

The Role of Health Information Technology in Creating Networks of Medical Homes in Rural North Carolina

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Health information technology (HIT) has been front and center in the conversation about improving access, efficiency, quality, and reducing costs in the health care system. In a systematic review of the published scientific literature, Chaudhry and colleagues concluded that there was convincing evidence that HIT could increase the adherence to guideline-based care, enhance surveillance and monitoring, and decrease medication errors.¹ But others caution that the impact of HIT implementation on the cost and quality of care may not be consistent across institutions and that the characteristics of the clinical setting where it is applied is likely to greatly influence its use and effect.²

As one of North Carolina's two remaining rural track family medicine residency programs, we have been very interested in learning how a multifunctional electronic health record (EHR) could be adapted into small rural practices. In 2007 we were selected to be one of 14 family medicine residency programs in the country to participate in a five-year research project known as Preparing the Personal Physician for Practice (P4).³ Our project is designed to test three hypotheses: 1) that providing an electronic health record to rural practices through a local hospital-based network is a cost-effective model, 2) that HIT can improve quality of care and provider, staff, and patient satisfaction in rural practices, and 3) that training students and residents in redesigned rural practices will increase their interest and eventual practice in rural medicine careers following graduation.

This commentary describes our early experience with this project and identifies opportunities and barriers to effective implementation of HIT in rural practice.

Description of Project

We began our project by implementing a multifunctional electronic health record in our residency teaching practice. Our EHR includes the evidence-based care templates we developed for a number of chronic care and preventive services,

e-prescribing, advanced reporting functions to track quality measures, and integrated EHR and practice management modules to allow computer physician order entry (CPOE) in the outpatient setting. A secure care portal allows patients direct access to some portions of their medical records through the internet, which also allows secure messaging with their health care provider and the ability to directly schedule their own office visit appointments online. Lab results come back directly into the patient's electronic record

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through an electronic interface with the hospital lab. From within the EHR, physicians can directly access a number of evidence-based databases to provide point-of-care decision support and can even document and receive Category I continuing medical education (CME) credit when they use an evidence-based medicine (EBM) resource to answer a clinical question. Within the EHR is a rich database of patient education material that can be individualized for each patient. The servers, technical support, training staff, and licenses for this EHR are all owned or provided by our local community hospital.

This EHR has allowed our teaching practice to be fully paperless for the last two years. It has also supported a radical redesign of our office, allowing us to effectively close our front

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desk and waiting room. We promptly usher each arriving patient into an exam room where a care team provides the patient all the needed care throughout the visit. Medical assistants have been retrained to provide a wider range of both clinical and administrative tasks at the point of care and more closely assist the providers in documenting the visit and carrying out clinical services. In some cases the medical assistants remain in the exam room and scribe directly into the EHR as the physician conducts the history and physical exam and discusses the treatment plan with the patient. This redesign has allowed our practice to reduce median clinic cycle times for an office visit from 65 minutes to 37 minutes and operate with a staffing level that is in the 25th percentile benchmark for practices of our size and patient volume.⁴

Using an application service provider (ASP) model we expanded access to this EHR to three solo practitioner rural practices located 10-20 miles from the hospital. Taking advantage of safe-harbor changes in Stark rules,⁵ the hospital was able to provide licenses and training to these practices at an 85% discount. Economies of scale for centralized servers and technical support personnel from the hospital's IT department allowed these practices to be added for only \$3,500 of actual cost to the practice and a low marginal cost for the hospital. A robust EHR such as this would have cost each practice at least \$50,000 if they had contracted directly with the EHR vendor for hardware, software, and training. Each practice was also enrolled in a clinical performance collaborative called Improving Performance in Practice (IPIP) to further support efforts to improve chronic care measures.⁶

Results

The practices implemented the EHR in late 2007 and early 2008. Approximately one year into the project we conducted an evaluation of each practice to see how they were using the EHR and how each practice felt the EHR had changed their practice up to that point. We conducted a series of focus groups with physicians and staff of the practices and recorded comments. These comments were then analyzed to identify themes and common concepts. We found that these could be divided into the major classifications of "benefits/positive effects," "challenges/drawbacks," and a residual category of "other." The following statements or quotations characterize the key themes that came up during the focus groups of providers and staff of rural practices.

Benefits/Positive Effects

- "Things run smoother—everything is right at your fingertips."
- The EHR minimizes error—medication refills get done quicker with fewer mistakes.
- Easier for continuity of care—the medication list is automatically updated.
- "Sparks you to think of things you might have forgotten to do."

