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MANUSCRIPT INTRODUCTION

Significant healthcare management challenges can be overcome through the successful analysis, evaluation, selection, and implementation of electronic health record (EHR) "component" information systems and integration of these component systems into existing, "core" EHR systems. However, this requires expert organizing, planning, and budgeting skills. Also, knowledge of various types of healthcare provider organizations and expertise in information technologies are critical. In addition, the ability to establish a vision for diverse facilities, assess healthcare provider organization information management needs, and predict reengineered business workflows / processes are key.

This manuscript explores how an independent healthcare information technology (HIT) advisory consultant, Deborah Kohn, developed key strategic information plans, analyzed returns on investment, and managed complex IT projects for **four different healthcare provider organizations** that considered implementing or implemented technology solutions as components of the organizations' existing, core EHR systems.   As such, this manuscript includes **four different case reports**, each describing how each healthcare provider organization successfully analyzed (and, in two cases, successfully implemented) **four essential EHR**

component information systems to complement the organizations' core EHR
systems.

The four healthcare provider organizations include:

- a small, critical access-based, acute care organization

- a medium-sized, community-based integrated healthcare delivery network

- a large, clinic-based integrated healthcare delivery network

- a large, university-based, tertiary care health system.

The four EHR "component" information systems successfully analyzed (and, in
two cases, successfully implemented) to complement the organizations' existing,
"core" EHR systems include, respectively:

- a picture archiving and communications system (PACS) for its radiology
  and cardiovascular disciplines

- a voice-text-speech (VTS) system for its health information management,
  radiology, cardiology, and pathology disciplines

- an electronic document management system (EDMS) for its patient-
  centric documents

- an enterprise content management system (ECMS) for its external patient
  information.

**Essential Electronic Health Record Component Information Systems:
Four Different Case Reports,
Four Different Healthcare Management Challenges**

CASE REPORT # 1

A Fellow Project
prepared for the Credentials Committee
of the
American College of Healthcare Executives

By:

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November 2008

In preparing my Fellow Project, I did not use the assistance of an editor.

My signature attests that the following Fellow Project represents my own work:

**Essential Electronic Health Record Component Information Systems:
Four Different Case Reports,
Four Different Healthcare Management Challenges**

CASE REPORT # 1

_____

Deborah Kohn
November 2008

CASE REPORT #1

A small, critical access-based, acute care organization
A picture archiving and communications system (PACS) for its radiology and
cardiovascular disciplines

Organizational Information

Healthcare provider organization (HPO) #1 is a 140-bed, not-for-profit, rural,

critical access-based acute care organization serving a population of

approximately 80,000 people in, primarily, two counties of a northeastern state.

Brief Summary of the Problem

HPO #1's complex, technical, information technology problem involved deciding

how to transition to a new Picture Archiving and Communications System

(PACS) product that was being "sunsetted" by HPO #1's current vendor as well

as, simultaneously, how to utilize a generous United States Department of

Agriculture grant to procure and install:

- a Computed Radiography (CR) system that would allow HPO #1 to

  digitize its remaining (approximately 65%) analog (i.e., film-based)

  diagnostic radiology services modalities (x-ray and mammography)

- a Cardiology/Cardiovascular services-based (C/CVS) PACS to begin

  digitizing HPO #1's existing, analog diagnostic cardiology services

  modalities as well as capturing and storing digital "objects" (e.g.,

waveforms, motion video / cine) and still-frame images from HPO #1's diagnostic cardiology and cardiovascular "object" and image-generating modalities (e.g., ECG/stress test, Holter Monitor, echocardiography, nuclear cardiology equipment, etc.).

Management's action to solve the problem was to retain an experienced healthcare information technology consultant who could assess HPO #1's current and future CR, C/CVS, and Imaging Services Department (ISD) PACS needs as well as provide management with strategic recommendations so that HPO #1 could successfully begin to select an enterprise PACS for C/CVS and ISD and a CR system.

Description of the Problem

During 2003, at the center of HPO #1's strategic telemedicine initiative and to meet HPO #1's diagnostic radiology service requirements, HPO #1 procured and installed Philips Medical Systems' radiology-based Easy Access Picture Archiving and Communications System (PACS) product. This product allowed HPO #1 to capture and store digital images from HPO #1's plethora of Digital Imaging and Communications in Medicine (DICOM) standard-based radiology image-generating equipment (i.e., modalities). Such modalities included:

- Siemens' Magnetic Resonance Imaging (MRI)
- General Electric's (GE) 32 slice, combined Positron Emission

Tomography and Computer Tomography (PET/CT)

- several Philips Ultrasound (US) machines to support HPO #1's Imaging Services (i.e., Radiology Services, RS) and Cardiovascular Lab

- Siemens' Nuclear Medicine (NM) equipment for radiology and cardiology.

In addition, the implementation of the Philips Easy Access PACS **web viewer** (PACSweb) allowed authorized, HPO #1 specialty and referring physicians to access / view the radiology-based PACS images within HPO #1 (e.g., in the HPO #1 operating rooms, on the HPO #1 units, etc.). However, HPO #1's radiology-based PACS had not been integrated with HPO #1's existing, "core", electronic health record (EHR) system, Cerner Corporation's Millennium EHR, via Cerner Millennium's RadNet Radiology Information System (RIS).

During late 2005, Philips turned its radiology-based PACS product strategy on its head when the company acquired Stentor, Inc. For several years, Stentor had developed and marketed its highly successful iSite Radiology, iSite Enterprise, and iVault PACS products.

As a result of this acquisition, Philips announced its decision to market / support only the (formerly Stentor) iSite radiology PACS solution suite and sunset its

Easy Access PACS product. Despite Easy Access having been installed in hundreds of healthcare organizations in the US and Europe, Easy Access, known in the PACS world as a "mini-PACS", did not fully support all radiology-based PACS features and functions. In addition, HPO #1's Imaging Services Department (ISD) as well as several HPO #1 specialist and referring physicians were not content with many Easy Access capabilities.

During 2006, in continuation of its strategic telemedicine initiative, HPO #1 received a generous United States Department of Agriculture grant to procure and install:

- a Computed Radiography (CR) system that would allow HPO #1 to digitize its remaining (approximately 65%) analog (i.e., film-based) diagnostic radiology services modalities (x-ray and mammography)

- a Cardiology/Cardiovascular services-based (C/CVS) PACS to begin digitizing HPO #1's existing, analog diagnostic cardiology services modalities as well as capturing and storing digital "objects" (e.g., waveforms, motion video / cine) and still-frame images from HPO #1's diagnostic cardiology and cardiovascular "object" and image-generating modalities (e.g., ECG/stress test, Holter Monitor, echocardiography, nuclear cardiology equipment, etc.).

Consequently, by late 2006, HPO #1 was confronted with several technical and clinical-related options regarding the grant-based CR and C/CVS-based PACS project as well as determining the fate of its existing radiology-based PACS. The technical and clinical options needed to be carefully analyzed to procure and install the grant-based CR and C/CVS-based PACS information systems. This included analyzing how the two, new, EHR "component" information systems would successfully integrate with HPO #1's existing, "core" EHR system, Cerner Millennium.

For example, regarding the grant-based CR and C/CVS-based PACS project, the following options needed to be analyzed:

- Should HPO #1 procure and install a single vendor PACS solution that could serve radiology and cardiology equally well, **excluding** CR?

- Should HPO #1 procure and install a single vendor PACS solution that could serve radiology and cardiology equally well, **including** CR?

- Should HPO #1 procure and install a "best-of-product" solution that potentially could consist of a separate CR system, a separate radiology-based PACS, and a separate C/CVS-based PACS?

- Should HPO #1 procure and install a single archive platform solution that could support not only radiology and cardiology but other HPO #1 digital image/object-generating disciplines, if required in the future?

Regarding how the two, new, EHR "component" information systems would successfully integrate with HPO #1's existing, "core" EHR system, Cerner's Millennium EHR, as well as the fate of its existing radiology-based PACS, the following options needed to be analyzed:

- Should HPO #1 procure and install a PACS solution provided by Cerner (ProVision PACS) that could serve only radiology well? Despite a recent upgrade, Cerner did not provide a PACS solution that could serve cardiology well, including CR.

- Should the option involve Philips' new iSite PACS solution? Cerner proposed that any "outside" PACS integration to Cerner's EHR/RIS still would require Cerner's ProVision Web PACS module at $110,000.

Administrative Decisions

It was in this context that in early 2007, HPO #1 engaged Deborah Kohn, principal of Dak Systems Consulting (San Mateo CA) to help "sort out" the above options and questions. Such consulting assistance included:

- assessing HPO #1's current and future CR, C/CVS, and Imaging Services Department (ISD) PACS needs

- providing strategic recommendations so that HPO #1 could successfully begin to select an enterprise PACS for C/CVS and ISD as well as a CR system.

