

Research Report

Perceptions of Electronic Health Records Effects on Staffing, Workflow, & Productivity in Community Health Centers

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The Issue

Significant federal investments under the Health Information Technology for Economic and Clinical Health Act of 2009 and the Affordable Care Act have motivated many community health centers (CHCs) to implement electronic health records (EHRs) in the past few years. The number of CHCs using EHRs has more than doubled since 2009 (Jones & Furukawa 2014, Ryan et al. 2014). CHCs are also known to use flexible and innovative staffing models (Ku et al. 2015), so their rapid uptake of EHRs creates a unique opportunity to study how the introduction of new technology influences staffing models, staff roles and workflow, and how these changes in turn influence productivity, coordination between providers and quality of care.

Several studies have examined the intersection of EHR implementation and staffing in primary care settings, although most of these have focused on single categories of workers (e.g. Skillman et al. 2015 on IT staff, Yan et al. 2016 on medical scribes) or specific dimensions such as “teamwork” (e.g. O’Malley et al. 2015). Our study aims to add to this evidence base by taking a more holistic view of staffing configurations and aiming to make clearer connections between EHRs, staffing, and productivity in CHCs. Evidence suggests that EHR implementation causes significant changes in how primary care clinicians spend their time (Furukawa 2011, Howard et al. 2013). Using quantitative analyses, Furukawa (2011) found that EHR use was associated with higher clinician productivity for new problems or procedure-related visits, but not necessarily for preventive visits. A qualitative study conducted by Howard et al. (2013) found that while EHRs reduced work burden for clerical and support staff in community-based physician offices, they caused clinicians to spend less time on some tasks (e.g. prescribing, communication within the office) while spending more time on others (e.g. charting and disease prevention tasks). The overall impact on quality and productivity was less clear, however.

Another study conducted by GW Health Workforce Research Center researchers sought to expand on this initial work by examining the impact of EHR implementation on productivity of other CHC staff members (e.g. nurses) along with providers. The study findings suggested that EHR implementation was positively associated with physician productivity, but negatively associated with nurse productivity in CHCs (Frogner et al., submitted). However, these effects varied with EHR experience level and the mechanisms to explain them were mostly speculative. The use of HRSA grantee-level administrative data did not allow for detailed analysis of the contribution of different site-level staff roles or models or possible changes in roles of different staff members interacting with the EHR over time in accounting for these changes in productivity over time.

CHCs’ use of EHRs is particularly interesting to study because they are subject to multiple reporting requirements and incentives that shape how they enter and analyze data using EHRs. CHCs that receive HRSA Section 330 funds are also required to submit quality of care indicators, financial data, etc. annually for the Uniform Data System (UDS), HRSA’s administrative database on CHCs (BPHC 2015).

Many CHCs use their EHRs to capture quality data for the UDS. The HITECH legislation also includes financial incentives for providers accepting Medicare and Medicaid that reward “Meaningful Use” of EHRs for coordination of care, tracking of clinical conditions, and reporting of quality indicators (Blumenthal 2010, Buntin et al. 2010). Extra support for providers in rural and underserved areas—such as many CHCs—through Regional Extension Centers has enabled many CHCs to upgrade their EHR capabilities to pursue Meaningful Use incentives (Lynch et al. 2014, Riddell et al. 2014). While the UDS reporting requirement and CHCs’ participation in Meaningful Use incentives have been well documented (BPHC 2015, Riddell et al. 2014), less is known about how using EHRs to pursue these goals may interact with their staffing choices, productivity, coordination, and quality of care.

These gaps suggest the need for additional qualitative evidence to understand how CHCs’ use of EHRs interacts with staffing models, staff roles, and workflow, and how this interaction influences productivity, coordination, and quality of care. This project aims to fill these gaps by seeking to understand how, from the perspective of clinicians, support staff, and administrators, CHCs’ implementation of EHRs has changed staffing models, staff roles, and workflow, as well as the mechanisms by which EHRs influence staff productivity, coordination between providers, and quality of care.

Methods

We conducted telephone interviews with 17 administrators, clinicians, and other staff members (including EHR administrators, IT, quality improvement staff, and case managers) at 6 CHCs representing a variety of staffing configurations and EHR experiences. We first identified possible sites using data from the 2014 Uniform Data System (UDS), aiming for a mix of small and large, urban and rural sites, and different EHR vendors across several Mid-Atlantic states. We made initial contact with site CEOs or other leaders via email using information on CHCs’ public websites or in the UDS data. CEOs/leaders who agreed to participate also provided additional contacts or introductions to other staff members within their CHCs after we explained the purpose and goals of the study. The final sample of respondents is shown in Table 1.

The semi-structured interviews were designed to answer the following research questions:

- How do clinicians, support staff, and administrators believe that EHR implementation changed staff roles and staffing models in CHCs?
- How do clinicians, support staff, and administrators believe that EHR implementation changed workflow and productivity in CHCs?
- How do clinicians, support staff, and administrators believe that have these changes influenced coordination between providers and quality of care in CHCs?

