

How useful are patient portals for hospitals in rural areas?

By

Eva Lorenz

A Master's Paper submitted to the faculty of
the University of North Carolina at Chapel Hill
in partial fulfillment of the requirements for
the degree of Master of Public Health in
the Public Health Leadership Program

Chapel Hill

Spring 2017

Date

Date

Table of Contents

Introduction	2
Background and Future of Meaningful Use.....	4
Patient and Perspectives on Portal Usage: a Case Study from a Rural Clinic in North Carolina ...	7
Challenges to Implementing EMRs in Rural Hospitals.....	13
Recommendations	17
Conclusion.....	20
References	23
Table 1: Provider Sample Demographics (10 Total Providers Interviewed).....	28
Table 2: Patient Sample Demographics.....	29
Table 3: Patient Restrictions HRMC Portal Initiative vs. Internship	30
Table 4: Internship Result Summary - Patient Responses to Questionnaire	31
Appendix 1: Internship Material – Patient Questionnaire	33
Appendix 2: Internship Material – Provider Interview Questions.....	39

Introduction

The latest headlines suggest that healthcare is always a subject ripe for a political or a policy debate. If the topic is not the feasibility of the Affordable Care Act (ACA) as a means of providing healthcare coverage to formerly un- and underinsured people, then questions about the security of data and another significant breach grab the headlines. This paper was driven by the observation that federal laws often generate blanket requirements that states must meet and that, within these states, individual communities or entities faced with implementing these laws need to take resources away from what looks like more pressing needs to the people on the ground. The ACA's move towards electronic medical records (EMR) and the use of incentives under the federal Medicare and Medicaid programs to push providers into adopting electronic health records is an example of such a requirement.

The move towards EMR was primarily intended to make healthcare more efficient. But besides saving money, EMR was also anticipated to make continuum of care easier by facilitating the transfer of medical information between providers and allowing patients to switch providers, while still providing access to medical records (Bell and Thornton, 2011). Despite these obvious advantages to patients and providers, a move towards EMR-based patient records nationwide constitutes a significant burden on many small providers, including rural hospitals. A study focused on rural Michigan estimated that the average cost of implementing EHR for rural hospitals is around \$1.5 Million, two-thirds of which are investments in software and staff training (Altarum Institute, 2011). The same study found that incentive payments under Medicaid will routinely cover the cost of implementing EMR systems, but hospitals may struggle to maintain the IT infrastructure going forward. Annual

costs for maintaining EHR systems averaged between \$360,000 to close to \$600,000 depending on whether the hospital was a critical access hospital (CAH) or not. The operating costs can therefore be a significant financial burden for rural hospitals that need to be offset by cost savings through benefits in other EHR-related areas such as improved access to medical data for purposes of health surveillance and improved patient care by allowing for a more efficient transfer to specialized facilities. These possible medical benefits are hard to estimate financially, but clearly rural hospitals need to be prepared to allocate a significant financial investment to maintaining EMR systems once implemented. To speed up the adoption of EMR, the federal government under the Obama administration developed a set of minimum standards focused on the use of electronic medical records (Rouse and DelVecchio, May 2010), called Meaningful Use (MU), which were overseen by the Centers for Medicare and Medicaid Services (CMS).

This paper is focused on the difficulty associated with one requirement under Meaningful Use (MU), namely the requirement to implement a patient portal so that patients can retrieve health information and monitor their health at their convenience. As mentioned earlier, from the facility side, the investment in the creation and maintenance of portals is a considerable expense, and it is only worthwhile if patients feel it is beneficial. This paper explores whether patients, particularly in rural areas, were ready and accepting of the use of a portal to communicate with providers and check their medical records.

The findings reported in this paper are based on an internship to study the acceptability and feasibility of portal use by patients at a rural hospital in North Carolina. It also looks at the broader implication of Meaningful Use for hospitals in rural settings and the benefits and

barriers to its successful implementation using the patient portal as one example. Finally, the paper then goes on to explore the use of EMR technology in various populations and possible barriers to implementing such technology and concludes with a set of recommendations to adapt Meaningful Use and portal implementation to the unique needs to rural hospitals and the patients they serve.

Background and Future of Meaningful Use

The push towards Meaningful Use was justified by the potential for cost savings by moving towards electronic records, but also by the promise of facilitating exchange of medical information between providers (Bell and Thornton, 2011). This second issue has been a challenge for many years and is frustrating to both patients and providers. To incentivize providers to accept Meaningful Use and demonstrate adoption of the framework as early as possible, CMS provided payments as incentives to participating entities upon reaching specific milestones in the adoption of EHR technology. To standardize measurement of adoption, CMS defined three stages of Meaningful Use.

The initial stage, Meaningful Use Stage 1 (MU1) had to be implemented and adopted by providers prior to December 31, 2014. The requirements are listed in detail in industry publications, such as the blog of Practice Fusion (Practice Fusion, no date). To summarize the general areas covered by the requirements, MU1 focused on introducing electronic entries for medical workflows, such as medication orders, as well as setting up a standardized data set in the EMR system for each patient that contained entries for allergies, smoking status, general demographic information etc.

For MU2, the focus was on patient provider communication through a patient portal as well as extending the electronic data workflow to third parties such as focusing on reporting for public health purposes. Demonstrated MU2 adoption was required by participating entities starting 2015 and is still ongoing.

MU3 focuses on improved clinical outcomes through increased interoperability (athenahealth, no date) by certifying EMR applications. It is anticipated that certified EMR applications generate data that is structured in a way that data from one EMR application can be received by another EMR application without having to be reformatted and this increased interoperability would improve the exchange of patient data between different providers. Unfortunately, MU3 has been significantly delayed due to opposition by providers. This stage will now be optional for 2017, but will be required in 2018, regardless of participation by the providers in the earlier stages of Meaningful Use (Nagathara, 2016). It remains to be seen how Tom Price, the new secretary of DHHS, will handle Meaningful Use since he was one of the members of congress to actively push for a delay in MU3 in the first place (Barker, 2016) and asked for the abbreviated reporting period of 90 days to ease the administrative burden on providers. With the emphasis on repealing the ACA, not much may change from the current state of Meaningful Use, but eventually the new government may amend Meaningful Use to lessen the requirements for standard data collection and reporting requirements; changes that would be in line with past statements and proposals by Dr. Price. This uncertainty surrounding MU3 also leaves the future of incentive payments in limbo, payments that many hospitals depend on as a source of income.

