Brief Report of the AAFP's EHR Pilot Project:

Key Learnings from Six Small Family Practices

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Center for Health information Technology

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Overview

During 2003 and 2004 the American Academy of Family Physicians' (AAFP) Center for Health Information Technology planned and carried out a collaborative Electronic Health Record (EHR) Pilot Project in which six family physician practices in different states participated. The practices were selected to closely approximate a representative sample of the AAFP membership physicians who work in small- and medium- sized medical practices. Each practice implemented the same electronic health record (EHR) software system, using it for the six-month period between May 2004 and end of December 2004. The practices were intensively studied and their progress monitored throughout the planning, implementation, and EHR use phases of the Pilot Project. All phases of the project were carried out as a collaborative between the practices, staff from the AAFP Center for Health Information Technology, and personnel from MedPlexus, Siemens Medical Solutions, Hewlett Packard, and Phyxe. Key findings and "learnings" from the Pilot Project relate to:

- the efficiency of an Internet-based ASP (application service provider) and open standards technology infrastructure to deliver the EHR;
- the value of cooperative long-distance training using Internet tools to facilitate project management and to solve problems on a daily basis;
- the barriers to full implementation that arose (practice-specific and general); and
- the relevance of workflow re-design to success in implementation in small practices.

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Background

There is a growing appreciation in America of the gap between the current state of health care delivery and what would be possible in our health care system with the effective use of information technology. Recognition of that gap is giving rise to a consensus among physicians, payers, consumers, and others that information technology can do at least as much to improve quality and efficiency in health care as it has done in the financial services, transportation, manufacturing and retailing sectors. Paper-based administrative and clinical information management is not merely symbolic of the highly fragmented and disconnected U.S. health care system; it is one of the root causes of this fragmentation and disconnectedness.

Physician adoption of health information technology (HIT) is widely viewed as a necessary component of a national strategy for health care improvement based on HIT. Physician use of HIT is not a new phenomenon. Surveys of physician members of the American Academy of Family Physicians in 2002 and 2003, for instance, indicated close to 90 percent of members' practices used computers for billing purposes; the same percentage had Internet connectivity; and over 70 percent of family practice residents used Personal Digital Assistants (PDAs) or other hand-held computers on a regular basis. Surveys of other medical specialty groups have indicated similar levels of use of HIT[1].

However, the adoption into the practice setting of *electronic patient health information systems*, also known as electronic health records (EHRs) is lower. There is credible anecdotal reporting of high rates of EHR implementation failure, reaching 50 percent,[2] amid much speculation that market forces alone may not be sufficient to entice this nation's doctors to "go electronic." At the same time, there are also reports of a recent "uptick" in physician EHR purchases and interest during 2004 and early 2005. Our best estimate is that approximately 13-15 percent of the 65,000 physician members of the AAFP in active practice now utilize an EHR purchased from a software vendor, and that this number has doubled over the past year and a half. This is exciting progress, to be sure. But it also begs the question as to why adoption has not occurred at a faster rate and

calls for an investigation of the experiences of practicing physicians who attempt this transition to inform the debate regarding what actions or incentives might stimulate faster adoption and to minimize failed attempts. Relatively little attention and few studies have been aimed at better understanding the adoption issues surrounding clinical automation, computerization, and networking of electronic data in the small- and medium-sized medical practices, where the great majority of patient care delivery occurs.

Much of our work at the AAFP's Center for Health Information Technology has been aimed at addressing the adoption barrier of high EHR purchase price, viewed as either initial purchase price or, more accurately, as costs over a three-year period, and including a bundle of costs related to hardware, training, third-party licenses, etc. Here the news is very good. The average purchase price has shown definite signs of decrease, according to our data from both vendors and purchasers. Our most recent surveys show that the *average* total cost of ownership for an integrated EHR system (e.g. billing, scheduling, and clinical information) for a typical three-doctor family practice is less than $10,000 per doctor per year (see Table 1), a number that still represents a significant purchase for primary care doctors but is approaching affordability for a large segment of the small practice population. Our members tell us this reduction has made a real difference to them in helping them decide to move ahead and buy.