We audio recorded the interviews with participants’ permission. We transcribed the recordings and imported the transcripts into ATLAS.ti, a qualitative data analysis software package, for coding and thematic analysis. We followed a three-stage coding process: 1) two coders worked together to develop a coding scheme, 2) they each separately coded a sample of transcripts and then met to discuss and

resolve discrepancies in the codes and coding scheme, and 3) one coder coded the remaining transcripts with the mutually agreed-upon coding scheme (Campbell et al. 2013). We used the code family and query functions in ATLAS.ti to identify common themes and develop memos comparing and contrasting informants' responses to each of the research questions.

This study was reviewed and approved by the Institutional Review Board at the George Washington University.

Results

Informants reported that EHR implementation led to changes in staffing, including hiring new staff members, expanding roles for existing staff members, or both. While Informants reported that changes in workflow enhanced quality of care and enabled a greater focus on population health they decreased productivity with most doubting they would get back to pre-EHR visit capacity.

1. With a few exceptions, most new staff members hired were in support roles such as LPNs, MAs, or QI staff. Some sites also hired IT staff, while others outsourced IT support tasks to external networks or EHR vendors.
2. Making the business case for new hires can be challenging on a CHC budget
3. Several sites also report that EHRs enabled them to make changes to staff roles (especially LPNs and MAs) that enabled *“every person [to] work at the top of their license”* by upgrading their involvement in workflows using EHR tools like standing orders and medication lists.
4. Respondents had mixed views on whether changes led to improved visit workflow
5. Informants generally viewed documenting care in EHRs as a drag on productivity due to excessive clicking and overly specific and frequently changing requirements about where information was entered in the EHR to be captured for reporting.
6. Sites reported EHRs improved coordination within the CHC, generally making it easier to find and share information, medication lists, and behavioral and dental health records.
7. However, sharing patient information with outside providers remained a significant challenge for all, resulting in manual entry and use of add-on products to facilitate communication.
8. However, respondents indicated that EHRs are leading to improved quality of care and that they are using the data to undertake new population health activities.

1. Most new staff hired in support roles

About half of the sites we spoke with indicated that they hired new staff as a result of EHR implementation. Some hired new clinical staff in response to increased requirements for follow-up or because they identified opportunities to improve efficiency. Several sites added IT staff to provide on-site technical support or to enhance their clinical informatics capabilities. Others added more staff in their quality departments to improve documentation and reporting and/or to take advantage of their newfound ability to address population health using EHR data.

While most sites that hired new staff only increased their staff by one or two people, one site grew its IT department from one person to 7. At this site, the new team members were responsible for maintaining infrastructure and managing EHR software upgrades, as well as clinical informatics. About half of the sites outsourced IT roles to vendors or other support networks in addition to (or versus) hiring their own IT staff members. Therefore, it is possible that UDS reports might underestimate the staffing implications of EHR implementation as outsourced positions would not be captured.

For those that hired IT or QI staff, the positions were often junior people brought in to support the existing leads, such as a business analyst who helps train staff on how to use the system effectively and who can also help with developing simple templates and queries.

“We’ve added actually two assistants for [our QI] department, so [the head of our QI department] is going a little less nuts on it herself, shortening her hours to maybe not too much overtime anymore.” [CMO]

Several sites indicated they felt under increased pressure to track follow-up due to federal reporting requirements and other quality incentives. This is leading some to hire additional staff to assist with documentation and quality tracking, including the need to hire part-time staff to migrate data into the EHR. One site added a Director of Population Health, along with a Performance Improvement Data Analyst. They wanted to have staff members who could focus on data mining and analysis to support enhancing quality of care and population health without getting bogged down with the technical challenges involved with supporting EHR implementation.

In some cases, the EHR has helped CHCs to assess whether or not to hire clinical staff and whether a case manager, care coordinator, or patient navigator would be the most beneficial. One site hired scribes for their family medicine providers in recognition that they were staying late to complete their documentation, leading to burnout. However, the CEO did not see the same need to hire scribes for pediatric providers because of the relative complexity of family medicine vs. pediatric visits. At another site, EHR data helped leaders and physicians to realize that they were not completing all of the components of required Medicare Wellness Visits as well as they thought. The site added a nurse practitioner who could make the Medicare visits her focus:

“I think another area that we’ve been able to use the system to really help is the Medicare Wellness Visit. This was one of those arguments that we have with providers who are like, ‘I see my Medicare patients every five months. They’re coming in,’ and we’re like, ‘But they’re not getting all that stuff needed to be done,’ because they’d come in and they’d have one of their chronic issues that need to be done, or refills, and they’d spend the time on that. [Our analyst] would often say when we would do chart audits we see, ‘Address next visit, address it next visit, address it next visit.’ This time we were able to make the case. And this is maybe one of those positions that changed, is that we are now using a nurse practitioner to serve one of our group of our sites, and she rotates through, and that’s what she’s doing. She does the Welcome to Medicare, or the Annual Wellness Visit for them.” [COO]

2. Making the business case to hire more staff can be challenging

Other sites were still struggling to determine how many support staff they would need to take advantage of the information in the EHR and get everyone practicing at the top of their profession. They were still working through questions such as, who is the best person to “tee up” the patient visit so the provider can just walk in the room and get started? Does every provider need an LPN or MA of their own?