These incentives were implemented in 2011 to speed up the adoption of certified EHR technology. All eligible entities trying to attest to meeting MU requirements can select from a menu of nine objectives and up to 16 clinical quality measures (CQMs) that focus on moving from paper records to electronic patient records (cms.gov, 2017). Starting with MU1 and progressing through MU2, any entity that can demonstrate meeting Meaningful Use by showing that workflows were developed around EHR will be eligible for incentive payments under Medicare and Medicaid. This incentive program was still in effect through 2016. If an entity did not meet MU requirements it could have its Medicare incentive payments lowered / adjusted starting in 2015. There are no payment adjustments under the Medicaid EHR Incentive Program. The threat of reduced Medicare incentive payments pushed hospitals towards not just implementing an EHR system, but also actively seeking to adjust workflows around the EHR system such as having patients communicate with providers or view their medical records through a portal. These incentive payments were an important source of income, especially for small and independent hospitals in rural areas with a high Medicaid population. .

The payments can exceed several million dollars because the base payment started with \$2 Million followed by additional payments for every discharge and an accounting for charity care provided by the hospital (HealthIT.gov, no date). A study on the cost/benefit for rural hospitals in Michigan (Altarum Institute, 2011) showed that the incentive payments contributed sufficient funds to pay for the implementation of the EHR system and staff training. This underscores how critical the incentive program under Medicare and Medicaid is for rural hospitals when moving towards electronic health records.

To maximize the incentive payments, entities had to adopt early since the Incentive program was frontloaded and reduced payments to entities that adopted starting 2014 and later (HealthIT.gov, no date). Any hospital starting to use certified EHR technology after 2015 was no longer eligible for any incentive payments under either Medicare or Medicaid. Due to the current uncertainty surrounding the ACA and the Meaningful Use program, it is unclear whether the payments will continue in their current form. This could have an impact on resources and IT expertise that rural hospitals are able to provide for securing patient data in EMR systems that have public-facing portals. This is particularly important because patients in providers in rural clinics already have challenges in using portals, as described below, and the lack of incentives and technical supports will only exacerbate this problem.

Patient and Perspectives on Portal Usage: a Case Study from a Rural Clinic in North Carolina

Hospitals need to enroll a specific percentage of patients as portal users to meet MU2 requirements. To do so, providers must succeed in getting patients to sign up and then use the portal. To see how portals were received in rural areas, such as Halifax County in North Carolina, and how prepared patients are for the use of portals to communicate with providers, I used an internship at a rural hospital, Halifax Regional Medical Center (HRMC), to solicit input from patients and providers about patient portals.

HRMC in Roanoke Rapids, NC, is the only hospital in Halifax County. Halifax County is one of the poorest counties in North Carolina, with a per capita income of \$18,728 and 23.5% of persons living in poverty (Census.gov, no date). 15.5% of people under the age of 65 have no insurance and 17.4% of people under the age of 65 are considered living with a disability.

Furthermore, according to the Census information, the unemployment rate for 2016 was at 7.6%, which is almost twice the state average. These statistics cause HRMC to have a high percentage of Medicaid-covered patients. The population of Halifax County is considered traditionally blue collar, with an emphasis on manufacturing jobs. 76.5% of the people have a high school degree or higher and of these only 11.9% have a bachelor degree or higher. Based on demographics, the population in Halifax County is typical of the patient population for many rural areas (Freyer, no date) (Mitchell, T., 2015); patients tend to be poor, older and less educated than the average urban resident.

To prepare the county population for modern technology, the public libraries in the area offered computer terminals with internet access in their locations as well as individual computer training in at least one location, the Enfield Public Library (Halifax County Library System - Enfield, 2017). In addition, students in at least two schools, Enfield Middle and SE Halifax High School, were provided with free computers starting with the 2014/15 school year (Enfield Middle School & Southeast Halifax High School, 2014). The “loaner laptop for every student” effort by these two schools was overshadowed by negative headlines around the same time in local and regional papers about the overall county school system being the victim of financial mismanagement, poor performance, and high teacher turnover. In the prior decade, the Halifax Public School system had been repeatedly taken over by the state to ensure children receive appropriate education and to aid with teacher retention (Sims, August 11, 2015).

This is the background on the demographics of Halifax County and the potential patients that Halifax Regional Medical Center is attempting to sign up for portal usage. HRMC,

as part of their MU2 attestation, developed a portal to allow patients to access their health information. HRMC, prior to deploying the portal, which was designed with the help of a third party, had the portal tested to ensure that the data accessed through the portal was secure. This initial security assessment was critical because HRMC assures its patients that the data accessed through the portal is safe by ensuring that only authorized parties can access patient data. Following these initial tests, HRMC then had a brochure designed to summarize relevant portal information (Figure 1) and distributed this brochure to all patients that were admitted as outpatients. HRMC anticipated that the brochure would get patients to sign up for the portal by listing benefits of portal use, such as quicker access to lab results and the ability to communicate with providers at any given time.

When HRMC staff realized that the number of patients signing up for the portal was too low to meet MU2 requirements, a staff member was designated to regularly visit admitted patients during their stay and through the in-person visit get the patients to sign up for the portal. Patients targeted for the in-person visit were selected based on the criteria listed in Table 3. With the portal sign-up initiative ongoing, I started an internship on how patients seen at HRMC, either admitted as outpatients or inpatient as well as seen at the emergency room, were receptive to the portal and whether the patients were ready for a portal-based communication with providers instead of the traditional in-person or phone contact with nurses and physicians.