Table 1

Average Total Cost for first 3 years of ownership based on a 3-physician practice

	Total Cost	Yearly Cost per physician (over 3 years)
Integrated EHR & PMS	$68,371	$7,597
Stand-Alone EHR	$51,714	$5,746
Stand-Alone PMS	$40,274	$4,475

Source: AAFP/CHiT Partners for Patients Vendor Survey, March 2005 http://www.centerforhit.org/x983.xml

Our research also indicates, however, that hard dollar costs do not tell the whole story about why EHR adoption is slow. Much remains to be learned about the transitional issues of EHR adoption in the small medical practice, and knowledge gained in this area might point the way to stability and consistency in the implementation process and give physicians in these practices (and those who seek to help them) a better roadmap to success.

Therefore, one of the first initiatives of the AAFP in its campaign to enhance HIT adoption among our members has been to explore the experiences of typical family physicians as they prepare for and transition from paper to electronic clinical management systems. This was accomplished through surveys, interviews, and focus group studies mostly for internal Academy use. In March of 2003, the Centers for Medicare and Medicaid Services (CMS) contacted the Academy to indicate their interest in supporting our goals of increasing small practice adoption of HIT. They requested that we submit a non-competitive proposal for support of a pilot project on implementing a low-cost and standards-based EHR. The application was submitted and funding for the pilot project was anticipated to arrive by September 2003. However, due to uncontrollable circumstances the grant was greatly delayed. Despite this disappointment, several of the parties involved, including the AAFP, MedPlexus, Siemens Medical Solutions, Hewlett Packard, and Phyxe, decided that the pilot project should go forward even without outside funding, and the pilot project was reorganized and launched as an AAFP-HIT industry collaborative in November 2003. The CMS funding was awarded to the AAFP in March 2004.

EHR Pilot Project Goals and Methods

The EHR Pilot Project was designed to include six typical small family practices of one to five physicians, in six states. Practices were selected in part on the basis of their average familiarity with computers; 'technical enthusiasts' were specifically excluded from the candidate pool. There were rural practices and urban practices. Some of the practices were start-up practices while others had been established for several years.

The physicians and staff from the six practices agreed to participate in the pilot project for the duration of the study, and committed to these main goals:

- to carry out a proof-of-concept for an ASP model/remotely hosted delivery of the EHR system ;
- to intensively study the barriers and keys to success during the EHR implementation process;
- to identify and support the special needs of small and solo practices during and after EHR implementation.

The EHR software used by the six pilot project practices was provided by MedPlexus, a small software company based in Santa Clara, California. Siemens Medical Solutions provided managed ASP hosting of the application and technical project management from their datacenter in Malvern, Pennsylvania. End-user PC tablets and desktop computers, as well as the servers for running the application in the Siemens datacenter were provided by Hewlett-Packard (Cupertino, California). Phyxe (San Francisco, California) provided the framework and methodologies for practice recruitment, selection, and evaluation. Staff from the AAFP's Center for Health Information Technology (Washington, DC, and Leawood, Kansas) provided project oversight and worked in concert with Phyxe. None of the physician practices was charged for the use of the products and services during participation in the pilot project, which went "live" in May 2004 and ran through December 2004. All training was performed online; there were no site visits for training or support.

Communications between the practices and the project management team were facilitated by an email discussion list and weekly telephone conferences during which the needs and expectations of the physicians were assessed and addressed; problems were discussed and solutions presented; and technical and workflow issues were grappled with. These communications occurred during all of the three main phases of the Pilot Project, including planning/preparation phase, the implementation phase, and the active EHR use

phase. This same methodology, with the addition of Web conferences for virtual online meetings, was used for training physicians and office staff to use the functions and features of the EHR.