“How do we help the staff use the data that's in the system when we have good data? What kind of roles are people going to play? If we're going to use someone who, for lack of a better term, is going to help be the investigator for the doctor and do that all the information, preventative care the critical decisions, support questions and preventative... And kind of tee up the patients for the doctors so they can just go in and see them, who's that going to be? Is it an LPN? Is it an MA? Or does everybody need one? How many do you need per provider [and that] sort of thing. We make sure that we really are taking advantage of the system, and doing the good preventative care that we should be. Corporately I think those are the roles that we're looking at, as whether staffing models are going to change, and whether we're going to have to add different staff to make those things happen.” [Nurse]

Often, making the case for new staff can be challenging on a CHC budget. For example, one site was very interested in hiring scribes, but was unsuccessful in making the business case to leadership. Sometimes, there may not be great financial justification but the data points to the value from a provider satisfaction or a population health point of view. In the case of the site that hired two scribes, the CEO felt that it would eventually lead to increased capacity to see patients, in addition to allowing providers to leave work earlier and reducing burnout. She also noted this led to increased patient satisfaction.

“I was just so desperate with our family practice providers, I just saw no other option [than to hire scribes]. They were staying until 7:00, 8:00, 9:00 every night...now [they] are getting out of here by 6:00 every night...I think that this could be a very, very functional thing, and I think, even if we see one more patient a day we can pay for this position.” [CEO]

Another site pointed out that hiring a care coordinator likely led to better outcomes, even if it did not necessarily help the CHC financially:

“If [a] doctor is showing much better outcome[s] and we've been able to, for whatever reason, hire a care coordinator there, we can say, ‘We think this is why.’ Maybe it doesn't make us money, so to speak, but it helps us do what we're supposed to be doing, which is getting people healthier. I'm a big proponent of, ‘We need to stop treating people once they're over the cliff and keep them from falling over the cliff on the

different healthcare issues.' We can't do that without utilizing the data and increasing preventive [care], and following the trends." [COO]

Several sites noted that EHRs are not well set-up to document case management efforts. This can present challenges in making sure that providers are kept up-to-date on case management activities. It also made case management work more abstract and limited CHCs' ability to understand or demonstrate the impact of case management activities. One informant reported that her CHC was interested in hiring a second case manager, but had a difficult time showing how many patients she had seen or tracking readmission rates of patients she had served:

"I know how much [the case manager] does because she's right down the hall from me. I hear the patients coming in, I hear the providers coming in..., but we have no way to show what kind of work she's doing, how long she's doing it, how long it takes.... You can't show that in reports, and that's what we're hoping, to start pulling out more numbers of who she's helping, how many she's helping. It would be really nice to see a report that says she educated 35 new diabetics this month. That can really show justice to her position, whereas right now we just say, 'Yeah, she does a lot.' ...but that's not something that you can prove and put on paper to justify needing another one." [Nurse]

3. EHRs leading to upgraded roles for MAs, LPNs and non-clinical support staff

Nearly all informants indicated that working with EHRs enabled the upgrading of medical assistants' (MA) and licensed professional nurses' (LPN) roles to include new tasks such as depression screenings, taking detailed patient histories, checking medication lists, and (in some cases) using standing orders to address preventive needs or other routine care. MAs are also increasingly involved in sharing results and following up on care plans. EHRs supported the new workflow by prompting for information such as history of smoking or when to do additional screenings. They also helped to reinforce the need for other preventive care activities such as patient education on diet and exercise for patients with a high Body Mass Index (BMI).

"The nursing staff will change because when we went electronic, they then started asking complete family medical social history, whereas before, they were basically doing vital signs and asking about pain...Their role greatly expanded with getting those things. They also do transitional care. They entered in a baked-in medication list. This system allows us to do some medication reconciliation. If you're insured, it brings in all the medications from the pharmacies. We also have a workflow that incorporates the medical assistant asking the PHQ-2, the first 2 questions of that screening tool for depression for adult patients. Then, again, if it's abnormal the provider can then go on and ask more detailed questions and bigger screening tools and then determine if they're going to treat, refer, discuss, follow-up, whatever they're going to do as appropriate. I think the EHR, when used in that fashion, can be helpful to kind of guide those things." [Quality Improvement Manager]

Informants noted that not all providers were ready to use their support staff in these expanded roles. Several sites pointed to providers' concerns about trusting their staff to meet their standards or needing to double check their work. But many sites recognize the potential to improve quality and outcomes with this approach and are working with their providers to help them to see the advantages:

"My big thing is trying to utilize the support staff to help achieve the quality goals. Trying to help the provider realize it doesn't have to be a one-person show. If we can't get a grant to hire a support staff person, like a care coordinator, case manager, can we utilize staff that they already have or rearrange things? A lot of that is helping pull them along the paradigm so that they are willing to shift, and not everybody's quite there...A number of our more vintage physicians in family practice were not really trusting of the MAs to do that information gathering and documentation. We still have that, [and it] of course slows down the process, since we should be working as teams. We have what we call our family practice advisory team, which is a group of physicians and MAs who are very skilled with the EHR, who are coming up with policies and procedures that everybody should follow. That's actually worked pretty well. We are gradually having the folks that wanted to do everything themselves, physicians, I'm speaking of, finally coming around to allowing the MAs to actually enter the information and save themselves a little bit of time and effort in getting the part of the EHR documentation done that they need to do, in addition to actually talking with and seeing the patients. That's been a struggle in places." [CMO]