To assess the readiness of HRMC patients to adopt a portal, a questionnaire was used to collect general demographic data as well as to ask questions focused on how familiar patients were with computers and email usage as well as whether they had enrolled in the

portal and saw potential benefits or concerns associated with the portal usage at HRMC. The patient questionnaires were supplemented with in-person interviews of providers to assess how providers may inform patients about the portal and if providers had received any feedback from patients about the portal. The interviews also covered the possible experience providers had themselves as patients at HRMC or with patient portals at other locations (Appendix 1 and Appendix 2).

In a three months period from September through November 2016, a total of 48 patients agreed to complete the survey and 10 providers were interviewed. The patient sample was selected at random by approaching patients in both the outpatient admission and the emergency room as well as any patient that stayed as an inpatient at HRMC who did not experience pain nor was isolated due to a possible infectious disease. The only drawback may be that due to the inclusion of patients using the emergency room a higher percentage of Medicaid patients may have been included in the sample (Garcia, 2010). The providers were selected at random from various departments at HRMC (Table 1). The providers were skewed towards non-MD staff at HRMC, but the sample ensured that all providers had positions which included spending the majority working hours interacting with patients.

Analysis of the questionnaires showed that the patients included in the sample had a median age from 45 to 65 years and their median household income was less than \$26,000. Full patient demographic information is shown in Table 2. The analysis of the questionnaire revealed that about half the patients had access to a computer and only about 10% of the patients had signed up for portal usage at HRMC (Table 4). HRMC admitted to struggling with portal sign up and so had started an initiative in which one staff member would regularly visit patients in the hospital to get them to sign up for the portal. This initiative was the major reason that more people were signing up for the portal compared to the initial attempts of providing patients registering for admission as in- or out-patients with a summary brochure explaining the portal (Figure 1), its benefits and how to sign up to use the portal.



Figure 1: HRMC Patient Portal Brochure

The questionnaire revealed that most patients did not sign up for the portal either because they felt they did not need one or because the portal seemed too complicated. Most

patients indicated that they preferred to talk to providers in person or by phone. Therefore, despite most patients surveyed seeing a potential benefit for a portal, such as quicker access to information and being better informed about their health, patients did not undertake the effort to sign up. When asked about concerns regarding a portal, such as privacy or security of their data, some patients indicated a concern about data privacy, but most patients could not elaborate a clear concern about portal usage.

Even among the providers, a relatively small number of providers were utilizing patient portals. Only 4 of 10 providers used a portal for their personal healthcare needs and only 3 of the providers had discussed the portal at HRMC with patients. In the interviews, several of the providers indicated that without some initiative by HRMC, patients may not know about the portal availability at HRMC. The providers indicated that no patient had brought up the portal on their own.

The experience with administering the questionnaire in this study showed that personal interactions with patients largely facilitated the completion of the questionnaire. The internship experience showed that a good percentage patients approached about the questionnaire was willing to participate in the study. The rate of patients approached and willing to participate in the study was more than 25% in the emergency room and outpatient admission and more than 50% for the inpatient units, indicating that many patients were agreeable to answering a paper survey, despite having no benefit from the study and having never met the person approaching them about the study. This supports the experience that HRMC had with approaching patients directly about the portal sign up, i.e. in-person interaction facilitates portal sign-up by patients. However, the patient population at HRMC,

due to the age and education level, is not well prepared to handle portal-based communication and use.

Based on the questionnaire responses, it is unlikely that expanding the target population for the HRMC initiative to patients of any age and to those without a proven email would have yielded significantly more portal enrollees. Therefore, portal sign up and continued portal use will be difficult to achieve at HRMC at the levels mandated by MU as a success criteria (more than 5% of patients seen at HRMC under MU2).

Our findings at HRMC are indicative of general challenges faced in implementing and encouraging use of EMRs in rural settings. The next sections will look in more detail at the literature on these challenges. We will begin by looking at implementation barriers, and then discuss barriers to the use of EMR, in particular electronic communication, in rural areas.

Challenges to Implementing EMRs in Rural Hospitals

While Meaningful Use has been associated with an increase in percentage of hospitals that have adopted EMR technology (Sandefur, April 2015), there is a divide between hospitals based on location, size, and involvement with teaching functions (Houser, 2011).

Small rural hospitals tend to be slower in adopting Meaningful Use technology, such as EMR software, and when they do, the EMR is out-of-the box and simpler in its implementation compared to networks of large hospitals that may also serve as teaching hospitals. Part of the reason, as indicated by Adler-Milstein (Adler-Milstein, 2014) is that rural hospitals also offer a more basic set of services and maybe therefore be served adequately using standard EMR

software to cover their service catalog without the need for customization that may be used by larger hospitals.

However, while it is not surprising that smaller hospitals tend to settle for simpler implementation, the reason for this may not just be lack of overall complexity in workflows and administration. McCullough et al. (2011) suggest that rural hospitals struggle to recruit IT professionals and retain them, forcing them to accept an out-of-the-box solution that may meet Meaningful Use requirements, but may not be a perfect fit for their environment. In a contrasting view, Houser et al. suggest that lack of IT expertise is not the reason for the slower adoption of EMR technology, but that lack of funding is the main barrier holding back implementing of EMR in rural hospitals (Houser, 2011).

A study in Iowa by Jaana et al. indicated that EMR implementation in rural hospitals may have been overstating the degree that EMR was actually present in this class of hospitals. While an affirmative answer was given when asking about EMR implementation, asking additional questions to determine the degree of EMR implementation indicated that this class of hospitals often just had a very basic implementation of EMR, such as clinical data present in electronic form, but had not progressed with using EMR for other purposes, such as order entry or remote monitoring. (Jaana, 2012).