A month later, Deborah conducted eleven onsite interviews consisting of six HPO #1 physicians and five HPO #1 staff members. The physician interviews consisted of Emergency Medicine, Radiology, Cardiovascular Surgery, Radiation Oncology, Cardiology, and Pulmonary Medicine physicians. The staff interviews consisted of HPO #1's Chief Information Officer, the Director of the Cardiopulmonary Services Department, the Radiology PACS Administrator, the Director of the Imaging Services Department, and a Network Administrator. In addition, Deborah reviewed HPO #1's existing information systems, technologies, and processes related to CR, C/CVS and ISD PACS.

The eleven onsite interviews provided Deborah with a wealth of information for assessing current and future CR, C/CVS and ISD PACS needs. For example, Deborah was able to obtain key technical and functional requirements for the CR, C/CVS and ISD PACS. In addition, Deborah learned that HPO #1's Management Information Systems (MIS) Department understood that an "enterprise" PACS should refer to the ability to incorporate a "vertical-based" infrastructure that includes all the enterprise disciplines (the "ologies") that generate digital, diagnostic "objects" / images (e.g., radiology, cardiology / cardiovascular services, oncology, endoscopy, pathology, etc.). Also, Deborah learned that many HPO #1's grant-funded PACS / CR project team members already had

discussions with several vendors and / or viewed vendor products via onsite demonstrations.

Results

Consequently, the following six strategic recommendations were articulated and subsequently presented to and accepted by HPO #1's senior management team.

RECOMMENDATION I

It was recommended that HPO #1 consider a single vendor PACS solution that could serve radiology and cardiology <u>equally well</u>, including CR.

Technically, this was the preferred solution. This was because of the:

- complex integration and demanding network requirements of the radiology-based static images and the cardiology/cardiovascular-based "objects" / moving images into HPO #1's overall EHR system strategy

- overall lower cost of ownership / management this solution provides.

Clinically, also this was the preferred solution. This was because of the HPO #1 physicians' eventual needs to have:

- similar screens (i.e., intuitive, similar look and feel), similar "one click" auto-launch solutions, similar image retrieval tools, etc.

- the ability to view a comprehensive record without having to log out of one system and onto another (i.e., to be able to tap into the patient's Cerner EHR-based record [via Cerner's PowerChart viewer] and retrieve all the objects / images across all the enterprise disciplines).

Unfortunately, given today's radiology and cardiology / cardiovascular-based PACS market, this recommendation would not be easily achieved, especially with the inclusion of CR. This is because not all PACS vendors provide CR systems. (A modified single vendor PACS and CR solution might be necessitated with the CR component separated from this recommended solution.)

However, this option was doable. As the trend of vendor consolidation continues in the PACS marketplace, most vendors realize that all the "ologies" must work more collaboratively. In addition, more healthcare provider organizations, especially those like HPO #1 that are procuring their second generation PACS, are requiring a single vendor PACS solution for radiology and other "ologies".

As such, today, most vendors are working to quickly and tightly integrate their radiology-based and (typically, acquired) cardiology-based PACS products "at the hip" – at the product architectural level – with similar screens, similar retrieval methods, preferably single databases but separate databases if the databases use

the same database vendor, etc. However, today, frequently this fierce, competitive effort ends up compromising the required functionality of the specific disciplines. Such functionality must remain robust and unique so that each "object" / image-generating discipline can be used with different, sophisticated viewing preferences and interpretation tools.

Consequently, Deborah recommended that HPO #1's decision-making process be based on serving both disciplines EQUALLY WELL (i.e., NOT perfectly). It was highly likely that this important concept would have to be emphasized and re-emphasized throughout the decision-making process to achieve the recommended technically and clinically-preferred solution.

RECOMMENDATION II

It was recommended that HPO #1 carefully analyze three, large, financially stable vendors with successful products to support a single vendor PACS solution that could serve radiology and cardiology <u>equally well</u>.

- **<u>Fujifilm Medical Systems'</u>** Synapse for Radiology and ProSolv for Cardiology
- **<u>McKesson Provider Technologies'</u>** Horizon Medical Imaging - for Radiology and Cardiology

- **Philips Medical Systems**' iSite for Radiology and Xcelera for Cardiology / Cardiovascular imaging

RECOMMENDATION III

Because HPO #1 wanted to analyze six vendors / products (as requested of Deborah) to support a single vendor PACS solution serving radiology and cardiology <u>equally well</u>, it was recommended that HPO #1 analyze three additional vendors / products.

- **Agfa HealthCare**'s IMPAX for Radiology and HeartStation / HeartLab for Cardiology (ECG) / Cardiovascular imaging, respectively
- **Emageon's** Enterprise Visual Medical System – RadSuite, HeartSuite, MammoSuite
- **ScImage's** PICOM Enterprise for Radiology and Cardiology

RECOMMENDATION IV

Despite the fact that HPO #1 would have to acquire Cerner's ProVision Web PACS module at $110,000 to integrate to any "outside Cerner" PACS, it was recommended that HPO #1 <u>not</u> consider analyzing Cerner's ProVision PACS for Radiology and Cardiology. On the other hand, it was recommended that HPO #1 analyze Cerner's relatively new (2005) MultiMedia Foundation module and, perhaps, leverage the cost of the

MultiMedia Foundation module against the cost of the Provision Web PACS module.

In addition, it was recommended that HPO #1 utilize its existing Cerner RadNet RIS for HPO #1's "mock" Cardiology / Cardiovascular Information System (C/CVIS), which, once interfaced to the new radiology and cardiology-based PACS could support several Integrating the Healthcare Enterprise (IHE) RIS and C/CVIS "actors", such as order placer, order filler, order scheduler. (IHE allows healthcare messaging standards to be uniformly implemented.)

RECOMMENDATION V

It was recommended that a single archive platform solution be carefully analyzed to support not only radiology and cardiology, but other HPO #1 digital image/object-generating disciplines, if required in the future. As such, along with the previously listed radiology and cardiology / cardiovascular PACS vendors / products, and ONLY if HPO #1's product-of-choice did NOT provide a satisfactory archive platform for the enterprise, it was recommended that HPO #1 additionally analyze several archive platform solutions.

All the archive solution vendors / products in the marketplace offer a patient-centric, central repository for most data types ("object" data / diagnostic and

document image data / ASCII data). For diagnostic image data, non-DICOM

images also can be stored. Typically, the archive represents a single site or

multiple sites and a centralized or distributed archival environment. Typically,

the solutions allow any application to control the archive through an open

Application Programming Interface (API). Typically, the storage plans are based

on user-defined rules per data type.

However, technically, an enterprise PACS strategy should embrace shared,

centralized technologies and services allowing for shared financing and

centralized hosting opportunities (i.e., a service-oriented architecture [SOA]).

Therefore, should HPO #1 analyze an enterprise archive platform solution(s), it

was recommended that each HPO #1 "object" / image-generating discipline:

- take ownership of the specific application hardware, software or modality

    provided by the specific application hardware, software or modality

    vendor with each solution "wrapped" with a service layer

    and

- share ownership of the enterprise-wide diagnostic "object" / image

    management system by paying only for those horizontal and vertical

    infrastructure technologies and services that are required,

collectively forming a "virtual data repository" that is accessible to all HPO #1

clinicians for viewing or interactive use. In addition, no longer would there be a

need to distinguish between a short and long-term archive.

RECOMMENDATION VI

Despite growing, internal, clinical competition among the "ologies" for the same patients, it was recommended that in addition to HPO #1 providers and staff in C/CVS and ISD who would be involved in HPO #1's formal enterprise PACS and CR project decision-making process, more of the other diagnostic object / image-generating disciplines' providers and staff be involved, too. Also, it was recommended that the process be anchored by MIS, including MIS' Network / Telecommunications staff and HPO #1's Biomedical Engineering staff. Much of this project's success then would be attributed to dedicated, HPO #1 enterprise "object" / image-generating and related disciplines that would realize that this project would offer them a natural extension of their current and existing skill sets.

Source Material

There were no source materials used in resolving the problem, such as books, magazines, articles, seminars, etc. I was the experienced healthcare information technology consultant retained to resolve the problem.

Essential Electronic Health Record Component Information Systems:
Four Different Case Reports,
Four Different Healthcare Management Challenges

CASE REPORT # 2

A Fellow Project
prepared for the Credentials Committee
of the
American College of Healthcare Executives

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November 2008

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In preparing my Fellow Project, I did not use the assistance of an editor.