Expanding roles for LPNs and MAs has also led CEOs and other leaders to focus more on hiring people with critical thinking skills in addition to training on basic tasks (e.g. rooming patients and taking vital signs). Based on their experiences working with LPNs and MAs, a few of the sites are starting to notice which training programs produce the best people and conversely, which are not. In some instances, they are starting to reach out to the training programs in the hopes of enhancing the curriculum to address gaps:

"How do [we] interview new staff to make sure we get staff that have those critical thinking skills, and not just a license? Because a certification isn't enough. Doing some kind of behavioral interviewing and giving scenarios to say, "Okay, what is this?" Even some things as simple as spelling and that. It's challenged us to look at where are the good folks coming from, from what nursing schools, or medical assistant training programs...And do we want to not take candidates from a certain school, because there are issues with those students, and gap in knowledge? Or do we want to talk about that school, and kind of partner and say, 'You know, we're noticing everybody we have from you has this gap. How can we help do that?' I think that's one of the things that we've noticed from the outside that's changed the need in the workforce as well." [COO]

Working with EHRs also expanded the roles of non-clinical staff members in some CHCs. Several informants reported that their CHCs had enhanced quality improvement staff roles to include population health management activities in addition to documentation and reporting as their EHR capabilities grew more sophisticated:

“[A QI staff member] was here at least, I think, from before we had the electronic record. I'm not sure how much before that, but she is very, very good at computer stuff, and has learned how to use the various reporting tools that we have available to us. We have one called ‘Deep Domain’ that could actually go in and pick various fields in the EHR to draw information out of, and actually give us little reports that look like little speedometers that tell us how we're doing what percentage of your patients that you saw in the last month have access to your patient portal, for example. Are you signing everybody up for that? All those little things that we have to do.” [CMO]

4. Mixed views on EHRs leading to improved workflow

Providers and support staff were mixed on whether EHRs made workflow more efficient in CHCs. Instead of starting by greeting patients with their records already in hand, staff members had to start by asking for date of birth and other information to retrieve the patient record. EHR templates did not always model a natural visit flow due to excessive clicking and the need to constantly input information which decreased the quality of the patient interaction. Sometimes patients may have had other pressing things on their minds and were not interested in discussing preventive needs.

“Prior, the physician or the nurse walked in the room and talked to the patient, and maybe jotted down some notes on a chart for them, and now they carry in or roll in a piece of equipment, and they immediately start addressing the piece of the equipment.” [Nurse]

Others felt the prompts provided helpful reminders that enhanced the visit:

“Frankly, I find the EHR helpful in prompting me to ask about things that I might otherwise forget. If I'm seeing a kid for a checkup, and just for guidance questions and those things are in templates.” [CMO]

On the other hand, another provider said that he was disappointed that EHRs could not provide more clinical decision support (helping to guide decision-making rather than just documenting care):

“...There's lot of discussion about how you could have clinical decisions support or, I forget the different words that they use, and Meaningful Use and that sort of thing, but I haven't seen many systems that actually go to the point of sort of like the Watson IBM computer. You know, if they can play Jeopardy, certainly there's computers out there who can start to, not that I would want to trust them at this point to necessarily take

over the role, but why can't you have them at the point of the end of the visit giving you its suggestions of what is going on with the patient, which you can then rule in or rule out. To me, that was something I kind of expected would have happened 10 years ago as opposed to still not seeing it.” [CMO]

At one CHC, informants described a workaround that the nurses developed to complete their documentation using EHRs while relating to patients as they thought was important as nurses. They developed a paper form to collect data from patients in the room before entering it into the EHR. Entering data directly in front of patients felt “overwhelmingly impersonal” to the point that nurses unilaterally decided to use the paper method instead:

“...It was so overwhelmingly impersonal that as nurse[s] and staff, we had just decided we just weren't going to do it. When we [sit] with our patients and we interview them and we take them to the room and we talk to them, we have a little work-up sheet in front of us. We, face-to-face, talk to the patient like we used to, and we come out of the room to the nurse's station, and we type our little stuff in, and then mark them ready for the doctor to come in. The doctors will take their computer in, but the nurses could not get over the fact that they didn't feel like they were a nurse, they thought that they were just putting in data, so we just agreed not to do it. We get it in there, [but] it's not in front of the patient.” [Nurse]

For these nurses, face-to-face interaction with patients was such an important part of their professional role and identity that they created an alternative process that gathered the data needed for the EHR without actually engaging with it in front of patients.

