implementation of electronic medical record (EMR) with the ultimate goal of an electronic healthcare record (EHR)?

Copyright:
©2015 Bennett

20

as after a report from the Institution of Medicine (IOM) "To Err is Human"(2002), which reported a staggering 100,000 deaths from provider errors alone, the invent of technology was looked at harder as a way to prevent such travesties.

High Level Solution

"A technology architecture is a set of guidelines for technology integration within an enterprise. The architecture is a critical tool in the effort to control information technology operating costs by constraining the number of technologies supported. A well-designed architecture is also an important aid to integrating disparate applications, data stores and networks between the various hospital departments".[3] It cannot be overemphasized enough, prior to implementing an information system (IS), there needs to be a very well thought out architecture discussion. A great starting point would be to define the goal of the HCO, ensure top level commitment, write a request for proposal, define the scope of the organization, etc. Before deciding on a vendor, the most important strategic issue in an IS standards, e.g. data processing, technical and electrical standards are essential for equipment interconnectivity.[4]

Once the pertinent questions have been asked and answered, the proposals have been accepted, the more rigorous discussion of what IT infrastructure for the HCO needs to be decided. This is a weighty issue, as there are pros and cons with both best of breed, which is an open system, to that of an integrated system, which is a closed system. Example, a small rural community practice of 20 physicians might agree to go with a fully integrated closed system, which offers multiple applications with a common database and a consistent user interface, giving a familiar look and feel. Since their common goal was easy access to shared data for better decision-making, it was logical to adopt one vendors' technical architecture that offers a complete suite of software application for their EHR. The potential exists for both cost containment and earning additional revenue since the integrated system does not require costly interfaces and licensing costs are minimal. However, with the integrated system once you are an installed customer there will be a power shift in the relationship, when adding new modules HCOs will have less leverage in negotiating price and terms.

Example, a large urban community hospital decides on a best of breed (open) technical architecture, as it has a well trained IT staff to support and maintain multiple disparate systems and different hardware platforms. Best of breed was chosen, as this hospital has several very dynamic and competitive areas, e.g. 22 OR suites that perform thousands of open heart cases annually, a pharmacy department that processes 5,000 orders daily and 130 highly skilled nurses with innovative medical equipment needs. Because best in breed is designed to excel in specific applications with richer functionality this can create a competitive advantage, which may also serve to cut costs or increase revenue. With this system there is a need for increased training for personnel, support for complex interfaces with other systems, duplicate data entry and redundant data storage. Also, if the system goes down there will be finger pointing amongst the array of vendors, thus it may be easier to deal with one vendor than many different companies.[5]

Benefits of solving the problem

Hospitals across the nation, some more than others, benefit greatly from federal funding, the funding is not a small number, as just one percent funding can range from 1million to millions, depending on many factors. One such factor is the demographics of the area, i.e. lower-income communities have the greatest need for federal funding and thus, are the primary benefactors of monetary support. However, in recent years there has been an edict leveled against the healthcare community as a whole, (from hospitals to physician practices, to out-patient clinics) and that command is "embrace technology" (the HITECH Act), to reduce medical errors, hospital re-admissions, hospital stay times, nosocomial infections, etc. The federal government has given monetary incentives to help implement the technology that they feel is needed, e.g. EMR, EHR, business intelligence (BI) and decision support, etc.; with that said, the time window is a finite one. If certain technology is not in place or a good faith effort is not seen by 2015, the government will start to reduce its funding to hospitals in a nominal fashion, e.g. the first year the hospital will be penalized by one percent funding, the second year it will increase to two percent funding reduction, the third year, a three percent reduction and soon and so forth, up to 5 percent reduction, until meaningful use, pay-for-performance, the HITECH act, etc., is taken seriously and hitting an organization in their pocketbook is one way to command their attention.