My signature attests that the following Fellow Project represents my own work:

**Essential Electronic Health Record Component Information Systems:
Four Different Case Reports,
Four Different Healthcare Management Challenges**

CASE REPORT # 2

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Deborah Kohn
November 2008

CASE REPORT #2

A medium-sized, community-based integrated healthcare delivery network
A voice-text-speech (VTS) system for its health information management,
radiology, cardiology, and pathology disciplines

Organizational Information

Since 1996, healthcare provider organization (HPO) #2 consists of three, not-for-profit, community hospitals that have been united as part of one health system. HPO #2 is located in a northeastern state.

Brief Summary of the Problem

HPO #2's complex, information technology problem involved deciding how to move HPO #2 toward a full electronic health record when the existing "component" EHR information systems (Voice / Text) not only were <u>not</u> meeting HPO #2's enterprise-wide clinical needs but were posing significant technical and functional challenges for the organization. Management's action to solve the problem was to retain an experienced healthcare information technology consultant who could assess HPO #2's existing voice and text information systems / services and to develop a comprehensive three to five year strategic, information systems plan regarding these systems.

Description of the Problem

By 2006, HPO #2 still was using two, disparate information systems for Voice (dictation) and Text (transcription) that were not only <u>not</u> meeting its enterprise-wide clinical needs but were posing significant technical and functional challenges for the health system.

For Voice, in general, Nuance Communications, Inc.'s Dictaphone Healthcare Solutions Division's Enterprise Express (EEx) VoiceSystem™ was used for HPO #2's digital dictation system. (However, some of HPO #2 hospitals' clinicians dictated reports into stand-alone, analog, cassette tape / voice recording systems, such as the cardiologists for ECG Interpretation Reports and the pathologists for Surgical Pathology Reports.) For Text, in general, Medical Information Technology, Inc.'s (MEDITECH) Health Care Information System™ (HCIS) operating on MEDITECH's proprietary MAGIC operating system was used not only as HPO #2's "core" EHR but for its digital transcription system, including its electronic signature (eSig) capability. (However, some of HPO #2 hospitals' dictated reports were transcribed into stand-alone, word processing systems, such as the Pathology Consultation Reports.) Three MEDITECH HCIS application modules were used to transcribe HPO #2's dictated reports:

- MEDITECH's Departmental (DPT) for Health Information Services' transcribed reports

- MEDITECH's Laboratory – Pathology (PTH) for Pathology Services' transcribed reports

- MEDITECH's Radiology (RAD) for Radiology Imaging Services' transcribed reports.

To make matters more complicated, only for the reading of the Magnetic Resonance Imaging (MRI) procedures performed at one of HPO #2's hospitals did the radiologists use Nuance Communications, Inc.'s Dictaphone Healthcare Solutions Division's PowerScribe for Radiology™ "orders"-based product for front-end clinician editing speech recognition system (Speech). An "orders"-based speech recognition system is one that primarily is used by the Radiology, Pathology and other, related service departments where ordered test results are dictated. This is opposed to an "encounters"-based speech recognition system that primarily is used by Health Information Management and other, related service departments where encounter information is dictated. In addition, all three, unstructured data-based, clinical document information systems (voice, text, and speech) needed to exist in tandem (i.e., to be integrated) with HPO #2's existing:

- "core" EHR system, MEDITECH's HCIS, running on MEDITECH's MAGIC operating system platform

- "component" EHR system, McKesson Technology Solutions (Alpharetta GA) radiology-based Horizon Picture Archiving and Communications System (PACS).

This integration was critical to moving HPO #2 toward a full electronic health record.

It was mentioned earlier that these existing "component" EHR information systems (Voice / Text) not only were not meeting HPO #2's enterprise-wide clinical needs but were posing significant technical and functional challenges for the organization.   In general, the challenges regarding Dictaphone's voice system were **technical**. In general, the challenges regarding MEDITECH's text system were **functional**.

For example, since the completion of HPO #2's upgrade of Dictaphone's EEx VoiceSystem Software version 4.x to version 6.x, which included a hardware reconfiguration, the technical performance of the Dictaphone voice system had been so unreliable and unstable that there were only a few days reported when the system was NOT "down" for a period of time. Understandably, this had caused an enormous amount of frustration and anger for dictating HPO #2 clinicians as well as supporting HPO #2 staff members (transcriptionists, systems analysts, department directors, etc.). In addition, this had a significant impact on the

production workflows and work efficiencies of HPO #2's clinical reports, which are critical to the delivery of high quality patient care services and the speedy reimbursement of those services.

Given that, understandably, MEDITECH's HCIS' core competencies do NOT focus on word processing capabilities, MEDITECH's HCIS report **input** functionally suffered from excessive, cumbersome keystrokes and other, related and unsatisfactory ease-of-use features. MEDITECH's HCIS report **output** functionally suffered from a severe lack of word processing "professionalism" expected of today's competitive HPO #2's clinicians and supporting staff members.

Administrative Decisions

Consequently, during 2006, HPO #2 retained Deborah Kohn, principal of Dak Systems Consulting (San Mateo CA) to assess HPO #2's existing voice and text information systems / services and to develop a comprehensive three to five year strategic, information systems plan regarding these systems. This involved:

- identifying the requirements and challenges for HPO #2's Health Information Services (HIS), Radiology Imaging Services (RIS), Cardiology Services (CS), Pathology Services (PS), and other HPO #2 areas where dictation and transcription systems existed

- identifying transcription staffing requirements for all HPO #2 areas

  - On-Site (i.e., on-campus)

  - Remote (i.e., at home)

  - Outside Services (i.e., outsourcing agencies)

- evaluating dictation and transcription system models

  - Premise-based (i.e., in-house)

  - Application Service Provider (ASP)-based (i.e., hosted)

  - Speech Recognition

    - Self-Correction-based

    - Correctionist-based

- investigating vendor / product solution options.

To accomplish this project's deliverable, Deborah conducted twenty onsite interviews / meetings to identify Voice, Text, and Speech requirements and challenges for HPO #2's HIS, RIS, CS, PS and other areas. Also, Deborah reviewed HPO #2's related, existing and planned, enterprise-wide information systems, technologies, and processes.

The twenty onsite interviews provided Deborah with a wealth of information for identifying current and future Voice, Text, and Speech requirements and

challenges. For example, when the Voice and / or Text systems were down (even for scheduled events), the associated inconveniences and productivity delays were excruciating, and the effects of the delays on patient safety and patient care (e.g., not being able to provide immediate access to patient information) were realized throughout the enterprise.

When MEDITECH's Text system would go down (even for a glitch, such as thirty seconds), often a recover function did not work immediately or at all. When all three HPO #2 community hospital sites' Dictaphone Voice systems were down due to the database servers, the system would "lock" (i.e., "jobs" [reports] would be locked in the system).   Consequently, all three systems had to be turned off to release the jobs and then rebooted – a process performed at midnight by a Florida-based Dictaphone employee. Then, reports had to be redictated and retyped, often resulting in duplicate reports. Many locked "jobs" were STAT reports, exacerbating clinician and transcriptionist frustrations.

When one HPO #2 community hospital site's Dictaphone Voice system was down due to the voice recorder servers, clinicians and transcriptionists were able dial into another hospital site. However, the HIS Transcription Team Lead had to block out / special assign the regular occurring jobs at the dialed-in site. And when the voice recorder servers would come up, the jobs had to be re-released.

When any changes were made to the HPO #2's network or the network slowed,

the Dictaphone Voice file retrievals and header prompts would slow, affecting

transcriptionist Turn-Around-Times (TATs), which affected physicians waiting

for the reports. When off-site transcriptionists experienced poor Internet

connections, again TATs would be affected, which affected physicians waiting for

the reports. When the electricity would go out at one of the hospital sites, a

generator stored in a department coat closet had to be fetched to maintain the

voice recorder servers.

Results

Consequently, the following seven strategic recommendations were articulated

and subsequently presented to and accepted by HPO #2's senior management

team. Also, during 2007, Deborah's professional services culminated in assisting

HPO #2 as Project Manager for the enterprise-wide Voice / Text / Speech (VTS)

vendor / product selection process.

RECOMMENDATION I

For integrated EHR purposes, it was recommended that in the near future

HPO #2 convert from Dictaphone's Voice and MEDITECH's Text system to

one, integrated, enterprise–wide Voice / Text / Speech vendor / product.