- Easier access to patient education handouts.
- The EHR has freed up room in the office.
- Quality of care has improved—documentation is better.
- For medical assistants, job satisfaction has increased.
- "Having access to the EHR from home is a nice feature, but a two-edged sword—I'm more likely now to take work home."

Challenges/Drawbacks

- Maintaining two systems (EHR and paper chart) is difficult and time-consuming.
- Slow connection to the EHR—"we're completely crippled if the system goes down."
- "As a small practice the rate of learning new features is slower, and there is a lot less filtering of information that goes into the EHR."
- Notes take longer to do—workday for the providers is longer than before the EHR was implemented.

Other Observations

- Two of the three practices were still using both paper and electronic records.
- Two of the three practices had different practice management programs. As a result providers were not able to use CPOE.
- None of the practices were using the Care Portal to allow patients to schedule, communicate, or request records.
- Practices have not yet used the EHR for chronic care improvement because generally they are not using the point-of-care templates to document care provided at office visits.
- None of the practitioners in the practices has yet used the point-of-care CME feature available through the network.
- Although the practices have the ability to e-prescribe, only a small percentage of prescriptions were processed electronically because the rural pharmacies do not yet have the software to send or accept prescriptions in this format.

Discussion

As we have demonstrated in our own teaching practice, HIT is capable of delivering on its promise to improve clinical efficiency and reduce overhead costs by reducing average clinic cycle times for an office visit from 65 to 37 minutes while keeping overhead costs within the MGMA 25th percentile benchmark. HIT is a powerful tool to support improvements in guideline-based chronic care in that it is able to extract monthly clinical chronic care measures by each provider from the EHR without having to do time-consuming audits, and this monthly feedback supports the quality improvement activities of the teams. Without an automated system to collect data, the collection and analysis of performance improvement measures is inefficient, if not impossible.

Local regional networks also appear to be an efficient way to take advantage of the considerable economies of scale of HIT. A key advantage of using a local network as opposed to a remote internet site is that the local network can employ its own trainers. Our experience suggests that, in order for physicians to employ all the potential benefits of this technology, regular updates and training are needed. Local trainers can develop a close ongoing working relationship with practices and can help to not only teach the specific software features but to assist the practice in changing processes to provide more efficient and effective care.

Hospitals are logical choices to be the hubs for these local networks.^a Most already have an IT infrastructure. Furthermore, because many rural patients also receive care at the local hospital, these institutions are in the best position to create electronic interfaces between the hospital clinical information systems and the outpatient EHR to post lab results, x-rays, discharge summaries, and inpatient consultations directly into the outpatient record. These connections make practices not only more efficient but could also help make care safer for patients in the hospital by allowing admitting physicians to have immediate access to outpatient records to confirm medications, allergies, and other vital clinical information. This is particularly important as more inpatient care is provided by hospitalists.⁷

Finally, a local network that also incorporates a teaching practice can serve as a valuable asset in developing new templates and tools to support guideline-based care. Our program has developed a number of such templates as part of the systems-based care curriculum of the family medicine residency, including sophisticated templates for managing depression, diabetes, congestive heart failure, and chronic pain. This capacity provides tremendous economies of scale because the developed template can be used by any other practice in the network at no additional cost.

Our preliminary experience also clearly demonstrates significant barriers to achieving these benefits in small rural practices. The key to achieving practice efficiencies using an EHR is its integrated use to eliminate unnecessary steps in the

care process such as filing paper and countless hand-offs between staff members that can be done more efficiently in an electronic environment. The paradox is that to accomplish this, nearly all elements of the EHR need to be in place, and to get all these features in place requires excess capacity to allow for staff to be trained and develop these new processes. But excess capacity is nonexistent in a busy rural practice. Some have likened the process to “building planes in the air.” Although our rural practices have made remarkable progress in implementing some aspects of the EHR in their practices, the road ahead remains daunting.