All communication with the pilot practices utilized the Voice of the Physician™ methodologies by Phyxe. This methodology consisted of structured interviews with the physicians to better understand their needs and progress during the pilot. Qualitative and quantities analysis was then performed on the results and used to drive further conversations with the physicians during the project.

On-site visits for evaluation purposes were made during January 2005 to all six practices. Structured interviews, observational case studies, and, in some cases, videos of physician and staff use of the EHR were obtained during a day-long visit to each practice. Finally, an EHR Pilot Project Summit was held in Washington, DC in late January 2005, during which project management staff and lead physicians from the six practices compared their experiences and assessed the degrees to which primary and secondary goals of the pilot project had been met. A planned product of that meeting was a consensus document about the "learnings" both anticipated and unanticipated from the pilot project.

Key "Learnings" from the EHR Pilot Project

Below we summarize several of the key findings, or "learnings" as we referred to them, which were identified during the EHR Pilot Project and agreed upon by participants at the meeting held in January, 2005 and attended by all of the project's principals. These are presented in the order of the main goals of the study, which were:

1. To carry out a proof-of-concept for an ASP model/remotely hosted delivery of the EHR system
2. To intensively study the barriers and keys to success during the EHR implementation process

3. To identify and support the special needs of small and solo practices during and after EHR implementation

1. The Application Service Provider (ASP) Model Worked Well for Small- and Medium-Sized Practices in the Pilot Project

The ASP model was a striking success for all participants. In this instance the components of the ASP model included: a thin-client EHR application built on XML, Java, and other Internet standard architectural components running on PCs and tablet PCs in the practices; managed hosting of additional application software, middle-ware, database, and all security and connectivity components in the Siemens data centers; and Internet connectivity at the practice level through DSL, cable, or dial-up connection to local Internet service providers (ISP).

The practices saw several benefits of the ASP model during the pilot. The ASP model obviated the need for a high-end server and extensive application and data redundancy in the practice. For example, all data backup was done centrally on a daily basis. This translated to minimal initial costs setting up and maintaining the practice's technical infrastructure. Deployment in each practice was also very efficient and easy. The vendor was not required to be on site during the implementation. Each practice was able to install its own connection to the Internet and load the software on their workstations with minimal assistance. All practices used wireless local area networks and tablet PCs in addition to using desktop or laptop PCs.

The ASP model gave the vendor a central point of control and access to each practice. This central control helped the vendor manage software versioning, maintenance, and data security. Connecting the EHR to external entities, such as labs and pharmacies, was done through the datacenter, permitting the vendor in theory to connect all six practices at once. (As it turned out, the clinical lab and e-pharmacy connections were not available to all of the practices because of local conditions, e.g., no pharmacies capable of using the

connections.) The ASP platform was scalable and able to service geographically dispersed practices with minimal "downtime" or service interruptions.

In the pilot project, we took the ASP model a step further and provided training and support in an ASP-like fashion. Training and support were provided via Web conference, email discussion list, and telephone. All of the practices stated this type of training was more than adequate for their needs. One advantage of the Web-based training was its flexibility. Because there was no travel involved, the vendor was able to respond to the scheduling needs of the practices, and the training could easily be spread out over the implementation and use of the product. Also, a single individual from the vendor was able to conduct the training at all practices in a short period of time. Besides the individual practice training, additional group training/support was provided, allowing the practices to share experiences and best practices. It also served as an informal support group as practices moved through implementation and training.

2. Keys to Success and Barriers Were Identifiable

1. Building a Community of Learners Was a Key to Success In All Stages of the Pilot Project

One of the side effects of the project management and web conferences was the formation of a community of learners among all practices. The interaction between the practices gave each group a yardstick against which to measure their progress and success. Understanding that their implementation was going as well as the other practices encouraged the practices to continue when barriers were encountered. They were also able to learn from other practices' experiences and avoid similar mistakes or change their implementation plans to take advantage of another practice's easy wins. The community provided the practices with peer support and cross pollination of best practices and workflows. Phyxe's Voice of the PhysicianTM methodology gave a framework for much of the interactions and therefore continued to gather and utilize learning gained during the project.