Another benefit of aligning with technology is trend data analysis, which is a new tool being used in some hospitals that can detect unusual patterns in a specific condition within a localized region; and if so decided, can alert the public health department(s), to launch a further investigation. Example, Biosurveillance work done at Rush University Medical Center in Chicago, using ED Pulse Check system, detected the onset of the flu season more than two weeks sooner than public officials would have noticed. Sharps Healthcare in San Diego has been testing the CDC's BioSense Surveillance program, which is being rolled out to hospitals nationwide. BioSense sends out "real-time" surveillance data from the emergency department, e.g. collected chief complaint, syndromic and demographic data, microbiology, serology, etc., and transmits it to local and state health departments, rapidly.[6] The goal of biosurveillance is to protect the public through early detection and diagnosis of any health threats and thus, pinpoint the event and location where it may be occurring. BioSense came out of the need to use syndromic data to quickly understand if a bioterrorism or natural disease outbreak was occurring during the anthrax attacks of 2001.

Since the inception of 911, America has had to wake up to the stark reality that we are vulnerable to mass destruction on our homeland. Not just in the form of physical terrorism, but also, in the form of chemical warfare. Out of necessity comes innovation, until the anthrax attack of 2001, America never knew of chemical terror first hand. The national health information network (NHIN) is imploring that vendors embed support for biosurveillance standards in their information systems; by mapping disparate codes with syndromic data. New technology is allowing connectivity between providers, public health agencies and emergency responders with early detection being a key element. Some participants are going beyond surveillance with protocols to treat anthrax, smallpox, bubonic plague, which are easily accessed on the web.[6]

An EMR and an EHR will change the way HCO capture data, communicate internally within a HCO and with other HCO externally. Doctors will no longer have to wait for medical records to be transferred between hospitals, which can takedays, to see if a patient already had a recent MRI, certain labs, a cardiac stress test, etc.

The intra/inter-operability in healthcare: the implementation of electronic medical record (EMR) with the ultimate goal of an electronic healthcare record (EHR)?

Copyright:
©2015 Bennett   21

Because of the transparency among HCO, there will be a substantial cost savings to the payer and the providers; as the need for duplicate extremely expensive radiology images, labs and tests, etc., will be reduce drastically and thus there will be less wasted healthcare dollars on duplication of therapy alone. Because all the multiple departments in a hospital will be able to communicate electronically, doctors, nurses, pharmacist, lab technicians will have information in "real-time" which will increase efficiency of care, patient satisfaction and add great value to the HCO, let alone strategic advantage for competing HCO's.

Technology and business practices used to augment the solution

When trying to compare and contrast the difference of an EMR to that of an EHR, we should first understand what lies at the core of both sources of information, that source would be the clinical data repository (CDR). A CDR houses a snap shot of a single patient and their relevant clinical data, e.g. patient demographics, computerized physician order entry (CPOE) and diagnosis, laboratory, pharmacy, radiology, nursing with electronic medication administration, etc.[7]

Controlled medical vocabulary (CMV) is the next crucial layer that's central to both systems, the CMV is a tool used to standardize information for purposes of Clinical decision support (CDS), which is a component in both systems; CDS is interactive software that guides the physician, if chosen, to make the most appropriate evidence-based medicine (EBM) choice for their patient. Example, a physician weighing the best treatment option of a febrile neutropenic patient presenting with suspected pseudomonas, has an option of double antibiotic coverage versus single treatment. The CDS can capture, stored exchanged data, search and analyze data. Essentially, controlled medical vocabularies are chosen words or phrases that are used to tag units of information for the purpose of easy retrieval through searches.[8] The CDS can push EBM through at the point of care (POC), i.e. CPOE, for selection of the best empirical coverage until the culture comes back.

An EMR is a fully integrated summary of a patient's demographics and their interactions in healthcare with their physician(s) and all the various departments: nursing, pharmacy, radiology, laboratory, dietary, etc., in a care delivery organization (CDO). When a patient arrives at a CDO they are assigned a permanent number (medical record #) and an episode of care number (account #). The account number will change with each return visit to that particular CDO; however, the medical record number (MR#) will not, thus upon admission/re-admission one will always be assigned their MR# and a new account number. Because each CDO has a unique MR# for each patient the need for an enterprise master patient index (EMPI) number is critical for the EHR to be viable across multiple CDO's.