Despite these concerns, informants generally saw EHRs as helpful in moving workflows toward a more team based approach, which enabled all staff members to practice close to the top of their license:

“I find that we have to work together as a team more than we did in paper, as far as nurses and providers, because we now find that because of all the requirements and all the things that you have to put into the system in order to get credit or in order to meet different requirements, it takes a village. We're actually working more as a team, I believe, for nurses and providers.” [Nurse]

Most sites had a subset of clinical, QI personnel, and IT personnel that took on the extra responsibility of participating in a committee of superusers and acting as resources for other staff members throughout the organization. They were helpful at one site in terms of helping to set standards for expanding MA roles. Others have used the superuser committee to decide who should have access to behavioral health records or to decide which upgrades should be adopted and to pilot test them before they are implemented across the clinic. They are often the go-to people when someone needs

training or additional help with adapting to EHR changes, which can be a major time commitment, particularly during system upgrades.

5. Informants report reduced productivity post EHR implementation

Informants at all sites reported experiencing reduced productivity (which they generally measured as visits per hour) post EHR implementation. They attributed productivity declines to extensive documentation required for all the different programs they report to—HRSA/UDS, Meaningful Use, etc.—as well as the complexity introduced by EHR software implementation processes and updates, which often consumed significant staff time and could slow down visits even after they were fully trained. In some cases, they reported it has actually continued to decline over time (or declined and remained flat) even years later. Some informants said they had accepted that they would never return to levels of productivity under paper documentation systems.

“I think initially, when we first went from paper to electronic health records, it's pretty well-known that the corporate-wide productivity dropped as we were doing that. It's a pretty big transition. Now that we've been in electronic health records a while, I think, again, from what I hear from an organizational standpoint, we still are not as productive as we were when we were just on paper. I think it kind of goes back to what we've said. The process takes longer to keep everything updated from the front to the back, and the patients are here longer to get that process completed, so I guess I would say productivity has decreased. I hope quality has increased, but overall, if I had to say true or false, I would say productivity, as far as numbers, has decreased. The number of patients we can see in a day, but I hope quality, although it has always been good, perhaps it's improved even a little bit more.” [Nurse Case Manager]

Using EHRs to complete reporting requirements for HRSA/UDS quality measures as well as Meaningful Use requirements was one of the most significant burdens on productivity according to nearly all informants. The reporting requirements created new hassles for providers and staff members, who were responsible not only for documenting care for communication with other providers and staff, but also for putting information in the right place in the EHR so it would be captured for reporting to HRSA or CMS. Even if meeting these requirements reflected no changes to the quality of patient care, informants said that meeting them often made visits significantly longer due to the extra clicking and navigation required:

“We choose to report Meaningful Use data, so we're constantly looking at our Meaningful Use reporting system to say where are we having issues, and then going back in and saying, ‘Well, remember you have to put it right here. If you don't put it right here, then it's problematic.’ In the scheme of things, the provider really doesn't care where they document patient education as long as they're doing it, as long as the patient's getting what they need, so some people you're not going to convince. They don't care that it has to be in a particular place. They want to see the patient, get them

what they need, go to the next patient. Then we potentially lose out on meaningful use money. It's just the checking the right box, and if you don't check the right box, you forfeit money, which is just... crazy.” [Director of Clinical Operations]

Most informants in leadership roles said they chose to prioritize specific Meaningful Use criteria rather than trying to meet all criteria because sometimes the burden on staff members was too great to make it worth the effort, or sometimes because of factors outside of their control (e.g. pharmacy that worked with a program for low income patients but doesn't do e-prescribing, patients that won't ever use patient portals):

“[Whether patients] have internet access [is] not under our control with our patient population, and some of the quality metrics because it's different from the HRSA ones than really having these discussions around who you attribute this metric to or which physician. We just don't have the time and then just frankly, policing it too much. There's only [so much] in the list of things that we're pushing our physicians to do and then trying to keep them recruited, retained, keep the patients happy. You have to be a little selective about what you push.

There is money associated with it as well, so it's a balancing act. The first year of payments where you just had to get payments for getting people on the system, obviously, we get those and then the second, some of the lower hanging fruit we do, but some of the more challenging ones, then we have to assess and we'll do that again in the next month or two as we're looking in next year's budget to really get a sense of where we realistically think we're going to land with Meaningful Use dollars next year.” [CMO]

EHR software updates sometimes made maintaining productivity more difficult for CHCs. For more complex updates, most sites had a person or small group (sometimes the superuser committee) to try out updates first—running different scenarios, etc.—but also frequently had to pull staff members out of clinics to train them. A couple of CHCs that customized their EHRs (sometimes using back end programmers) often ended up redoing the customizations when their EHR software was updated, so updates were sometimes more hassle than help. Some also said that losing customizations designed to help meet reporting requirements could be troublesome—they might realize after implementing an update that the information wasn't being captured as before, so their quality indicators would be poor unless they redid the customizations or re-taught staff members where to enter the information so it would be captured.