While rural hospitals may favor out of the box solutions with basic workflows, there are still fundamental operational requirements that require resources and expertise. For example, all hospitals, rural and urban, must still protect the patient data stored within the EMR software from breaches that can prove very costly even for small hospitals. An audit of hospitals by HHS revealed many security vulnerabilities in the implemented EMR software. The

technical requirements for EMR systems, such as strong access controls, good audit trails and encrypting data at rest (replacing data with random characters through application of complex mathematical algorithms) (Rodriguez, 2011) are only part of the equation. In addition, staff needs to be trained in the proper use of EMR technology and what to do in situations in which the EMR system is not available, such as during prolonged power outages (Iron Mountain, no date). Failure to properly train staff can also facilitate security incidents by having staff improperly use EMR systems or bypassing technical safeguards. Implementing EMR software well is a project that can span several years and requires investing funds in the areas of technology as well as human resources (McDavid, 2013). While researchers have argued that EMR holds great promise for rural areas (Hargreaves, 2010), they were also quick to point out that rural areas face significant obstacles due to lack of infrastructure, lack of a consistent security standard and lack of incentives that meet the specific needs of rural hospitals.

Even if all these challenges are met, there is still the issue of patient acceptance and demographics. There are few published studies on how rural populations accept the use of patient portals for disease management and general access to patient information. One study by Karatzanis (Karatzanis, 2013) indicated that in rural England, patients with diabetes had an overall positive experience with portals, expressing satisfaction with the improved access to information that allowed them to be more proactive about their health. Despite this, overall use was low. The authors cited the reason for low engagement was the possible age of the patients since in the UK only 33% of people 75 years and older use the Internet. This suggests that an aging population may not be good candidates for the use of portals not only due to lack of everyday computer usage, but also, as speculated in the paper by Karatzanis, due to

accessibility issues with vision, hearing and coordination that make computer usage difficult. This is reinforced by a study of underserved and underinsured patients in the San Francisco area (Schickedanz, 2013) that visit FQHC (Federally Qualified Health Centers) . The patients seen at the FQHCs in questions were poor, had no college education and were mostly from minority backgrounds. But when comparing email vs. non-email users, most the patients at the provider locations were using email. This is because the patients using email in the study by Schickedanz showed more education, including some college classes, had a higher proficiency in English and tended to be white and younger to a larger degree ($p < 0.01$) compared to the patients without regular email usage.

Challenges also exist on the provider side. A study by Burke (Burke, 2002), indicated that rural providers are less likely to seek adoption of advanced technology beyond a simple portal, such as technology to manage diseases and that they seem to lag behind more urban areas when it comes to technology adoption rates. In part, this lag may be due to the influence that early portal adopters among providers have on pushing other providers in the same geographic area towards adopting patient-facing portal technology. In rural areas, such as Halifax County, the density of hospitals is less than in urban area, so providers do not feel pressure into adopting portals to compete with other providers. This is true of HRMC, which is not affiliated with a large regional network, such as UNC Healthcare or Novant Health. The hospital staff must perform their own research in selecting the vendor, carry the cost of implementation and any associated costs and manage patient education on their own.

Besides these factors, providers also bring to the decision on portal implementation their background and experience in dealing with IT projects. For example, an older physician

may be less likely to seek implementation of an enterprise software program and prefer to stick with paper notes (Tucker, 2012). EMR adoption in rural areas may differ between primary physicians, specialists and hospitals with each provider group showing a different adoption rate and experiencing different barriers to EMR adoption (Singh, 2011). Reimbursement models may impact adoption, with Medicaid heavy practices showing higher rates of EMR adoption than offices with an emphasis on Medicare payments (Whitacre, 2014).

In summary, both providers and patients seem to see benefits in EMR implementation, but both groups struggle with barriers that may be related to the rural location of a hospital as well as socio-economic factors. The following section includes possible solutions geared towards providers and patients to improve portal acceptance and usage in rural areas.

Recommendations

The review of the literature has shown that adoption of a portal in rural areas faces several obstacles. To effectively implement portals in rural hospitals, both barriers for providers and patients need to be addressed.

Starting with the barriers that patients face, electronic communication for patients should not be limited to email. If patients are not ready for email usage to communicate with providers, maybe more basic electronic technologies such as SMS would offer a possible a solution. In several studies, SMS has been evaluated as an alternative to engage patients in high poverty areas as well as developing countries with limited internet infrastructure (Siedner, 2012). But SMS technology has several stumbling blocks of its own. Concerns about SMS arose over privacy and the low-quality transmission of medical results in image form (Free, 2013).

But if hospitals have already implemented EMR technology, using SMS technology that is encrypted could alleviate the privacy concerns. While SMS may not be adaptable to as many uses as a built in EMR-email component, SMS would be one step to get patients to accept electronic communications from providers and a first step towards getting patients to trust and use EMR-associated technology. Even if patients would not log into a portal, using SMS to remind patients of appointments or prompt them for a follow-up call with a provider would still connect providers to patients and could possibly occur through an application that is part of the overall EMR set-up to automatically retain SMS messages as part of the health record.

Another solution to more actively engage patients is bringing a human face to patient enrollment. What HRMC has shown is that a real person visiting patients is more effective than a brochure to enroll patients in a portal. Therefore, a formal in-person patient engagement by hospital staff equipped with tablets and test patient data could walk patients through a portal, explain its uses and show its benefits. Hospitals could also use brief videos to explain portal benefits that could be shown in patient waiting areas to explain to patients portal use and benefits.

On the provider side, possible barriers to portal usage include lack of qualified IT staff, lack of infrastructure and lack of financial resources. To assist providers and stay in line with prior comments by Secretary Price to focus on interoperability (Miliard, 2017), a secure SMS application could be designed to allow providers to contact patients that are not comfortable using email and are therefore unlikely to enroll in a portal. This could be maintained by a central authority, thereby avoiding the need for hospitals to hire IT staff for its maintenance.

In the long run, such an application may prove more cost effective than rural hospitals seeking to meet % goals for patient enrollment.

Another possible solution to make portals more suitable for the unique needs of rural hospitals would be a staged roll-out to delay portal go-live dates of rural hospitals by some years to allow rural hospitals to learn from larger clinics in urban areas what worked and what did not work in their portal initiatives. Rural hospitals could use the delay to build up an infrastructure that can support a secure portal application and possibly train staff, including IT staff, in effective use of EMR software. It may even be possible to think about a shared IT support model, in which several smaller hospitals are provided with one support technician focused just on EMR and portal support. This would ensure highly training IT staff being available to rural hospitals, but at a relatively affordable rate due to sharing of the support service by several hospitals.