Even though HPO #2's IT strategic plan called for a MEDITECH-integrated organization, MEDITECH's Text system functionality was not (and should not be) MEDITECH's core competency, which explained MEDITECH's lower-priority efforts to enhance its existing Text system capabilities. Such a change in IT strategy would require more interfaces and higher costs. However, HPO #2 did not bear the same burden as other provider organizations that choose "best of breed" information systems. In addition, given all the medical devices and instruments that generate electronic reports for inclusion in the EHR, organizations that strictly maintained such a status quo would not be able to realize the EHR.

Also, an enterprise-wide solution still would allow all the HPO #2 Voice / Text / Speech functional, line-of-business departments to remain separate, so that each department would be able to meet their unique needs; yet, also, allow the departments to focus on one vendor / product for important team collaboration and maintenance.

RECOMMENDATION II
It was recommendation to deploy a Speech system <u>with correctionists</u> (i.e., back-end editing).

Even though today's Speech systems maintain a significant 5 – 10% inaccuracy rate and have been "coming to a store near you" for the last twenty five years, only a sleeping giant would not recognize the potential for Speech vis-à-vis rising report volumes, escalating costs, and the scarcity of sufficiently trained transcription staff. This is because, for the wide range of dictators who are already Voice telephone-based, those dictators would continue their normal dictation patterns. Speech recognition would work "in the background" with the dictated reports edited by back-end "correctionists" to speed overall report production. Also, despite correctionists having to edit / correct a sufficient volume of Speech-entered reports in the learning phase, typically, correctionist technology fits comfortably into most existing transcriptionist workflows. In addition, an integrated Voice / Text / Speech product permits transcriptionists to more easily switch between work types (e.g., STAT reports, Operative reports, Discharge Summary reports, etc.).

Specifically, Deborah did not recommend deploying Speech with self-correction (i.e., front-end editing), even for those few clinicians who might have been willing to use Speech in that manner. Instead, Deborah recommended that this option be offered during a longer-term implementation phase of the new, converted Voice / Text / Speech product – if and when the entire, new product had been fully implemented, gained new workflow efficiencies, and demonstrated high user acceptance, etc.

RECOMMENDATION III

It was recommended that the following, general criteria be used to evaluate vendors / products.

Security: 1) The integrated VTS system must include built-in, comprehensive, user-level data security features, which will provide assurances that information can be accessed and modified only by authorized personnel. 2) Controls must be included to ensure the integrity and protection of all the data entered into or presented by the system.

Vendor: 1) The vendor must maintain a deep system support personnel pool, with constituents who have the appropriate functional and technical expertise and who are readily available to support the organization. 2) The vendor must have a reputation for financial and organizational stability. 3) The vendor must be fully committed to the health care industry concerning breadth of product base, product development plans, and research and development expenditures. 4) The vendor must have established an existing base of healthcare provider organization customers who are satisfied with the vendor's systems / applications / support services and who can be used as references. 5) The vendor must be fully committed to the ongoing support of its products and services. 6) The vendor must offer a software support/maintenance agreement that assists in monitoring

system performance (e.g., guaranteed uptimes) and provides system

enhancements including modifications requested by the organization. 7) The

vendor must provide both license-based and subscription-based product solutions.

System Functionality: 1) The integrated system must be user-friendly (e.g. menu-

driven screens, icons, help screens, easy-to-read screens/reports). 2) The

integrated system must be easy to use by professional and nonprofessional

personnel who are not skilled in information technology. 3) The integrated

system must enhance the flow of information to facilitate user satisfaction.

System Cost: 1) One-time costs, including hardware, software, and services (e.g.,

implementation, integration, and interface fees), must be reasonable and

commensurate with the benefits provided by the system. 2) Recurring costs must

be reasonable and commensurate with the benefits provided by the system.

Vendor Training/Documentation: 1) The vendor must provide detailed technical

and functional training to appropriate hospital personnel. 2) The integrated

system does not require a long and complicated training process for the personnel

who will be utilizing the system. 3) The vendor must provide online system and

user documentation that is well-written and clearly understandable to hospital

personnel. 4) The online system and user documentation updates must be

provided in a timely manner.

Hardware / Software: 1) The required system hardware and software must be consistent throughout the vendor's product line. 2) The integrated system must meet the organization's processing requirements in terms of transaction volumes, response times, throughput, downtimes, etc. 3) The integrated system and its related hardware peripherals must be reliable with no significant amount or frequency of unscheduled downtime. 4) The integrated system must have the ability to easily (i.e., not complicated) back-up and restore the systems' key data files.

System Flexibility/Scalability: 1) The integrated system must be easily maintained and modified by the organization to accommodate the organization's specific and ever-changing functional requirements. 2) The integrated system must be extensible and scalable to accommodate future growth in information systems requirements. 3) The system users must be able to easily access standard reports, manipulate report data, and create ad hoc reports. 4) The integrated system must be parameter-driven and allow for user-defined fields.

System Integration: 1) The integrated system must be able to tightly integrate with the organization's existing and planned information systems using available

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Technical Frameworks (i.e., implementation guides) that consist of vendor-neutral implementations of existing healthcare IT data standards, including but not limited to the HL7 standard of messaging. 2) The integrated system must be able to download information to a variety of network addressable, Internet-enabled, digital hand-held devices in a usable format.

RECOMMENDATION IV

It was recommended that when evaluating the new, integrated Voice / Text / Speech product, HPO #2 perform a crucial, one-on-one comparison with each potential Text system's eSig capability vs. MEDITECH's HCIS existing Text eSig capability.

Having the Text eSig capability reside in an organization's "core" EHR is strategically preferable for integrated EHR purposes. In other words, clinicians would not have to use one eSig capability for structured HCIS data input (electronic orders, electronic documentation, etc.) and another eSig capability for unstructured Text data input (transcribed reports). In addition, HPO #2's Information Technology (IT) Department wanted to expand its efforts to integrate the MEDITECH EHR to community physician practices / systems. MEDITECH's Text eSig capability would be critical to that effort. However, a functionally weak eSig capability might not be worth the integration benefit.

On the other hand, an unproven (i.e., unable to be demonstrated as well as not user-accepted) yet functionally robust eSig capability might not be worth the functional benefit. For example, at another MEDITECH MAGIC HCIS EHR customer site, MEDITECH's eSig capability was retained even though the organization used another Text vendor / product with a robust eSig capability. The MEDITECH eSig process at this facility was viewed by its clinicians as more simple ("2 steps") than the Text vendor / product eSig process. And, the Text vendor / product eSig capability would have required another interface.

At still another MEDITECH MAGIC HCIS EHR customer site, MEDITECH's eSig capability was not retained, and, instead, the organization used its other Text vendor / product's eSig. The MEDITECH eSig process was viewed by this facility's clinicians as more cumbersome than its Text vendor / product eSig process, despite having to implement another interface.

RECOMMENDATION V

It was recommended that HPO #2 retain all three existing transcription staffing models with the implementation and use of the new Voice / Text / Speech product.

In other words, it was recommended that HPO #2 retain some transcription employees on-site (e.g., on-campus) for management, experience, quality, and loyalty purposes; retain and add more HPO #2 transcription employees off-site (e.g., remotely - at home, off-campus office building) for the above purposes as well as purposes of utilizing today's technology and personal / convenience requirements; and , retain local, outsourced company transcriptionists, especially for backup purposes but also for their experience, loyalty, and quality.   The reasons for this recommendation were the following:

- The above combination of transcription staffing models would provide HPO #2 with superior quality and staffing flexibility at an affordable price.

- HPO #2 was "blessed" by having motivated, dedicated transcription employees and outsourced personnel!

- HPO #2's clinicians were fast dictators, relatively efficient, and very attached to the dictation process. Therefore, at that time, mission critical, patient care-based, EHR component information systems, such as Voice / Text / Speech that are relatively resource-intensive could not be about eliminating or reducing FTEs. As a former transcription product company Chief Executive Officer said to Deborah circa 1988, "If (HPO #2) wants to save money on transcription, don't talk as much!"

In addition, with the kind of resources and impressive TATs and performance indicators at HPO #2, Deborah recommended that, in particular, HIS absorb more business and even generate revenue from, perhaps, community physician offices, other internal departments, clinics. Or, Deborah recommended using HPO #2's resources to re-engineer staffing rotations on weekends / holidays, primarily to appease the organization's cardiologists.

RECOMMENDATION VI

It was recommended that HPO #2 provide a combination of system models with the implementation of the new, integrated Voice / Text / Speech product.
In other words, it was recommended that HPO #2 procure and install in-house (premise-based) the Voice / Text hardware / software and have the vendor host (Application Service Provider - ASP) the Speech (with correctionists) hardware / software.

The reasons for this recommendation were the following:

- Having both premise-based and hosted systems complements one another. Most organizations benefit best from an approach that leverages the competencies and cost advantages of both internal and external resources and systems.