An EHR is a longitudinal EMR repository, as its primary goal is to provide integrated access to all patient data by multiple providers; it's the acquisition and organization of these data that pose major challenges. An EHR has many "architectural requirements of integrating data from multiple sources" and data standards for continuum of care record/document (CCR)/ (CCD), when patients are transferred to another CDO, many other data standards, e.g. "HL7 as the primary message standard, DICOM for radiology images, LOINC for laboratory test observations, and likely SNOMED for medication identifier codes, general clinical terminology, measures of units, etc [9]" is all integral parts of the EHR.

Conclusions and overall recommendations

In conclusion, I would recommend implementation of an EMR and EHR early on at AHH, while the government is still offering monetary support, as the economical upfront costs are staggering. At the onset it is imperative to have strong leadership from senior management, and to engage the end-user early and often throughout the entire build of the new information system. Once these systems are in place the next step is to connect to health information exchange's (HIE) which will then in turn link to a Regional Health Information Organization (RHIO), that ultimately will become a communication highway connecting all RHIO's nationwide, like that of the internet.

High-level implementation plan

Implementing an integrated EHR is a significant endeavor for any HCO. A strategic plan should be devised addressing the objectives of the organization and establishing a timeline for implementation. Healthcare organizations need to address how and EHR system helps achieve goals, such as, improved connectivity with physicians, improved continuity of care, operational efficiency gains, advances in quality improvement and performance, as well as, support and service expansion.[10]

The main purpose of creating a strategic plan for EHR implementation is to determine what outcomes are expected. According to Breaux,[11] prior to the implementation of an EHR, an organization must first look at the objectives of the business. Can business processes become faster, better or cheaper?[11] Increasing the provider's performance from process modification and allowing additional time to care for patients can be a substantial improvement for the organization. Some strategic factors to consider in implementing and integrated EHR are successful change management strategy, key stakeholder involvement and staff training.[12] Implementing and EHR without proper planning for change and engaging key stakeholders in all decisions can lead to poor selection and careless adoption. Clinical leaders and management staff should also be involved from the start, providing input regarding workflow and process redesign. Moreover, involving staff in the selection and design of the system with appropriate and timely training will increase adoption and readiness for change. Many EHR deployments are doomed to fail due to lack of training, and input of the end-user. According to Edwards,[13] "fifty percent of information system projects fail because of a lack of staff acceptance and willingness to use the system".

Prior to integration of an EHR, existing data management software and legacy information systems also need evaluation. Currently, best-of-breed, best-of-suite or single vendor approaches are the three main strategies for acquiring new information systems.[14] Each may be appropriate depending on the existing systems and the complexity of integration. Even though there is a significant financial investment required for implementation of new systems, the increase in data quality and the resulting error reduction will be advantageous. Poor quality data can "threaten patient safety and can lead to increased costs, inefficiencies and poor provider financial performance".[15] Investing in information technology solutions can help with many of these data issues.

Despite high initial investments, the costs for implementation will be recouped for three reasons. First, as of 2015 per the HITECH Act, hospitals will lose money with reduced Medicare reimbursements without an EHR. Second, improved quality and safety metrics along

The intra/inter-operability in healthcare: the implementation of electronic medical record (EMR) with the ultimate goal of an electronic healthcare record (EHR)?

Copyright:
©2015 Bennett   22

with patient communication can lead to increased patient volume and revenue. Third, adopting an integrated EHR may attract independent physicians to admit more patients to a healthcare organization. These investment returns make implementation worth the cost. When coupled with well-planned, strategic and organizational considerations, the benefits of a truly integrated EHR are realized for patients, providers and healthcare as a whole.

Summary of project

All the new legislation that falls under meaningful use is the government's plan to contain cost, while giving patients better care through performance measures; however, the real push is to keep the patients out of the acute care setting, i.e. the hospital, as the cost is far greater, than keeping a patient in the chronic care mode, at home. Example, when a patient presents to the hospital with an aliment of an asthma exacerbation and gets admitted, the bed alone is ~ ten thousand dollars a night and this is prior to the phlebotomist drawing blood, the physician assessing labs, tests or images, the nurse reconciling the patients home meds to send to the pharmacist, etc. Therefore, it only makes sense that the payers want the providers to start embracing preventative medicine, instead of interventional medicine. Let's continue to the example, had the asthmatic been given a "patient care scripts" to be taken to their pharmacy they could've avoided an asthma exacerbation and thus a costly visit to the hospital (acute care). A patient care script could have the following:

i. Albuterol med nebs, inhale 2 puffs every 2-4hours as needed, for shortness of breath

ii. Prednisone 50mg orally daily and tapered down by 10mg every two days, until gone

iii. Singular 10mg orally at bedtime, keep as a scheduled med, for preventative measures, since patient prone to exacerbations

iv. Albuterol MDI (inhaler) 2 puffs as needed continually once patient no longer requires the med nebs

v. Add on a steroid inhaler (Asmanex) 1-2 puffs daily for maintenance

Using patient care scripts is on the horizon and can save all stakeholders millions if not billions of money, as the insurance payer rather pay for outpatient prescription(s), than a preventable costly hospital stay. The patient (payer) knows their chronic condition well thus, at the first onset of an exacerbation they could get the meds they need in a timely manner from their local retail pharmacist and avoid the costly hospital co-pays and can return to their everyday life and work that much sooner. The physician provider knows the patients chronic illness well enough to write for these scripts and soon will here from the CMS for not preventing, but intervening. The hospital provider has a stake as well, as if the patient is admitted and acquires another illness while under their care they will not be paid but penalized.

Giving people the opportunity to have the medicines they need, at first onset of their chronic disease, is practicing preventional medicine; instead of letting them suffer through the lack of coordination of care, in the acute care setting, i.e. the hospital intervening, is not efficient,

safer, or cost-containing. Instead, empower the patient, as today's patients are interested in their own care and know their symptoms better than anyone through their own experience with the chronic illness. In conclusion, you can have the best hardware, software, vendor relationship, senior management support and IT manager working in conjunction, to create EMR, EHR, HIE and RHIO's; however, without the cultural change from all stakeholders involved the outcome of the project can still be a colossal failure.

Acknowledgements

None.

Conflict of interest

Author declares that there is no conflict of interest.

References

1. Foster D. *Healthcare Reform: Pending Changes to Reimbursement for 30day Readmission*. USA: Thomas Reuters; 2010.

2. Centers for Medicare & Medicaid Services (CMS.gov). *Outcome Measures*. Centers for Medicare & Medicaid Services, USA; 2014.

3. Jones DT, Duncan R, Langberg ML, et al. Technology architecture guidelines for a health care system. *Proc AMIA Symp*. 2000;2000:399–402.

4. World Health Organization (WHO). *Setting Up Healthcare Services Information Systems. A Guide for Requirement Analysis, Application Specification and Procurement*. USA: World Health Organization; 1999.

5. Anonymous. Best of Breed Vs. Integrated Systems. *Online Consultant Software*. 2004.

6. Goedert J. The Biosurveillance Evolution. *Health Data Management*. 2007;15(2):50.

7. Garets D, Davis M. Electronic Medical Records vs. *Electronic Health Records: Yes There is a Difference*. Chicago: HIMSS Analytics; 2006.

8. Tangient LLC. *Controlled Medical Vocabularies-CMV*. Health Informatics, USA; 2015.

9. Tang PC, McDonald CJ. Electronic health record systems. In: Shortliffe EH, Cimino JJ, editors. *Biomedical informatics: Computer applications in health care & biomedicine*. London: Springer; 2014. p. 391–421.

10. Nicholas ED. *Making IT Happen: Strategies for implementing the EMR-EHR*. Healthcare Information and Management Systems Society, USA; 2006.

11. Breaux T. *Why implement and electronic medical record?* Health Leaders News, California, USA; 2007.

12. McCarthy C, Eastman D. *Change management strategies for an effective EMR implementation*. Healthcare Information and Management Systems Society. USA; 2010.

13. Edwards C. Nursing leaders serving as a foundation for the electronic medical record. *J Trauma Nurs*. 2012;19(2):111–114.

14. Menachemi N, Shin DY, Ford EW, et al .Environmental factors and health information technology management strategy. *Health Care Manage Rev*. 2011;36(3):275–285.

15. Baxter C, Dell R, Publ S, et al. Assessing and improving EHR data quality. *Journal of AHIMA*. 2013;84(2):48–53.