Lastly, changes would have to be made on the policy level as well. Here, success criteria would be adjusted and measured in a way that was customized towards rural hospitals. Considering that these hospitals often perform laboratory services for primary care physicians, portal enrollment could be measured by counting patients who log into the patient portal at the hospitals, but could also include patients using a portal at their primary physician practice. The patients for whom the hospital performed laboratory tests would be credited to the hospital as well since the primary physician in question is relying on the hospital for clinical services. Even though patients would discuss results with their physician, the hospital relays the information for the patient's lab results to the physician via secure electronic means and

therefore this provider-provider transmission constitutes an important component of EMR usage.

These adjustments would still support a move towards a portal by rural hospitals, but would importantly tie the EMR system in with other initiatives that prepare patients more effectively to use electronic communication, provide a more even playing field for rural vs. urban hospitals and adjust the legislation to consider the unique role that rural hospitals play in the medical provider landscape of their area.

Conclusion

The research for this paper has shown that portal usage is a significant investment for rural hospitals, and that, in addition to the financial stake, they face significant barriers from the rural population in signing up for and using a portal. Rural hospitals face obstacles due to constrained resources, but also a small IT talent pool to implement a portal and perform the daily maintenance of a patient portal. Financial incentives to support MU may mitigate some of these obstacles, but these are uncertain under the current administration. Yet, the research indicates that EMR implementation does affect outcomes, and so there is value in promoting the implementation of EMR components, including portals, as much as possible. Possible solutions to overcome the IT issues range from rural hospitals solving the issue on their own by having regular networking events to overcome the shortcoming in IT expertise (Janaa, 2012) to creating an improved infrastructure for rural areas that would provide reliable internet access (DesRoches, 2012). In North Carolina, the Golden Leaf Foundation has provided grants to select counties to improve the overall IT infrastructure (Tryon Daily Bulletin, 2006), but no

statewide initiative is in place to target rural counties in general or specifically work on improving healthcare-related IT infrastructure. Without making the portal central to patient-related workflows, rural hospitals, due to lack of IT resources and trained health IT staff, may not then maximize the benefit of investing in a portal and instead implement a “stripped down” portal to meet a milestone required under Meaningful Use. This approach does not only potentially leave the portal open to hacking attacks due to the hospital seeing the portal as not central to its mission and failing to implement sufficient security around it, but also forces the hospital to pay a significant amount of money for a portal that could provide more effective services if interconnected with a larger number of applicable hospital workflows.

Even with a comprehensive approach to improve the IT aspect of infrastructure and training for rural hospitals, only one part of the problem is tackled. While several studies have shown that people in rural areas value a portal to assist with their personal healthcare, a personalized effort is needed to get people to sign up for the portal and then use the portal consistently.

While a totally individualized approach is not feasible, any initiative that seeks to improve or alter how healthcare providers function and interact with patients should consider that not all providers are equal. The solution is also not as simple as pushing more responsibility to the states since even within a single state, providers differ significantly between rural areas and large urban cities. What is needed is an approach that, especially when technology is involved, considers the technology awareness of the population served by a specific provider and combines efforts aimed at both providers and patients to get both groups ready for the deployment of a new technology. Unfortunately for the rural hospitals

already engaged in portal deployment under Meaningful Use, the preparation stage has already passed and costs are being incurred every month now to maintain the patient portal.

In order to assist these rural hospitals with the portal cost going forward, state and federal governments should assist rural hospitals through short-term grants to ensure affordable IT support. As long-term solutions, some of the alternatives summarized in the paper should be considered, such as providing a phone app to allow patient communication via SMS and to put urban, large network hospitals in a position to pass lessons learned onto other providers as means to allow in particular rural hospitals to save time and money related to portal implementation and ongoing use.

References

1. Adler-Milstein, J., Everson, J., and S.-Y. D Lee. 2014. Sequencing of EHR adoption among US hospitals and the impact of meaningful use. *Am Med Inform Assoc* 21:984–999.
2. Altarum Institute. 2011. Overcoming Challenges to Health IT Adoption in Small, Rural Hospitals. Available online at https://www.healthit.gov/sites/default/files/pdf/OvercomingChallenges_in_SmallRuralHospitals.pdf.
3. Anonymous. 2011. Security Gaps Plague EMRs. *The Journal of Medical Practice Management: MPM; Phoenix* 27:1.
4. Athena Health. No date. Meaningful Use Stages. Available online at <http://www.athenahealth.com/knowledge-hub/meaningful-use/stages>.
5. Baird, A., Furukawa, M. F., and T. S. Raghu. 2012. Understanding Contingencies Associated with the Early Adoption of Customer-Facing Web Portals. *Journal of Management Information Systems*, 29:293-324.
6. Barker, S. 2016. Incoming HHS Secretary Tom Price Brings Physician-Focused Perspective to Health IT. Covington Health. Available online at <https://www.covingtonhealth.com/2016/12/incoming-hhs-secretary-tom-price-brings-physician-focused-perspective-to-health-it/>.
7. Bell, B. and K. Thornton. 2011. From promise to reality achieving the value of an EHR. *Healthcare Financial Management* 65:51-56.
8. Burke, D. E., Wang, B. B. L., Wan, T. T. H., and M. L. Diana. 2002. Exploring Hospitals' Adoption of Information Technology. *Journal of Medical Systems* 26:349-355.
9. Census.gov, no date. Search terms Halifax County and North Carolina. Available online at <https://www.census.gov/quickfacts/table/PST045215/37083>.
10. Claunch, D., and M. McMillan. 2013. Determining the right level for your It security investment. *Healthcare Financial Management* 67:100-103.
11. CMS.gov. October 6, 2015. CMS Fact Sheet: EHR Incentive Programs in 2015 and Beyond. Available online at

<https://www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-sheets/2015-Fact-sheets-items/2015-10-06-2.html>.