- Typically, the premise-based model provides more robust functionality at a higher, upfront cost (perpetual licenses) and allows the users to better manage more complex, mission critical processes that essentially define the value of the organization's business.

- Typically, the hosted model provides more flexibility at a lower, upfront cost (subscription licenses) and allows the users to better manage more generic, less complex processes that enable an organization's business.

RECOMMENDATION VII

In the event that new system servers could not be partitioned to run both in text and production modes, it was recommended that HPO #2 invest in test servers for these information systems. As such, redundant, clustered servers for these information systems were recommended.

Unfortunately, this recommendation would be costly. However, at HPO #2, the component Voice and Text information systems would continue to be mission critical for a long time. Therefore, such costs needed to be budgeted into HPO #2's cost of doing business and Total Cost of Ownership (TCO).

Source Material

There were no source materials used in resolving the problem, such as books,

magazines, articles, seminars, etc. I was the experienced healthcare information

technology consultant retained to resolve the problem.

Essential Electronic Health Record Component Information Systems:
Four Different Case Reports,
Four Different Healthcare Management Challenges

CASE REPORT # 3

A Fellow Project
prepared for the Credentials Committee
of the
American College of Healthcare Executives

By:

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November 2008

In preparing my Fellow Project, I did not use the assistance of an editor.

My signature attests that the following Fellow Project represents my own work:

**Essential Electronic Health Record Component Information Systems:
Four Different Case Reports,
Four Different Healthcare Management Challenges**

CASE REPORT # 3

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Deborah Kohn
November 2008

CASE REPORT #3

A large, clinic-based integrated healthcare delivery network
An electronic document management system (EDMS)
for its patient-centric documents

Organizational Information

Healthcare provider organization (HPO) #3 is a large, not-for-profit, integrated

healthcare delivery organization headquartered in the upper Midwest. With a

group practice consisting of over 350 employed physicians who staff 38 clinic

locations in several upper Midwest states, HPO #3 exemplifies the clinic model of

healthcare delivery. In addition, HPO #3 includes one hospital at two locations,

which consists of approximately 580 acute, sub-acute, and post-acute licensed

beds.

Brief Summary of the Problem

HPO #3's information technology problem involved determining if and / or when

to acquire and implement an electronic document management system (EDMS), a

"component" EHR system, for its several business units. Management's action to

solve the problem was to retain an experienced healthcare information technology

consultant who could provide healthcare information technology advisory and

strategy consulting assistance. Such assistance consisted of preparing a

- Needs Assessment

- Strategic Plan

- Return on Investment Analysis

- Short List of Suitable EDMS Integrators / Suppliers

- EDMS Request for Proposal (RFP)

Description of the Problem

Despite significant investments in and benefits from a wide range of implemented electronic information systems, several HPO #3 business units, in whole or in part, realized the need for an electronic document management system (EDMS), a "component" EHR system. EDMSs enable business units to more effectively and efficiently use and process paper and computer-generated documents, such as forms, notes, letters, reports, and messages. EDMSs allow business units to migrate from their existing analog and manual output and processes to digital output and processes. And, EDMSs complement business units' already-automated or, perhaps, less-than-automated, data technology solutions. As such, frequently, EDMSs become critical for healthcare provider organizations to continue to realize quality improvements in work processes.

Administrative Decisions

In 2003, HPO #3 engaged Deborah Kohn, principal of Dak Systems Consulting (San Mateo CA) to provide healthcare information technology advisory and

strategy consulting assistance for this project. The EDMS Project consisted of the

following, deliverables:

- Needs Assessment

- Strategic Plan

- Return on Investment Analysis

- Short List of Suitable EDMS Integrators / Suppliers

- EDMS Request for Proposal (RFP)

To accomplish the deliverables, Deborah:

- provided two, introductory EDMS education presentations to HPO #3

  executive managers, Information Systems (IS) Strategy Committee

  members, and professionals in the affected business units

- examined sample analog documents from many of the business units and

  provided recommendations so that the paper documents would be easier to

  digitally scan and, eventually, automate via the EHR

- coordinated visits to four EDMS vendor booths at the 2003 HIMSS

  Convention

- reviewed existing and planned HPO #3 information systems and

  technologies

- conducted eighteen interviews to assess HPO #3's current business

  requirements, barriers, readiness and opportunities for document

management.

All the above provided Deborah with a wealth of information for identifying HPO #3's current and future EDMS requirements, enterprise readiness, and challenges. For example, Deborah was able to confirm that all the affected business units required an electronic document solution to more effectively and efficiently manage the use and processing of their paper and computer-generated documents and to improve their work processes. Specifically, the Revenue Management business unit, of which its two divisions (Business Services and Health Information Management [HIM]) worked with patient-centric documents (e.g., patient administrative, clinical, and financial documents), required an IMMEDIATE electronic document solution as a "component" information system to HPO #3's existing "core" EHR systems. This was because Revenue Management had a near-term, executive objective to significantly reduce financial and medical compliance risks and improve customer service.

Frequently, Revenue Management's Business Services division failed to produce proof of "medical necessity" or documentation to support billed services to Medicare, which is considered fraudulent billing. Revenue Management's HIM division no longer could provide exceptional services for its customers. This was because HPO #3's Clinic Patient EHR system (GE's Centricity) was able to

generate and store only approximately 75% of the clinic patient medical record. The remaining 25% of the clinical medical record consisted primarily of hand-written notes and / or external documents that were not computer-generated. To resolve this problem, many of the clinics deployed store-bought Optical Character Recognition (OCR) software and related scanning devices to translate and import the non-computer-generated documents as text documents into the Clinic Patient EHR system.

In addition, HPO #3's Hospital Patient EHR system (Siemens' Invision) was able to generated and store only approximately 25% of the hospital patient medical record, with the remaining 75% of the hospital medical record consisting of non-computer-generated documents. Integrating clinic patient and hospital patient medical record documents (some computer-generated, some not) from two, existing, "core" EHR systems became a nightmare for HIM and its customers who required immediate, simultaneous access to the information.

To complicate matters more, HPO #3 not only had one, "core" EHR system for its clinic patients and one, "core" EHR system for its hospital patients, but it had different, disparate information systems for its clinic patient financial records and its hospital patient financial records. Consequently, HPO #3's existing Master Patient Index (MPI), represented by four different information systems,

threatened the integrity of the EDMS for the enterprise's patient-centric documents. This is because MPI problems occur when "multiple" medical record numbers (i.e., one patient with two or more numbers) and "duplicate" medical record numbers (i.e., two or more patients with same number) are erroneously assigned to patients by registrars or erroneously generated by the multiple information systems that feed the EDMS. When "multiple" medical record number errors occur it is unclear into which database file the patient's document should be entered. If the document is entered in the incorrect file, unnecessary, duplicate tests, billing problems, and increased legal exposure in the case of adverse treatment outcomes are common. When "duplicate" medical record number errors occur, these errors of overlay result in the merging of two different patients' data into one file. The clinical risks are obvious.

Results

Consequently, during that year, Deborah articulated the following six strategic recommendations, prepared the Return on Investment Analysis deliverable, and presented both to HPO #3's senior management team for acceptance. The acceptance by senior management of these deliverables allowed HPO #3 during 2004 to proceed with a vendor / product evaluation / selection process that was based on the distribution of the EDMS RFP deliverable, also prepared by Deborah.

RECOMMENDATION I

It was recommended that HPO #3 pursue an EDMS solution and not just a document imaging solution to allow the affected business units to take advantage of all the EDMS component technologies. Even though document imaging technology was the primary EDMS component technology earmarked by HPO #3 prior to Deborah being engaged, other EDMS component technologies, such as enterprise report management (ERM) and workflow needed to be included in HPO #3's functional requirements to meet HPO #3's many, different, short and long-term, electronic document requirements. In addition, frequently, EDMS benefits can be realized only when multiple EDMS component technologies are used in tandem.

RECOMMENDATION II

It was recommended that HPO #3's EDMS technical strategy be based on a model of shared, centralized, EDMS services (i.e., Service-Oriented Architecture [SOA]), allowing for shared financing and centralized hosting opportunities in the organization.

This technical EDMS approach emphasized EDMS extensibility – by configuring independent, document technology servers that would allow HPO #3 to centralize all the commonly-shared, enterprise-wide document technologies. To accomplish

this, a suite of shared, centralized, document imaging, mass storage, ERM, workflow, etc., servers would manage and control an organization's existing and future application systems' desktop and organizational analog and digital document requirements.