Much of the community-building and initial online exchange occurred during a three-to-four-week period in which the physicians and staff could experiment with the software

application and load dummy data into the system, prior to the go-live date. This experience was appropriately dubbed the "sandbox," after the familiar children's play area where both social and motor skills are practiced.

The level of ingenuity and innovation in the small practices was unexpectedly high. The practices brought novel and adaptive uses of information technology to the project, for example use of voice recognition software and methods for implementing wireless components to their networks, and shared their innovations with other practices on an ongoing basis.

2. Planning that Related EHR Implementation with Practice Workflows Was a Key to Success

The practices with a well-defined plan had fewer issues and problems during implementation and use than those that were less disciplined in their preparation. All participants came away with a strong impression that preparation pays off. In several cases, an implementation plan revealed needed functionality from the vendor that was not part of the initial requirements. The most success was achieved when the plan started with a critical look at the practice by questioning the merit of the current workflow and processes. For each workflow and process it was helpful to ask: "How can it be optimized and how can the EHR be used as a tool to improve the workflow?"

An inventory of the practice's needs for improvement tended to reduce unexpected issues arising during implementation, and helped staff to cope with disappointments, such as missing functionality in the EHR or connectivity solutions that had to be delayed for various reasons. A detailed implementation plan can be a tool to help set the right expectations for the practice and the vendor.

3. Starting with "Easy Wins" Was a Key to Successful Implementation

A particularly successful approach to implementation was: "think of office staff first, and think incremental adoption." Underlying this approach was the observation that practice automation can be more important than "physician automation." Many current

implementations of EHRs in small practices try to "automate the physician" by implementing clinical documentation as a first step. Although this is a natural inclination, and perhaps critical for full adoption of an EHR, participants in the pilot project agreed that it may actually increase the risk of implementation failure to focus too narrowly on only the physician's use of the EHR. Implementation of an EHR affects everyone in the practice, front and back office staff and nurses included. In this project we observed that overall staff functions and workflows, such as internal messaging, prescription renewals, and lab result tracking, could be automated as a first step in the implementation and use of an EHR, with very satisfactory results in terms of physician and staff satisfaction. This was not as relevant a finding in the solo practices, where a single staff person worked with the physician and workflows were much simpler than in the larger practices: yet it was a principle with which there was complete agreement on the part of all participating pilot project physicians.

4. Connectivity Is Increasingly Important to the Value Proposition of an EHR

We found that the pilot project practices placed increasing value on the EHR as a vehicle for achieving connectivity with outside entities, even within the timeframe of the project. Connectivity for this pilot project was defined as electronic exchange of information within the practice *and* with external sources, such as pharmacies and clinical laboratories. We observed that there is a hierarchy of value to be achieved using an EHR, related to the efficiency of the electronic transfer of information with external parties.

Using prescription medications as an example, the lowest level of value is comprised of the process in which a prescription is electronically created in the EHR, but then printed to paper and given to the patient to take to the pharmacy. All refill requests have to be entered into the EHR by hand, and this process repeated. It is somewhat more valuable if the paper prescription can be printed and then faxed to the pharmacy. Refills still must be typed into the EHR. Next, use of a fax server that removes the need to print out the prescription on the practice's end of the transaction offers increasing value and efficiency. But refills and renewals are still handled by phone, fax, and hand data entry. And finally, the highest value – true electronic connectivity – comes when the digitized

prescription information goes directly from the EHR software application as discrete data to the pharmacy's computer system, and vice versa, without phone or fax intermediation. Faxes and scanned images are intermediate levels of connectivity which do not offer maximal workflow efficiency gains, but do require equal or more information technology (on both ends of the transaction) than does true electronic connectivity.