12. CMS.GOV. January 24, 2017. eCQM Electronic Specifications. Available online at https://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/eCQM_Library.html.
13. DesRoches, C.M., Worzala, C., Joshi, M.S., Kralovec, P.D., and A. K. Jha. 2012. Small, Nonteaching, And Rural Hospitals Continue To Be Slow In Adopting Electronic Health Record Systems. *Health Affairs* 31:1092–1099.
14. Enfield Middle School & Southeast Halifax High School. 2014. Parent-Student Laptop Handbook 2014-2015. Available online at http://en.halifax.k12.nc.us/UserFiles/Servers/Server_100964/File/Parent-Student%20Laptop%20Handbook14-15.pdf.
15. Free, C., Phillips, G., Watson, L., Galli, L., Felix, L., Edwards, P., Patel, V. and A. Haines. 2013. The Effectiveness of Mobile-Health Technologies to Improve Health Care Service Delivery Processes: A Systematic Review and Meta-Analysis. *PLoS Med* 10(1): e1001363. doi:10.1371/journal.pmed.1001363.
16. Freyer, A. no date. 40 rural counties lose working-age population. *Prosperity Watch* 38:1.
17. Garcia, T. C., Bernstein, A. B., and M. A. Bush. May 2010. Emergency Department Visitors and Visits: Who use the Emergency Room in 2007? *NCHC Data Brief* 38. Available online at <https://www.cdc.gov/nchs/data/databriefs/db38.pdf>.
18. Gosk, S. May 27, 2015. Electronic Medical Records Are Latest Target for Identity Thieves. Available online at <http://www.nbcnews.com/news/us-news/electronic-medical-records-latest-target-identity-thieves-n365591>.
19. Halifax County Library System – Enfield. 2017. 2016 Programs. Available online at <http://www.halifaxnc.libguides.com/content.php?pid=361678&sid=2972536>.
20. Hargreaves, J. S. March 2010. Will electronic personal health records benefit providers and patients in rural America? *Telemedicine and e-Health* 16:167-176.

21. HealthIT.gov. no date. EHR Incentive Programs. Available online at <https://www.healthit.gov/providers-professionals/ehr-incentive-programs>.
22. HealthIT.gov. no date. EHR Incentive Payment Timeline. Available online at <https://www.healthit.gov/providers-professionals/ehr-incentive-payment-timeline>.
23. HIMSS. 2014. Using Patient Portals to Achieve Meaningful Use (EP Edition). Available online at <http://www.himss.org/using-patient-portals-achieve-meaningful-use-ep-edition>.
24. Houser; S. H., Au, D., and R. Weech-Maldonado. 2011. The Impact of Geography on Hospital Electronic Health Records Implementation in Alabama. *Appl Clin Inf* 2: 270–283.
25. Iron Mountain. No date. Electronic Health Records Security and Privacy Concerns. Available online at <http://www.ironmountain.com/Knowledge-Center/Reference-Library/View-by-Document-Type/General-Articles/E/Electronic-Health-Records-Security-and-Privacy-Concerns.aspx>.
26. Jaana, M., Ward, M. M., and J. A. Bahensky. 2012. EMRs and Clinical IS Implementation in Hospitals: A Statewide Survey. *The Journal of Rural Health* 28:34–43.
27. JAMA - Journal of the American Medical Association. April 14, 2015. Increase seen in data breaches of health information. *ScienceDaily*. Available online at www.sciencedaily.com/releases/2015/04/150414125807.htm.
28. Jha, A.K., DesRoches, C.M., Shields, A.E., Miralles, P.D., Zheng, J., Rosenbaum, S. and E. G. Campbell. 2009. Evidence of an emerging digital divide among hospitals that care for the poor. *Health Affairs (Project Hope)*. 28:w1160-70. Available online at <http://www.ncbi.nlm.nih.gov/pubmed/19858142>.
29. Karatzanis, I., Clarke, M., Chiarugi, F., Manousos, D., Spanakis, E. G, Marias, K., Jones, R. W., Kontogiannis, V., Fursse, J., Kouroubali, A., Verma, V., and Thomson, Shona. 2013. First results about the use of a patient portal by people with diabetes in a rural area. *2013 E-Health and Bioengineering Conference (EHB) 2013:1 – 5*.

30. Lee, M.J., and T. Luhby. 2017. Medicaid takes center stage as Democrats grill Tom Price. CNN.com. Available online at <http://www.cnn.com/2017/01/24/politics/tom-price-nomination-hearing-finance>.
31. McCullough, J., Casey, M., Moscovice, I., and M. Burlew. 2011. Meaningful Use of Health Information Technology by Rural Hospitals. *The Journal of Rural Health* 27:329–337.
32. McDavid, J.P. July/August 2013. HIPAA Risk is contagious: Practical Tips to prevent a breach. *The Journal of Medical Practice Management*. Pages 53-55.
33. Mitchell, T. 2015. North Carolina’s Great Challenge: Widespread struggles remain a grave threat to economic growth and us all. Available online at http://nccalj.org/wp-content/uploads/2015/11/BTC-Report_North-Carolinas-Greatest-Challenge.pdf.
34. Miliard, M. June 25, 2014. For portals, speak patients’ language. Available online at <http://www.healthcareitnews.com/news/portals-speak-patients-language>.
35. Miliard, M. 2017. Tom Price takes aim at the inefficiencies of meaningful use, questions how to pay for precision medicine. Healthcare IT News. Available online at <http://www.healthcareitnews.com/news/tom-price-takes-aim-inefficiencies-meaningful-use-questions-how-pay-precision-medicine>.
36. Nagathara, H. 2016. Meaningful Use Stage 3 and its Impact on the Healthcare Industry. Available online at <http://www.sutherlandhealthcare.com/wp-content/uploads/2016/12/Point-of-View-Meaningful-Use-Stage-3-and-Its-Impact.pdf>.
37. Practice Fusion. No date. Meaningful Use Stage 2 for 2015 - 2017. Available online at <http://www.practicefusion.com/meaningful-use-criteria-stage-2/>.
38. Rodriguez, L. December 12, 2011. Privacy, Security, and Electronic Health Records. Available online at <https://www.healthit.gov/buzz-blog/privacy-and-security-of-ehrs/privacy-security-electronic-health-records/>.
39. Rouse, M. and A. DelVecchio. (May 2010) Definition of Meaningful Use. Available online at <http://searchhealthit.techtarget.com/definition/meaningful-use>.
40. Sandefer, R., David, M., and P. Kleeberg. April 2015. Meaningful Use Attestations among US Hospitals: The Growing Rural-Urban Divide. *Perspectives in Health*

Information Management. Available online at

<http://library.ahima.org/doc?oid=301186#.WMSEhBDtnYA>.