Architecturally, these EDMS component technologies could be viewed as "utilities" – centrally managed by network servers in IS and, subsequently, reducing risk in terms of disaster recovery, mirroring and task scheduling. In addition, as "utilities," the technologies could become more cost-effective. Instead of acquiring these same component technologies from different vendors, the technologies would be provided as shared, centralized services offered by one, or no more than two, EDMS vendors.

Also, this model would allow HPO #3 and its business units to consider a variety of financing and hosting opportunities and to choose only those EDMS component technologies that best suited the organization. HPO #3's diverse business units would be able to take ownership of the specific application software provided by their specific application vendors. HPO #3's diverse business units would be able to share ownership of the EDMS by paying only for those EDMS component technologies and services that are required and provided on a shared, as-needed basis.

RECOMMENDATION III

It was recommended that the EDMS include the following four HPO #3 business units (and divisions) to complement HPO #3's existing, two "core" EHR systems and two "core" patient financial record systems:

- Revenue Management

  – Business Services Division

  – Health Information Management Division

- Business Decision Support Services

  – Diagnosis, Procedure, and Professional Services Coding Division

- Information Services

  – Clinical Informatics Division

- System & Clinical Support Services

  – Referral Management / Pre-Certifications Division

RECOMMENDATION IV

It was recommended that HPO #3's implementation strategy consist of implementing business unit "pilots" over several years. This approach would leverage all EDMS capital and operating costs. Also, it would provide HPO #3 with the flexibility to continually substitute / modify the implementation plan and to "phase-in" the user impact of the EDMS and its component technologies.

Consequently, it was additionally recommended that Revenue Management be the

first HPO #3 business unit to acquire an electronic solution to manage the unit's

existing and future repositories of paper and computer-generated documents.

And, it was strongly recommended that the first "pilot" implementations of the

EDMS dovetail with any and all document aspects of Revenue Management's

Business Services division. This would significantly minimize the Business

Services divisions' current workload inefficiencies and associated financial

compliance risks as well as provide improved, 21st century, customer service.

Therefore, it was recommended that HPO #3 "pilot" the EDMS Business Services

division installation in Clinic Cash Management, whereby the EDMS would

capture externally-generated Explanations of Benefits (EOBs), Remittance

Advices (RAs), Checks, and Correspondence for the Clinics. Then, it was

recommended that the EDMS installation be rolled-out to the Hospital Business

Office, whereby the EDMS would capture externally-generated EOBs, RAs,

Checks, and Correspondence for the Hospital.

Interestingly, Revenue Management's Health Information Management division

used the largest number of HPO #3 electronic information systems but, ironically,

was HPO #3's most analog / manual department! Therefore, Deborah realized

that HPO #3's HIM division would be the most complex and longest-to-install

business unit automated with an EDMS. As such, it was recommended that, in the meantime, HIM diligently continue to standardize patient medical record forms and develop form inventories. When it came time to install the EDMS in the HIM division, it was recommended that the EDMS be "piloted" in the same regional clinics that were used to pilot the "core" Clinic Patient EHR system Only after the clinics would the EDMS HIM installation be rolled-out in the Hospital, and, there, it was recommended that the EDMS be piloted in Hospital patient areas that generated the fewest pieces of paper per episode of care record yet still have major quality of care ramifications, such as the Emergency patient records or the Same Day Surgery patient records

RECOMMENDATION V

It was strongly recommended that HPO #3 acquire an Enterprise Master Patient Index (EMPI) to satisfy the EDMS' infrastructure needs. EMPIs provide access to multiple repositories of information from overlapping patient populations that are maintained in separate systems and databases, such as HPO #3's two "core" EHR systems and two "core" patient financial record systems. The approach is through an indexing scheme to all the organization's databases' unique patient identification numbers and information. As such, EMPIs become THE cornerstones of healthcare systems integration projects. The EDMS would be no exception.

RECOMMENDATION VI

It was recommended that HPO #3 appoint an EDMS executive stakeholder and a physician champion for this project. Such individuals were lacking for this project, and the success of such a project only would be realized given such support.

Source Material

There were no source materials used in resolving the problem, such as books, magazines, articles, seminars, etc. I was the experienced healthcare information technology consultant retained to resolve the problem.

Essential Electronic Health Record Component Information Systems:
Four Different Case Reports,
Four Different Healthcare Management Challenges

CASE REPORT # 4

A Fellow Project
prepared for the Credentials Committee
of the
American College of Healthcare Executives

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November 2008

In preparing my Fellow Project, I did not use the assistance of an editor.

My signature attests that the following Fellow Project represents my own work:

Essential Electronic Health Record Component Information Systems:
Four Different Case Reports,
Four Different Healthcare Management Challenges

CASE REPORT # 4

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Deborah Kohn
November 2008

CASE REPORT #4

A large, university-based, tertiary care health system
An enterprise content management system (ECMS)
for its external patient information

Organizational Information

Healthcare provider organization (HPO) #4 is a large, public, academic / research-based, tertiary care health system located in a southern state. HPO #4 consists of three acute care hospitals, seventy-six ambulatory care clinics, a rehabilitation center, and eight primary care health centers located throughout the state.

Brief Summary of the Problem

HPO #4's healthcare information management problem involved determining how to manage HPO #4's large volume of clinical, financial, or administrative externally-generated patient information (EPI). HPO #4 had no consistent patient information management processes, standards, and information systems for handling EPI, which represented a significant risk in managing patient care and complying with pertinent regulations. Management's action to solve the problem was to 1) initiate a project to develop an enterprise strategy and to define a proposed solution for the management of its EPI and 2) retain an experienced healthcare information management and technology consultant who could assist HPO #4 in realizing the objectives of HPO #4's EPI project.

Description of the Problem

Due to the nature of the health system, its physicians accept a large number of patient referrals. Consequently, on a daily basis, a huge volume of critical patient information comes into HPO #4 from external sources. The information can be clinical, financial, or administrative in nature.

Well-established HPO #4 information management processes, standards, and information systems were geared toward internally-generated patient information, not externally-generated patient information (EPI). As such, HPO #4 had no consistent patient information management processes, standards, and information systems for handling EPI. Instead, policies and procedures for handling EPI were specific to a plethora of units, departments, or individual employees, with no enterprise-wide oversight.

From a clinical perspective, this lack of oversight represented a significant risk in managing patient care and complying with pertinent regulations. Frequently EPI was not available / accessible where and when it was needed for patient care. EPI intake did not always meet HPO #4's standards for data confidentiality and security. Often redundant or irrelevant EPI was received. Typically, caregivers made decisions with little guidance on appropriate EPI storage / retention or destruction. Additionally, EPI arrived at HPO #4 by a variety of means – by

patient, by courier, by postal mail, by overnight / express mail, or by facsimile –

and on a variety of data storage media, such as on analog paper, on analog

photographic film, or on digital disk. If the EPI were digital, the EPI arrived at

HPO #4 in a variety of data file formats – in proprietary data file formats or in

defacto or dejure standard data file formats, but often without the required

viewers. All this complicated the disposition of the information, with some of the

information needing to be destroyed immediately, stored as a permanent health

record, retained as "external", or organized so that it could be used appropriately

for patient care or business purposes.

Administrative Decisions

In 2007, HPO #4 initiated a project to develop an enterprise strategy and to define

a proposed solution for the management of its EPI. The proposed solution had

employ information technology to make the EPI accessible when, where, and to

whom it is needed. The enterprise strategy had to include information

management processes, policies, and procedures to track EPI from the point of

intake to the point of use and to long term retention. From a legal and business

process standpoint, the information had to be consistent with HPO #4's existing

standards. From a policy and procedure standpoint, the HPO #4 EPI had to be

differentiated from HPO #4's internally-generated medical record.

It was in this context that HPO #4 retained Deborah Kohn, principal of Dak

Systems Consulting (San Mateo CA) to assist HPO #4 in realizing the objectives

of HPO #4's EPI project. Specifically, this required Deborah to assist HPO #4 in:

- differentiating the legal medical record from the EPI and determining

  crossover

- defining EPI organization, indexing, and search needs

- proposing EPI retention policies, including intake of redundant and / or

  irrelevant information

- defining intake storage standards for all external media received

  (facsimile, photographic film, videotape, CD)

- defining data security and privacy standards for EPI

- determining process change requirements for stakeholders

- defining overall work processes, including centralized or decentralized

  information intake for the HPO #4's clinics and hospitals

- defining triage processes to support the proposed standards.

Even though all of the above tasks were process-oriented, not technology-

oriented, in order to make the EPI accessible when, where, and to whom it is

needed, the project still required Deborah to itemize which existing and future

electronic information systems and applications would be required to implement

and support the requirements. This meant that Deborah needed to examine HPO

#4's existing, "core" EHR system, Cerner Corporation's Millennium, at the time being implemented only for hospital patients, and any other existing "component" information systems.