“I find that each time we do an upgrade, it seems like there are different issues that occur with it. I know in the past from working with the programmer when I was helping develop the behavioral health templates and system, you would identify an issue for the programmer and the programmer would correct that particular issue, and that broke two or three other things. I believe that this system is very similar so that when you do an upgrade or they do an enhancement, it oftentimes then disrupts some other pathway

and creates another problem. One of the challenges with NextGen in particular—and maybe it's like that with all EHR companies—but they'll say things like, 'It's a known issue.' That's not so helpful. If it's a known issue, why don't you just fix it? Then they'll offer workarounds. In itself, that creates more work because it's not a simple, direct workflow. It's something that you have to do out of the ordinary to make it function the way it was intended to function.” [Quality Improvement Manager]

To manage the challenges of updating processes, some informants said they assessed tradeoffs (benefits and challenges) of updates before accepting them—sometimes rejecting updates they did not think were worthwhile—although others were on systems where updates were “pushed out” automatically. In some cases, CHCs had access to state-based networks (e.g. in VA) or EHR vendor-specific entities (e.g. OSIS) that could provide needed support and training on software updates, which many of them use for these purposes rather than hiring in-house staff.

Another informant pointed out that regardless of the productivity challenges introduced by EHRs, CHCs’ productivity expectations were different from other types of primary care providers because of their unique patient populations, who often had needs that extended beyond medical visits and required more time (especially from support staff) to ensure they received high quality care:

“We historically have allowed lower productivity levels than many of our peers. We were hoping our physicians between fifteen to twenty and our nurse practitioners between ten to fifteen, and we'd be happy. I think we should push those, but part of pushing is finding these other ways to support the providers. I think it does compromise quality of care that's expected of health centers if we expect them to see patients every fifteen minutes. How are those disability papers getting, done, how is all is that work getting done if we don't give them support staff to help get things done? Because we know they can't do it all that.” [COO]

6. EHRs improve coordination of care within CHCs

Informants reported that EHRs made coordination of care between providers and staff within the CHC easier in some ways, although most also said that navigating EHRs to find the relevant information made some tasks more time-consuming than paper systems. For example, a physician leader appreciated the degree of “accountability” for patient care and follow-up introduced by the electronic system, but acknowledged that the variety of places where information could land in his CHC’s EHR system also caused providers and staff members to spend more time checking for messages in different electronic spaces to make sure they had seen all relevant information:

“I think internally our [EHRs] have helped incredibly, because health care is a field where you really need accountability. If someone says that they need to do something, they're going to do something, or if a patient asks for something you need to really make sure that it gets done and you will need to make sure that someone responded to that request. If it didn't happen you need to be able to track it down to the place where there

was that gap...The [EHR] allows that, you can send each other notes and it's all a part of the patient's chart and you know when people responded and when people took actions like send a prescription or check the lab...It really adds a credibility that way, which is important...That's sort of the burden too because you don't have to just check your email, you have to check your labs, you have to check your clinical work messages. There's this long list that's usually not built into the day and those are some of the challenges you have, but having said that, it's taking us to a better place. I think internally the communication has been great.” [Executive Director/physician]

A nurse case manager at another CHC saw a similar tradeoff: while EHRs enabled consistent (although less “personal”) documentation, they were also sometimes more difficult to navigate and made information sharing more time-consuming than paper charts:

“For note documentation, I think the electronic records make that a little easier. In many ways, it makes it easier, particularly when you document from a template to help you remind yourself how to document, make sure you get all the pieces in there. I can also say I think electronic records make documentation often impersonal, because providers tend to just use blank statements, and sometimes don't go in and make it a little more personal. It can be hard to find things, sometimes, in an electronic health record, because there's so many different folders and places things could be put. When I used paper, I could flip through usually and find something a little more quickly than having to change screens and go here, and go there, and go everywhere else. Sometimes, because you can only assign a note for a message to one or a few people in the organization, that can make it hard to find things when other people have to access the records.” [Nurse Case Manager]

Informants reported some challenges with electronic dental records—e.g. one EHR vendor has a dental product that doesn't talk to its medical product—but said that sharing of information between medical and dental providers mostly worked smoothly and was helpful in coordinating care at their CHCs. In one case an informant mentioned that the vendor had undersold the complexity of the electronic dental record and didn't provide sufficient training for front desk staff, which led to confusion and frustration during the implementation process:

“...They did one and a half day trainings with the providers and nurses, one day for the...front desk folks, one day for dental ... When we asked, we said, ‘Well, do we send our front desk people to that?’ And they said ‘Yes, yes, yes. That will be fine. They'll learn what they need to know.’ We found out, ‘No, no, no.’ At the last minute, we were trying to squeeze our dental front desk people into the front desk system training, because they didn't talk front desk at all. That was sort of a miscommunication. It really seemed to me that [the vendor] didn't understand their own dental product. I think that's the impact is the different things in dental that they're very ... My understanding is they're very provider-driven software, and I think our providers would agree with that, and that's

why they liked it. But I don't think that they have the same dental knowledge that they have of medical. I think they're playing catch-up with their dental product.” [EHR Administrator]

EHRs were also generally helpful for coordinating care between medical and behavioral health staff. The clinic manager at one site described the challenges in this area, which were mostly around determining access privileges for different staff members:

“Part of our struggle is how do we keep the behavioral health records confidential, now we have dental that can see the medical record...It's like part of our struggle too has been who are we going to limit access to the record to whereas when it was in paper, anybody can see the paper chart off the wall, ‘assist’ the patient, but also have access to the record. To set up our internal processes to limit access to only the people who only need access to certain parts of the record, so that they can still help with the patient, but not be able to see parts that they don't necessarily need to see...Then, a challenge for some of the sites that felt like...certain people from their site needed access to entire record, where we were like, ‘why [do you] need to see this piece of the record?’ We are a large organization, so we have a lot of diversity in our sites, which has made it interesting.” [Director of Clinical Operations]

Some sites allowed all staff members to see behavioral health records, while other sites gave access on a “need to know” or partial basis (e.g. MAs and LPNs can only see medication lists rather than full records). Other sites gave full access to behavioral health records to all staff members by default.