41. Schickedanz, A., Huang, D., Lopez, A., Cheung, E., Lyles, C. R., Bodenheimer, T., and U. Sarkar. 2013. Access, Interest, and Attitudes Toward Electronic Communication for Health Care Among Patients in the Medical Safety Net. *J Gen Intern Med* 28:914–920.
42. Siedner, M.J., Haberer, J.E., Bosco Bwana, M., Ware, N.C. and D.R. Bangsberg. 2012. High acceptability for cell phone text messages to improve communication of laboratory results with HIV-infected patients in rural Uganda: a cross-sectional survey study. *BMC Medical Informatics and Decision Making* 12:56-62.
43. Sims, J. August 11, 2015. NC Superintendent: Halifax school board 'dysfunctional'. Available online at <http://www.wral.com/nc-superintendent-halifax-school-board-dysfunctional-/14824403/>.
44. Singh, R., Lichter, M. I., Danzo, A., Taylor, J., and T. Rosenthal. 2011. The adoption and use of health information technology in rural areas: Results of a national survey. *The Journal of Rural Health* 28:16-27.
45. Tucker, M. T., Higginbotham, J. C., and J. M. Parton. 2012. EMR Use among rural and urban Alabama Family Medicine physicians. *Southern Medical Journal* 105:72-77.
46. Tryon Daily Bulletin (September 19, 2006). e-Polk signs contract to expand fiber optic network. Available online at <http://www.pangaea.us/whats-happening/e-polk-signs-contract-to-expand-fiber-optic-network/>.
47. Whitacre, B. E. and R. S. Williams. 2015. Electronic Medical Record Adoption in Oklahoma Practices: Rural-Urban Differences and the Role of Broadband Availability. *The Journal of Rural Health* 31:47-57.

Table 1: Provider Sample Demographics (10 Total Providers Interviewed)

	Providers
Departments	Progressive Care Patient Education Laboratory Services Outpatient Registration Customer Service (patient care)
Job titles	Registered Nurse Laboratory Technician Registration Staff
Employed at HRMC for more than 10 years?	Yes = 10
Do you use the portal as part of your job?	No = 10
What function do you perceive patients use the most?	N/A = 10
Do you communicate more with patients through the portal than other means?	N/A = 10
Has the portal increased patient communication in your opinion?	N/A = 10
Have patients commented to you about the portal and its benefits/drawbacks?	Yes = 3, No or N/A = 7
Have you used the portal at another provider or as a patient?	Yes = 4, No = 6
If yes, how would you rate your experience?	Beneficial = 4, N/A = 6

Table 2: Patient Sample Demographics

Patient demographics			
Age		Employment	
18-30	11	35 or more hours/week	10
31-45	9	less than 35 hours/week	6
46-65	13	not currently employed	27
65-more	13	Employment	
Gender		General management	5
Male	17	Computer-related	2
female	30	Advertising	1
Residence		Finance	0
Inside Halifax County	33	Legal	0
Outside Halifax County	14	Engineering	3
Income		Building trade	3
Less than \$26K	33	Manufacturing	3
\$26,000 to \$50,000	4	Government/public agency	5
\$50,000 to \$100,000	6	Health-related	4
More than \$100K	0	R&D	1
Education		Publishing	0
some high school	2	Production	0
GED	20	Education	2
Trade school	3	Other	11
some college classes	14	Ethnicity	
College degree	2	Hispanic	0
Some graduate school	4	Non-Hispanic	32
Professional degree	0	Race	
Family		Asian Islander	3
married	16	Asian	0
never marry	7	Black	19
separated	11	Native Islander	0
widowed	5	White	22
partnership	2		
no answer	4		
Children			
No	9		
Yes	36		
less than 10 years old	2		
From 10 to 18 years of age	4		
Older than 18 years	16		

Table 3: Patient Restrictions HRMC Portal Initiative vs. Internship

	Portal Initiative	Internship
Age	Less than 65 years of age included	No age limitation
Patient indicating being in pain	Excluded from interview	Excluded from interview
Patient in Isolation	Excluded from interview	Excluded from interview
Patient being seen in ER	Excluded from interview	Included in target population
Email address included in record	Included in interview	Not relevant for interview selection

Table 4: Internship Result Summary - Patient Responses to Questionnaire

Note: Questions not directly related to the portal or computer usage, such as which HRMC department a patient was seeing for their treatment, were omitted.

Q4: Do you own a computer?	
Yes – please proceed to question 5	22
No	16
Q4a: If you do not own a computer, do you still use a computer regularly?	
Yes	6
Does the computer belong to a family member or friend?	4
Is the computer in a public location, such as in a library?	2
No - thank you for your participation in this study!	12
Q5: Do you regularly use email (at least once a week)?	
Yes	16
No	18
Q6: Have you used the patient portal at Halifax Regional (Halifax Health Link)?	
Yes – skip to question 7	5
No	29
Q6a: If you have not used the patient portal at Halifax Regional, please indicate the reason	
Did not need to	9
Too complicated	4
A family member /third person handles this for me	3
Prefer to talk to a human	6
Other _____	2
Q6b: If you have not used the patient portal at Halifax Regional, please indicate how you communicate with your physician at Halifax Regional?	
Through your primary care physician	4
Email	1
Phone	10
In-person	12
Do not do any follow-up outside of visits	7
Q6c: If you have not used the patient portal at Halifax Regional, please indicate whether you use a portal to communicate another physician or health organization?	
Yes	7
To communicate with your Primary physician	6
To communicate with your Health insurance company	0
Other _____	0
No – thank you for your participation!	19
Q7: Do you use the patient portal at Halifax Regional to?	
Check appointment schedule	4
Check prescriptions	1
View health information	11
Q8: Do feel that the portal is benefit over traditional health information access in person or by phone	
Yes – move to question 8a:	14