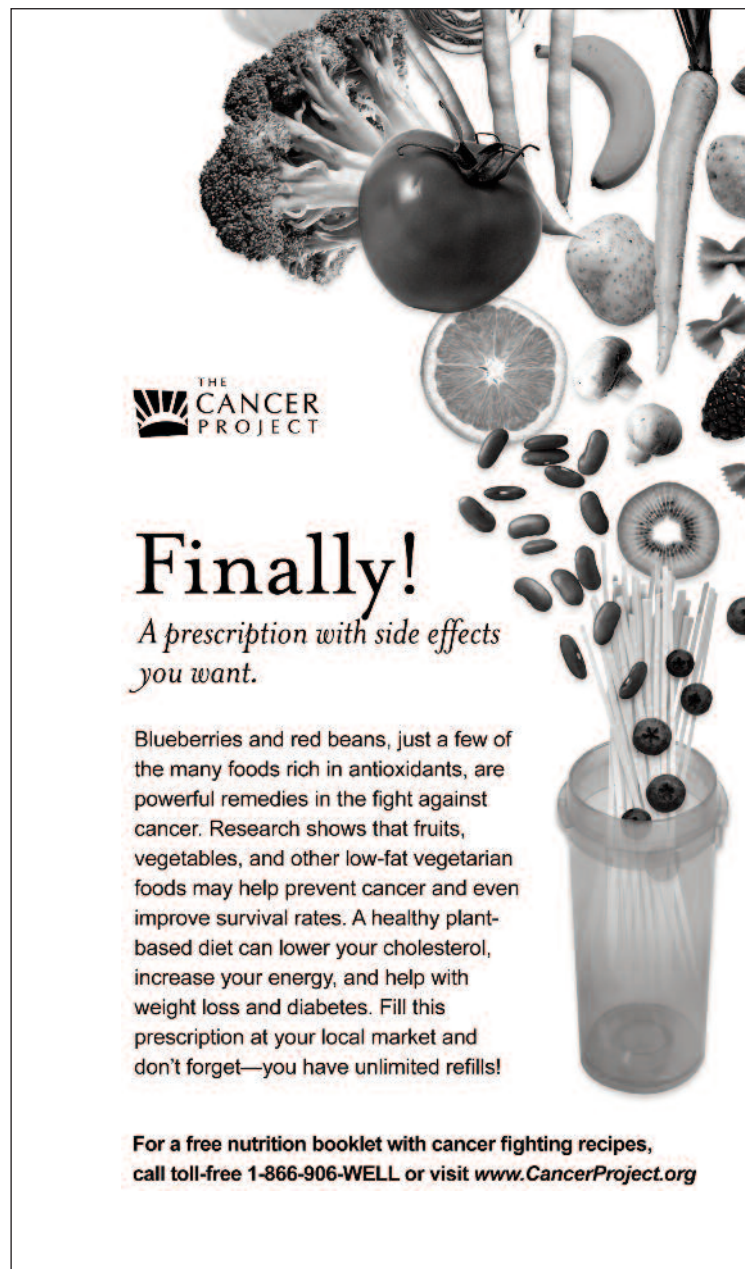
The other key lesson we have learned is that while the EHR can make a practice system much more efficient, it may not actually reduce the time a practitioner spends providing patient care. For instance, using an EHR to document a visit note frequently takes considerably longer than it would to dictate the same note or complete a paper form by hand. Similarly, while e-prescribing can reduce the total staff time required to process a single medication refill from over five minutes to less than 30 seconds, it still takes the same amount of provider time. To prevent consuming valuable clinician time with direct scribing into the EHR, practices need to redistribute these overall efficiencies by training medical assistants to take a more direct role in assisting physicians in completing their work. But again, this requires additional time which is a very rare commodity in rural practices.

According to the definitions of the North Carolina Rural Economic Development Center, over half of North Carolinians lived in rural areas in 2006;⁸ most of those people receive primary care close to home. As we look to improve access and quality of care for this large segment of our population, we need to develop models of health information technology that not only take advantage of economies of scale but are also designed to enhance local and regional systems of care and recognize that small rural practices may require additional support to fully implement this technology. We believe our hospital-based EHR network is a model that could work in other communities and should receive special attention from policymakers. **NCMJ**

a A network “hub” is a centralized secure data center where the servers are maintained that support the software. Maintenance functions include monitoring system function, regular backup of data, redundant data servers and power sources to prevent unscheduled downtime, doing regular software upgrades, and monitoring security and unauthorized access of records. The hub also supports a help desk to troubleshoot should any system problems at the practice sites. In addition, the hub employs an application (EHR) specialist who conducts trainings for new practices coming on to the EHR, provides on-going training as new features are developed, develops new point of care EHR templates to improve documentation in the EHR, and provides reports to support performance improvement activities at each practice.

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