Results

To begin the project, HPO #4's Health System Information Services (HSIS) Department analyzed new inpatient and new clinic outpatient volumes from October 2006 – March 2007 for the health system's hospitals, clinics, and other care areas. HSIS determined that the high, new patient volumes for the following hospital units, clinics, and other care areas merited project assessment:

- Hospital Units – Emergency Services, Neuroscience, Regional Newborn Intensive Care Unit (RN-ICU), and Surgical Intensive Care Unit (S-ICU)

- The Clinics and other Care Areas – Cardiology / Endocrinology / Nephrology / Chronic Kidney Disease (CKD) Clinic, Dermatology Clinic, Gynecologic Oncology Clinic, Internal Medicine Clinic, Neurology / Neurosurgery / General Surgery Clinic, Orthopedics Clinic, Pulmonary / Rheumatology / Otolaryngology Clinic, Urology Clinic, Women's Health Clinic (Obstetrics/Gynecology, Medical/Surgical – Continence, Reproductive Endocrinology/Infertility), and Family & Community Medicine Department / Clinic.

After an HSIS Department representative and Deborah jointly-developed a Questionnaire for use during the assessment, Deborah conducted twenty-two on-site interviews / meetings with the above clinics, hospital units, and related stakeholders. The purpose of the interviews was to gather data on the EPI functions performed and the EPI formats / media received.   For each of the above project clinics, hospital units / departments, etc., the following project scope requirements were assessed:

- Point of intake / triage process

- EPI requested and received

- EPI formats and storage media

- How EPI was received (facsimile, postal mail, in-person)

- Process for EPI inclusion in the patient medical record

- Volume estimates, such as percentage of patients arriving with EPI

- Disposition of EPI received (storage in record, retention, destruction)

- Security policies

- Work processes

The interviews provided Deborah with a wealth of information for assessing HPO #4's existing EPI operations, systems, processes, and needs, and for developing an effective and comprehensive strategic plan, combining process and technology solutions for HPO #4's EPI. For example, in general, the interviewed user and

technical employees demonstrated a noteworthy interest in this project. Per an

RN from the S-ICU, "Recently we had a Joint Commission mock survey, and we

were asked what we do with EPI received." Per an MD from Neurosurgery,

"Once the EPI is reviewed by the Chief Residents, the EPI gets stuffed in various

file drawers of medical staff offices / hospital units, never to be seen again!" Per

an RN from the RN-ICU, "We get a lot of CDs. But our computers don't have CD

drives, so we don't know what to do with this 'new technology'." Per a

Cardiology Department technician, "The cardiologists have a huge interest

because the service is about 95% consultative." Per a Surgery Department

assistant, "We don't make a clinic appointment for the patient until we receive the

EPI."

Also, Deborah learned that the scheduling of new clinic outpatients had a large

impact on the receipt of EPI. Given the large number of HPO #4 physicians

(700+), specialties (35+), clinics (76+), and patient diagnoses, there were almost

as large a number of request varieties for new patient EPI when new clinic

outpatients were initially scheduled for appointments. In addition, Deborah

learned that HPO #4 maintained a huge number of decentralized, historical, active

and inactive, paper-based health record retention locations, which typically

included the paper-based EPI subsequently retained / filed into the patient's

paper-based chart. In summary, Deborah confirmed that far too often EPI

received was not available / accessible where and when it was needed for patient care.

Perhaps because HPO #4 was so large and complex, additionally, Deborah articulated the following eight strategic process recommendations and only two strategic technology recommendations and presented these recommendations to HPO #4's senior management team for acceptance. Such a mix of process and technology recommendations was consistent with the healthcare informatics literature that advocates reworking and successfully managing manual business processes prior to introducing technology solutions.

However, unfortunately, even though these recommendations were enthusiastically accepted by the senior management team, HPO #4 lost to attrition its HSIS project representative. Therefore, to date, no progress has been made regarding this project.

RECOMMENDATION I

It was recommended that HPO #4 tie the External Patient Information (EPI) Project to HPO #4's nascent, informal "Defining the Legal Health Record Initiative", directed by HPO #4's Chief Information Officer. This was because all current white papers and journal articles relating to Defining the Legal

Health Record unanimously agree that the contents, including EPI, of a healthcare provider organization's legal health record (the health record that is generated at or for a healthcare provider organization as its business record and that will be disclosed upon authorized request) must be determined by that organization, with the assistance of several organizational disciplines. Therefore, it was recommended that HPO #4, through this existing initiative, determine whether it wanted all / some relevant, non-redundant EPI to be included in its legal health record.

RECOMMENDATION II

To aid HPO #4 in its EPI / legal health record decision-making, it was recommended that ALL relevant, non-redundant EPI be considered part of the legal health record. Legal analysts insist that if EPI is received and used to provide patient care services, make clinical decisions, review patient data, or document observations / actions / instructions, the EPI must be considered part of the legal health record.   On the other hand, unless a care provider specifically documents such use in an note / report, there is no way to determine if the EPI is being / had been used to provide patient care services, make clinical decisions, etc. Therefore, until there was a suitable, technical means to determine if EPI is being / had been used without having to burden clinicians with more

documentation requirements, Deborah recommended that all EPI be included in the legal health record.

RECOMMENDATION III

If all or some relevant, non-redundant EPI were to be included in HPO #4's legal health record, it was additionally recommended that HPO #4 pre-determine and then communicate via an appropriate policy what is meant by "relevant" or "pertinent" EPI for health information exchange purposes.

Unfortunately, currently there was no good way to parse EPI that is considered relevant / irrelevant. Consequently, Deborah provided the following "relevant" or "pertinent" EPI guide:

- Any analog or digital copies of reports associated with any invasive or non-invasive procedure, operation, and / or hospital stay during the past xx year(s) that pertain to the patient's current condition / symptoms, such as consultation reports, diagnostic test result interpretative reports, facility transfer records, hospital discharge summary reports, physician consultation reports, procedure / operative reports, etc.

- Any analog or digital copies of physician dictated/ transcribed or hand-written chart notes and other reports during the past xx year(s) that pertain

to the patient's current condition / symptoms, such as laboratory test result reports, etc.

- Any glass pathology slides of biopsies as well as the reports that discuss the local pathologist's impressions that pertain to the patient's current condition / symptoms

- Any analog photographic film copies or electronic CD copies of all relevant x-rays as well as the reports that discuss the local radiologist's / cardiologist's impressions during the past xx year(s) that pertain to the patient's current condition / symptoms, such as CT scans, MR scans, PET scans, upper GI and / small bowel series, etc.

RECOMMENDATION IV

If all or some relevant, non-redundant EPI were to be included in HPO #4's legal health record, it was additionally recommended that ALL HPO #4's health records contain an analog or digital health record section / folder / tab called "EPI" or "Other Provider Records", etc., separating externally-generated patient information from internally-generated patient information. Then, by establishing enterprise-wide rules and an appropriate policy for disclosure of the EPI upon authorized request, it was recommended that this health record section / tab be used to direct the user to either the disclosure or non-disclosure of the information. This recommendation might require HPO #4

to hasten its efforts to reengineer its enterprise-wide Release of Information processes.

All interviewed HPO #4 clinics / departments for this project (except one) filed analog, paper-based EPI into the chart. And, most included some form of record section / tab for this information.   In addition, HPO #4's existing, "core" EHR system for its hospital patients, Cerner Millennium, contained an "External Information" folder / tab that allows users to access for patient care purposes any digital information assigned to this folder. However, HPO #4 was instructed to investigate if, additionally, the Cerner Millennium EHR allowed users to establish (e.g., in a table) and then apply rules for this folder's "content" (e.g., for disclosure purposes) and to include unstructured data in this folder, such as document images, diagnostic images, text-based reports, drawings, videos, vector / raster graphics, etc.

RECOMMENDATION V

If all or some relevant, non-redundant EPI were to be included in HPO #4's legal health record, it was additionally recommended that HPO #4 accept EPI stored only on ANALOG paper / photographic film / glass slides / video cassette tapes and / or DIGITAL CDs. Unfortunately, HPO #4 could not read and / or appropriately retain other storage media. Therefore, it was also

recommended that HPO #4 develop an appropriate policy to either return to the patient or shred / destroy the other storage media on which the EPI has been received.

RECOMMENDATION VI

It was recommended that HPO #4 also tie the EPI Project to HPO #4's ongoing implementation of the mandated Health Insurance Portability and Accountability Act (HIPAA) – Title II Administrative Simplification's Confidentiality & Privacy Standards (for its analog and digital EPI) and Security Standards (for its digital EPI), directed by HPO #4's Privacy and Security Officials. This would allow HPO #4 to apply its existing HIPAA standards to the intake and use of EPI received.