7. Coordination of care with outside providers remains challenging

Informants said that even with EHRs, coordinating care with providers outside the CHC (e.g. hospitals, specialists) was still difficult, even if they were on the same EHR systems or are in states (e.g. MD) that had health information exchanges.

“I can tell you, we are actually working on creating an interface with the Maryland HIE. It is called CRIST. C-R-I-S-T. We are actually working on getting information to them. I think they are not quite as advanced as other states with the ability to transmit data back and forth, and be able to share that as readily as other states have done. The ability to communicate with the labs and have them communicate back with us has been very beneficial, same with the radiology. CRIST can send us hospital information for admissions and ER visits and we have the ability to send them some clinical information, but there is no real circle where all of this is happening consistently and in a broader way. It is very pieced [together] at this time.” [Director of Health Informatics]

Some had systems set up to import lab results from specific providers directly into the EHR, while others reported assigning staff members to enter data from outside providers (e.g. labs), often received by fax or other means that were not directly interoperable, into the EHR:

"...There's no obvious interface for those things for most of us. I mean, we might be able to get lab results to come in electronically and digitally so that it will automatically flow into the chart but for most of us, at least at this point, the x-ray reports and obviously consult notes, all those sort of things, are usually coming as faxes that get scanned in... You know, if we get a radiologist report on a mammogram, if we get a gastroenterologist operative note from a colonoscopy, that piece of paper comes into our office. I don't know if there is any way to have that through an automated system go right into there. We're certainly not connected with those other practices in any way that it would allow that to happen. I don't know how it could happen unless you were somehow on the same system and sharing the information that way. Perhaps it's possible. That's always a roadblock. Even if it's things that we've sent them for, when those results come back we still have to translate it, basically, and put it into some format that the computer can recognize and then draw out as digital reports. The mammogram is one example, colonoscopies is another, where part of the obstacle is just not only getting the information but then putting it into the chart, having someone that's assigned to do that, takes the time to do that." [CMO]

Informants at one CHC noted new voluntary efforts to support coordination and communication between providers that enabled providers to share patient records more directly. But since the utility of these depended on whether both providers had chosen to participate, they were only helpful under limited circumstances:

"That database will be available to anybody who signs up for the P2P program. They will be able to send information to another practice, a specialty practice that may have 1 or 2 providers that is not on the eClinicalWorks... Once we get their email addresses, those are added to the system, so that that person who is on a Gmail account or a Yahoo account... will get an email that says, "Dr. [name] sent you some information regarding a patient," and they will get encrypted link to the cloud and then we send our stuff up into the cloud." [EHR administrator]

8. Informants report EHRs enhance quality of care and support population health

Informants at all sites indicated that they were using reporting features in the EHR to enhance their population health efforts and quality of patient care. Most used the EHR to identify patients due for screenings or other preventive care, although some indicated that the EHR was not well set up to pull the reports they needed and required information to be reported in very specific ways to be useful for extraction and analysis:.

"Again, it's a challenge but I think it raises our awareness of how well we're doing that. Are we looking? Are we asking the questions? Are we trying to find out the information, the answers? I think to a much better degree than we ever did in the past and certainly than I ever did in many years in private practice in a paper chart. I'm sure we were trying

and I asked those questions many times, but could I as easily have abstracted and told you which group had it, which group didn't? Of course, you'd have to go by individually each chart and find an answer. I think it does help a lot to be electronic, but it still doesn't make the task any easier to find out all that information, track it down, and put it in the right place.” [CMO]

Despite these challenges, data drawn from EHRs were sometimes useful in helping to motivate providers to change their own behavior or to be more open to staffing changes to improve quality of care. Informants reported that data from the EHR was useful in convincing physicians of needs (e.g. for chronic disease follow-up visits) that they may not see otherwise:

“We did have one reporting tool that kind of was on top of the system that would dig into the system and create reports out of it, a report writer program we purchased separately. I remember one provider saying, ‘I really thought that I saw my diabetic patients on a regular basis, and once I pulled this, I realized how time gets away from me, and the patients that I thought I had seen three months ago really I haven't seen for five months, or six months. Or I totally forgot about this patient.’ That has been really helpful in being able to get that information.” [COO]

While EHR data was clearly useful for making actual improvements to patient care, physician leaders at two sites also suggested that the emphasis on using EHR data to fulfill reporting requirements sometimes created perverse incentives for providers to report activities that they may not have completed (or completed in a very limited way) them during a visit:

“I know that we have people that I think that do that, that have their review systems with everything pre-clicked and memorized. They're saying, ‘Oh, I'm seeing a school-aged kid, so this is my memorized review system.’ They sort of pretend they've asked them a lot of things. You look through those lists in our peer review process sometimes, and you say, ‘I know you didn't ask all those questions. I know how much time you spent with this patient. It would have taken you 10 minutes to ask all those things.’ One of the quirky things about EHRs is they allow you to document stuff that you may or may not have done. I find that a little aggravating, but I just document the things that I actually did.” [CMO]