All of the participants in the pilot project agreed that the highest value occurs when the EHR can receive and send data electronically and directly to labs, pharmacies, and hospitals, in large part because this permits information to be routed to the appropriate staff or physician in a secure, timely, and accurate manner. This model is not unlike that of an email inbox: all the messages (data) come into one place and can be handled in the same fashion. Intra-office messaging, renewal requests, and lab results flow together into a staff or physician "inbox," allowing efficient management of diverse sources of data.

In the "staff first" plan the practice was automated first by the use of connectivity and messaging and then the physician is automated with charge capture and documentation. The foundation of this plan is the basic automation of the front and back office with a practice management system, then, via an integrated EHR, tasks that can leverage connectivity are added. For example, e-prescribing and lab interfaces allow automation of incoming and outgoing data. This can all happen with relatively small amounts of data entry by the practice. This allows the EHR database to be populated with structured data, such as lab results, medication lists, and problem lists. Next the remaining health summary data, such as represented in the Continuity of Care Record can be added in, and the system has enough data to drive decision support around reminders and drug checking. Finally, leveraging the data already in the system, physician can begin entering documentation and coding. One of the tenets of this approach is to start with easy wins that keep the practice on track to full adoption and full automation.

5. Partial Implementation Is a Barrier, But it is Likely to Occur Frequently in Small Practices

Probably the biggest issue once the EHR was installed in the practice was that of partial implementation, which occurred in two major categories: in the sense that not all parties

in the practice used the EHR equally (type 1); as well as in the sense that only limited functionality of the EHR was used (type 2).

Partial adoption of a function of the EHR within the practice created opportunity for confusion and duplication of work that undid some of the potential efficiencies gained with the EHR. As an example, we encountered a situation in which one or more physicians in a practice did not use the EHR for documentation, while others did. This created parallel systems – one paper, one electronic/computerized – for patient charts. Multiple difficulties were observed in this situation, for example cross coverage by staff became complicated as the physicians struggled to work with either the EHR or paper and did not always know which patients' records could be located via computer.

Similarly, if a practice chose not to implement a function (or the vendor did not have the feature that was desired), we observed that the practices had to run a parallel paper system to meet that function. In one practice, for example, the messaging function did go completely "paperless," but only selected patients had their clinical documentation entered into the EHR system. This meant that the paper chart remained in operation alongside the electronic one. Another common partial implementation involved what to do with incoming paper documents. If these are not scanned and placed as images in the EHR (not an option with the EHR used in the pilot project until the very end of the project), there was an obligatory paper trail and charting process that had to be run in parallel to the computerized medical record.

It needs to be stated that both these types of partial implementation might reasonably have been expected during the relatively brief period of EHR use (6 months) mandated by the structure of this pilot project. We should also point out that the physicians and their staffs were not necessarily disappointed by the type 2 partial implementations, and felt that they had realized considerable benefit even though falling short of maximum benefit. This area is ripe for further research that would help discover how a modular or incremental approach to EHR implementation could work most effectively.

6. Variability Among Medical Practice and Physician Styles of Practice and Expectations for EHRs Is A Barrier to Implementation

Participants in the pilot project were impressed by the variability in both practice styles and expectations for what an EHR should and could do. Even within the six pilot practices there were very different needs, wants, expectations, uses, and implementation details. In general, there appeared to be stark differences between the very small, one and two doctor, practices and those with three to five physicians and extenders. Clearly, the solo practices had an easier time making decisions, as there was generally just the one physician in charge, whereas the larger practices had to deal with many decision-makers and the lead physician faced a small but diversified mini-culture that had to be persuaded that EHRs were the way of the future. But the variability was deeper and wider than we had expected, and extended to issues that were professional (how do the doctors want their EHR notes to look, and will common templates work for common problems?), technical (how does the practice want to configure its wireless LAN, and will the front office use or not use the EHR?), and economic (can the doctor afford additional hardware and cable Internet service?). Many EHR vendors market their product to small, medium, and large practices alike. This means the EHR vendor has to support many configurations and uses of its products. This is a burden to the vendor and affects its ability to effectively support their clients, and can be expected to be a complicating factor as the market for EHR products continues to grow. All participants in the pilot project were agreed that evidence-based best practices are needed to help eliminate unneeded variability in physician expectations and styles of practice. This could result in greater efficiency and quality in the practice and change the vendor's burden from supporting the great variability to optimizing for best practices.