No – move to question 8b:	9
Q8a: Why do you believe that the portal is beneficial?	
Easier to access	7
More convenient to access	7
Better way to present information	4
Other	1
Q8b: Why do you believe that the portal is not beneficial?	
Too complicated	2
Not enough information	1
Hard to access / do not have computer	2
Concerned about Privacy	3
Other	5
Q9: Do you more regular communicate with your provider due to the patient portal?	
Yes	8
No	15
Q10: Do you feel better informed about your health and your health outcome due to the patient portal?	
Yes	16
No	8

Appendix 1: Internship Material – Patient Questionnaire

Demographic information:

Age

- 18 through 30 years of age
- 31 through 45 years of age
- 46 through 65 years of age
- 66 and older years of age

Gender

- Male
- Female

Residence

- Halifax County
- Outside of Halifax County

Annual household Income (includes income for all members of the family)

- \$25,999 or less
- \$26,000 through \$50,999
- \$51,000 through \$100,000
- more than \$100,000

Education level

- Attended some High school
- Completed High school or GED
- Trade school
- Attended some College
- College degree
- Graduate school (Ph.D., Masters)
- Professional school (J.D., M.D.)

Family

- Married
- Never married
- Separated
- Widowed
- Partnership
- Prefer not to answer

Children

- No
- Yes
 - Less than 10 years old
 - 10 to 18 years old
 - 18 years or older

Employment

How many hours do you work in a typical week?

- 35 hours a week or more
- Less than 35 hours a week
- I am not currently employed

Employment type

- General management
- Computer/technology/IT/Internet
- Advertising/Marketing/Sales
- Finance
- Legal
- Engineering
- Building/Facilities
- Manufacturing
- Government
- Health/Medicine/Fire/Safety
- Research Development
- Publishing/Printing

- Production
- School/Library/Education
- Other Function

Ethnicity

- Hispanic / Latino
- Non-Hispanic / Non- Latino

Race

- American Indian or Alaska Native
- Asian
- Black or African American
- Native Hawaiian or other Pacific Islander
- White

The following questions deal with your interaction with the patient portal at Halifax Regional, in particular how comfortable you are using the portal for communicating with your provider, checking test results and using the electronic format to maintain a good health status.

Question 1:

How long have you received services at Halifax Regional?

Question 2:

Services received at Halifax Regional (select all that apply)

- Anesthesiology
- Dentistry
- Family Medicine
- Internal Medicine
- Cardiology
- Gastroenterology
- Geriatrics
- Hematology
- Infectious Diseases
- Nephrology
- Oncology
- Pulmonary Medicine
- Rheumatology
- Obstetrics
- Ophthalmology
- Orthopedics
- Otolaryngology
- Pathology
- Pediatrics
- Psychiatry
- Surgery
- Urology
- Emergency Room Services
- Other

Question 3:

Are you being treated at Halifax Regional for a chronic illness or condition?

(Chronic illness/condition – defined as requiring regular treatment or follow-up with a physician)

- Yes
- No

Question 4:

Do you own a computer?

- Yes – please proceed to question 5
- No

Question 4a:

If you do not own a computer, do you still use a computer regularly?

- Yes
 - Does the computer belong to a family member or friend?
 - Is the computer in a public location, such as in a library?
- No - thank you for your participation in this study!

Question 5:

Do you regularly use email (at least once a week)?

- Yes
- No

Question 6:

Have you used the patient portal at Halifax Regional (Halifax Health Link)?

- Yes – skip to question 7
- No

Question 6a:

If you have not used the patient portal at Halifax Regional, please indicate the reason

- Did not need to
- Too complicated
- A family member /third person handles this for me
- Prefer to talk to a human
- Other _____

Question 6b:

If you have not used the patient portal at Halifax Regional, please indicate how you communicate with your physician at Halifax Regional?

- Through your primary care physician
- Email
- Phone
- In-person
- Do not do any follow-up outside of visits

Question 6c:

If you have not used the patient portal at Halifax Regional, please indicate whether you use a portal to communicate another physician or health organization?

- Yes
 - To communicate with your Primary physician
 - To communicate with your Health insurance company
 - Other _____
- No – thank you for your participation!

Question 7:

Do you use the patient portal at Halifax Regional to?

- Check appointment schedule
- Check prescriptions
- View health information

Question 8:

Do you feel that the portal is a benefit over traditional health information access in person or by phone?

- Yes – move to question 8a:
- No – move to question 8b:

Question 8a:

Why do you believe that the portal is beneficial?

- Easier to access
- More convenient to access
- Better way to present information
- Other

Question 8b:

Why do you believe that the portal is not beneficial?

- Too complicated
- Not enough information
- Hard to access / do not have computer
- Concerned about Privacy
- Other

Question 9:

Do you communicate more regularly with your provider due to the patient portal?

- Yes
- No

Question 10:

Do you feel better informed about your health and your health outcome due to the patient portal?

- Yes
- No

Appendix 2: Internship Material – Provider Interview Questions

Interview with providers

This interview will occur in person with providers randomly selected from HRMC staff. The interview will include open-ended questions. The questions listed below are provided as guidance on the topics covered.

Basic background:

- Job title:
- Department:
- How long employed at HRMC:

A discussion will follow about whether the provider feels that the portal is a benefit for communicating with patient:

- What specific uses do you have for the portal as part of your job?
- What function do you perceive as patients using the most?
- Do you communicate more with patients through the portal than other means (email, phone call, in person)?
- Has the portal increased patient communication in your opinion?
- Have patients commented to you about the portal and its benefits / drawbacks?
- Have you used a portal at another provider location (not affiliated with HRMC)?
- If yes, were your experiences similar at that location with respect to patient use of the portal?