RECOMMENDATION VII

It was recommended that for new clinic outpatients, HPO #4 also tie the EPI project to HPO #4's recent, formal "Coordinated Scheduling Initiative" for improving clinic outpatient access, directed by HPO #4's Clinic Chief of Staff / COO. While some exceptions had been made to the clinics' Coordinated Scheduling Initiative, in general, the majority of HPO #4's clinics and personnel supported the standardization of clinic outpatient access as directed by the

Initiative. Therefore, it was recommended that the Scheduling Initiative additionally address:

- standardizing (as much as tolerated) a computer-generated (i.e., using the clinics' GE Flowcast Clinic Registration / Scheduling system), New Clinic Outpatient Appointment CONFIRMATION FORM and / or New Clinic Outpatient Appointment REQUEST FORM to incorporate

  - the type of new patient EPI requests when new clinic outpatients are initially scheduled for appointments to HPO #4 (e.g., In the same location of every Appointment Confirmation Form there would be "Required EPI" [checked / not checked].)

  - appropriate communication on the Appointment Confirmation Form for those patients who, due to their diagnosis / physician / clinic-type, etc., will not and cannot be seen if new patient EPI is not received within xxx week(s) / day(s) of the scheduled appointment

  - how to receive the required EPI – by the preferred method (e.g., by patient at time of patient visit, by facsimile xxx week(s) prior to patient visit,, etc. [checked / not checked])

  - what required EPI to receive and on what type of storage medium (e.g., "Do NOT send EPI stored on floppy disks, USB flash drives, projector slides, in eMail attachments, etc.)

- standardizing (as much as tolerated) the New Clinic Outpatient

  Appointment Confirmation PROCESS to incorporate

  – appropriate verbal communication during the appointment call for

    those patients who, due to their diagnosis / physician / clinic-type, etc.,

    will not and cannot be seen if new patient EPI is not received within

    xxx week(s) of the scheduled appointment

  – standardized, New Clinic Outpatient Appointment Confirmation and

    Request forms following the appointment call

  – the successful process during and following the appointment call

    developed by HPO #4's Cardiology Clinic's schedulers, who actively

    worked a report generated by entering New Clinic Outpatient and

    required EPI data into HPO #4's existing GE Flowcast clinic

    scheduling system.

RECOMMENDATION VIII

Because HPO #4's enterprise-wide, historical health record retention / archival policies were inconsistent, it was recommended that HPO #4 develop, communicate, and enforce (as much as tolerated) formal, long-term retention policies and schedules for all patient information – analog and digital (and not just EPI). The key is that HPO #4 must retain / archive health records in ways that prevent loss, destruction, or unauthorized use.

However, consistent, long-term, analog and digital, historical record archival

policies require organizational guidance from clinicians, health information

management, legal, HSIS, and other, related professionals regarding not only

patient care and research requirements, but compliance requirements associated

with any state and federal regulations as well as accreditation standards (e.g., the

Joint Commission). State regulations include specific statutes pertaining to the

retention of health information. Federal regulations include but are not limited to

the:

- 1996 HIPAA Title II – Administrative Simplification's Confidentiality & Privacy and Security Standards

- Centers for Medicare and Medicaid Services' (CMS) Conditions of Participation

- Confidentiality of Alcohol and Drug Abuse Patient Records Rule

- Privacy Act of 1974

- New Federal Rules of Civil Procedure Governing Electronic Discovery (effective December 1, 2006)

RECOMMENDATION IX

To ensure that EPI is available / accessible where and when it is needed for

patient care, it was recommended that HPO #4's existing Enterprise Master

Patient Index (EMPI) system (Quovadx's EMMI) be enhanced (if possible) to

include the location of the paper-based chart for each encounter / episode-of-care, in addition to HPO #4's standard data elements, such as Patient Name, Medical Record Number, Date of Birth, Service Date(s) and Account Number, etc. Technically, this would require the development and maintenance of an EMPI table listing all Record Retention Locations based on service and / or patient type.

For retrieval purposes, the EMPI enhancement would allow users to know the location of the historical paper chart including any paper-based and CD-based EPI. It was recommended that the location of any photographic film, glass slide, and / or video cassette tape-based EPI would default to, for example, HPO #4's Radiology, Pathology, and Cardiology Departments, respectively.

RECOMMENDATION X

To ensure that EPI is available / accessible where and when it is needed for patient care, it was recommended that HPO #4 invest in an Enterprise Content Management System (ECMS) as a proposed technology solution. ECMSs consist of various tools, technologies, systems and methods to manage organizations' "content", wherever it exists – from traditional content (office documents, diagnostic images, graphics, print streams) to new electronic objects (web pages, eMail, video files) – and throughout the content's life cycle. With an

ECMS, eventually, HPO #4 would be able to capture, manage, store, preserve, and deliver ALL HPO #4's digital EPI, including all types of EPI documents (video files / audio files / diagnostic image files, if readable; eMail messages, web pages, etc.).   As such, the ECMS would be able to effectively manage the potential discovery of organizations' eMail messages that contain Protected Health Information (PHI) given the new Federal Rules of Civil Procedure Governing Electronic Discovery, for example.

Given HPO #4's current organizational structure, whereby the health system maintains a huge number of decentralized, historical, paper-based health record retention locations, a centralized "EPI" Department was NOT recommended. Instead, with an ECMS, HPO #4's EPI Intake, Access / Retrieval, and Retention / Archive processes could remain decentralized. For example, the paper document capture processes could be performed in several "paper document scanning centers". This decentralization could be achieved with the decentralized implementation of a recommended Electronic Document Management System (EDMS), an ECMS component information system, allowing each HPO #4 record retention location to digitally scan and index its paper-based EPI.

Technically, the EDMS component system of the ECMS would need to "image-enable" HPO #4's home-grown, Horizon Intranet / Portal. "Image-enabling"

would allow HPO #4's end-users to view from Horizon all scanned and indexed EPI paper documents (a.k.a. document images). In other words, there would be no other portals or systems whereby HPO #4's end-users would have to separately log into in order to access the information. Based on the context of the information, Horizon will natively "point" to the EDMS' document images for retrieval / use purposes. Architecturally, all HPO #4's scanned and indexed, paper-based EPI would reside in the EDMS.

HPO #4's existing, "core" EHR system for its hospital patients, Cerner Millennium, contains a module, ProVision, which is Cerner's Document Capture or EDMS module for paper-based medical record documents. However, HPO #4 was instructed to investigate if the Cerner Millennium ProVision module was acquired by HPO #4, could image-enable Horizon, could be implemented in a decentralized manner, could be expected to be implemented across the enterprise (e.g., for clinic outpatients), and could be integrated into a larger (non-Cerner) ECMS for the enterprise. Technically, also HPO #4 was instructed to define as part of its legal "electronic" health record for disclosure purposes whether any electronic health record documents generated in HPO #4's existing or planned information systems (e.g., the Cerner EHR system for hospital patients, the GE Flowcast Registration / Scheduling system for clinic patients, the GE MUSE Cardiology system, etc.) would either remain in those systems and be retrieved

via Horizon pointers -- or would be fed as report-formatted / print stream

documents to the EDMS as either .tif, .pdf, or .xml files.

Source Material

There were no source materials used in resolving the problem, such as books,

magazines, articles, seminars, etc. I was the experienced healthcare information

management and technology consultant retained to resolve the problem.

MANUSCRIPT CONCLUSION

This manuscript highlighted how an independent healthcare information technology advisory consultant developed key strategic information plans, analyzed returns on investment, and managed complex IT projects for **four different healthcare provider organizations** that considered implementing or **implemented technology solutions as critical "component" information systems of the organizations' existing, "core" EHR systems**. **The four different case reports** described how each healthcare provider organization was able to successfully analyze (and, in two cases, successfully implement) a picture archiving and communications system for its radiology and cardiovascular disciplines to complement a Cerner Millennium EHR system, an integrated voice-text-speech system for its health information management, radiology, cardiology, and pathology disciplines to complement a MEDITECH HCIS EHR system, an electronic document management system for its patient-centric documents to complement a GE Centricity clinic patient EHR system and a Siemens Invision hospital patient EHR system, and, finally, an enterprise content management system for its external patient information to complement another Cerner Millennium EHR system being implemented only for hospital patients at that time. The healthcare information technology consultant's keen organizing, planning, and budgeting skills, knowledge of various types of healthcare provider

organizations, expertise in information technologies, and vision for diverse

facilities were critical to successfully meeting the healthcare provider

organizations' management challenges.