7. The Challenge of Structured Data Entry Is a Barrier to Optimal Use of EHRs

Family medicine, and more generally primary care medicine, deals with a wide variety of medical conditions. The volume of diagnoses, treatments, complaints, etc., leads to difficulties in template-based documentation, in the first instance because there are so many templates needed to capture this diversity, and in the second instance because so many patients have a mix of multiple chronic illnesses, and this complicates creation and use of templates. Templates are virtually required, however, because they permit "point

and click" data entry that results in what is known as structured data capture in the EHRs database. Structured data capture, as opposed to simple text entry, is extremely important to drive decision support and measurement of quality, but generating it increases the time physicians must spend in documentation. Templates are an imperfect solution to a very difficult generic problem associated with computerizing medical information at the primary care level.

We did not expect we would solve this problem in the pilot project. However, we did observe that there was less-than-robust appreciation by the physicians of the importance of structured data entry, and very little tolerance for time-consuming data entry. We speculated that this might be due to the fact that neither the physicians nor their practices were rewarded for, nor received any measurable benefits from, structuring the data. None of the practices in the pilot project were required to submit clinical performance data for quality improvement or were engaged in pay-for-performance programs, both of which would require structured data capture in order to utilize the EHR to create reports and submit these data elements. As a result, the solutions arrived at during the pilot coupled structured and unstructured data according to the physicians' preferences and styles of practice. The most clinically pertinent and easily structured data were likely to be entered as structured data, but the remainder was entered as unstructured data. This unstructured data included free text, scanned documents, and voice recognition. Most of the unstructured data recorded the patient story (which is very hard to express in structured data) and external requirements (e.g. reimbursement, legal needs). As the value of structured data is made real to practices, they are likely to invest the energy to structure additional data.

Summary and Discussion

In this small pilot project, we learned that the ASP hosting and remote delivery of the EHR works well and has the potential to scale massively to meet the demand of small- and medium-sized medical practices. Web-based training is a viable, cost-effective solution for medical practices as they prepare for and implement an EHR system. This

type of training allows the vendor to be rapid and flexible in the delivery of training and gives practices a lower cost option that is effective. Connectivity of the EHR (practice) to external sources of information (e.g. laboratories, hospitals, pharmacies, etc.) is critical to success in small practices. Partial implementation should be expected, but practices benefit from well-defined plans toward full implementation and automation. A "staff first" incremental plan gives the practice early benefits from the EHR and continually moves them toward full automatization.

We also learned that variability, even among "typical" family practices that are small, with regards to expectations for the EHR's functionality and its fit with the "style" of the lead physician, is larger than we had expected. It was difficult for the participants to articulate a more coherent description of this finding, or to fit it within a comfortable, well-known conceptual framework. However, the mass of observed detail during the pilot project pointed to the variation in how the doctors and practices perform common professional tasks handling patient information, variation in *what* the doctors wanted the EHR to accomplish with respect to these tasks, and variation in *how* they wanted the EHR to accomplish it, as a significant barrier to the more widespread adoption of EHRs in small practices. It would be useful for further research to better understand this variation in the practice and art of medicine and its relationship to the deployment of HIT in small practices.

Overall, the pilot project left participants with optimism about the future use of EHRs within family medicine. Five of the six practices planned to continue implementing and using the EHR software from the pilot, and the one practice that did not is seeking another EHR solution.

David C. Kibbe, MD, MBA
Principal Investigator
AAFP EHR Pilot Project

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