“I'll give you one example, there's a HRSA measure, counseling for obesity, now it's a quantitative measure, so if you [have] 5,000 patients, how many did you give nutrition advice for? ... You can imagine if it's a quantitative measure and it's a check the box, to be able to reach as many people as you can you're probably going to be doing very little.” [Executive Director/physician]

While most informants agreed that EHRs were useful in supporting high quality patient care, the longtime CEO at one CHC expressed a dissenting view, suggesting that EHRs diverted providers' attention from focusing on patients to the technology itself:

“I do not believe that it has [improved quality of care]. I do not. I think everything is better documented...You know, we used to have fabulous focus with our patients. I think we talk the game [that] it's all about the patients, but right now it's not. It's all about that EHR and that record. I think we've lost a lot. I truly do. I'm familiar with the record. I can use it. I'm also a provider. I found it to be ... I'm disappointed. It's not doing what I thought it would do.” [CEO]

Discussion

Our findings suggest that EHRs have changed nearly every aspect of providing care in CHCs, from staffing decisions to workflow to quality tracking and reporting. They make certain aspects easier—e.g. tracking population health measures, sharing information within the CHC—but also introduce new burdens on providers and other staff members. It is well known that primary care practices have responded to these new realities by hiring new staff members and altering the roles of other staff members (Fleming et al. 2014, Skillman et al. 2015), but our study adds a deeper exploration of the specific considerations that inform how these decisions are made in CHCs. Many new staff roles described by informants were designed to take advantage of EHR functions to reduce provider burden (e.g. upgraded MA or LPN roles using standing orders or medication lists—consistent with O’Malley et al. 2015) or improve population health and quality tracking (e.g. new QI staff). Other roles were designed to manage new challenges introduced by the EHR—e.g. new IT staff members (or addition of IT-related responsibilities for existing staff members) to train staff and manage EHR updates and back-end programming, and (in one site) scribes to manage the new burdens of entering data into the EHR for family medicine providers.

Our findings are broadly consistent with existing studies of how specific staff categories such as IT staff (Skillman et al. 2015) and scribes (Yan et al. 2016) have been introduced or altered in light of EHR implementation, although they also exposed some likely distinctions of the CHC environment in shaping staffing decisions relative to other primary care practices. Like Skillman et al. (2015), we also found that most CHCs were less likely to add new IT staff positions than to add IT responsibilities to existing staff members’ roles. (We also found that several sites strongly relied on outside networks or other support systems to manage IT responsibilities rather than hiring new staff members or attempting to manage the tasks in-house.) Like Yan et al. (2016), we found some interest in hiring scribes (or moving other support staff members such as MAs into such roles) to help manage documentation for providers, although this was less consistent across sites. The one site that had actually hired scribes used them only in family medicine because of the relative complexity of patients (compared to e.g. pediatrics), and others expressed interest in using scribes but were not able to justify the positions due to financial constraints. Others were not interested at all, but preferred to have their providers continue doing their own documentation even as the roles of support staff such as MAs and LPNs expanded in other ways to maximize the benefits of the EHR for workflow and reporting data collection.

The role of EHRs in supporting teamwork—defined as task delegation, use of templates by MAs and LPNs, etc.—in primary care has been well documented (O’Malley et al. 2015), and other studies

have found positive effects of collaboration between physicians and NPs/PAs using EHRs (Adler-Milstein & Jha 2012). Our study also suggests that EHR data can be useful in fostering more team-based approaches to care by making providers more willing to delegate certain tasks to other providers or staff members. Concrete data from EHRs may help providers to see more clearly if they are not completing tasks as completely as they think (as in the case of the CHC that hired a nurse practitioner to do Medicare Wellness visits) or to track and verify the work of other providers or staff members (such as MAs following standing orders). But the utility of this information depends on how “documentable” staff contributions are in the EHR. Since the work of enabling staff members (such as case managers) is less directly related to specific visits or process measures that CHCs are required to document, it might not show up in EHRs as that of clinical staff members (such as MAs or LPNs). CHCs may need to be more creative and purposeful in finding other ways to document their contributions if they hope to make a case to providers or boards of directors for hiring them or giving them new responsibilities. But as EHR tools become more embedded in practice and (perhaps) more flexible over time, they could become a valuable new tool for CHC leaders to analyze the contributions of different staff members and use the information to optimize their staff configurations.

Informants’ impressions of the impact of EHRs on coordination and quality of care were also mostly positive, although most did not think their use of EHR systems in these areas had reached its full potential yet. Most reported that they were making progress and could see more potential benefits in the future, especially for new population health activities such as using EHR data to track patients with certain conditions and sharing information with outside providers to improve coordination of care. While EHRs offer much greater potential for extracting and sharing information than paper records, both functions seem to rely on add-on platforms in some cases (rather than the original EHR), which adds expense and requires additional staff time and expertise. Health information exchanges and other efforts to share information between CHCs and outside providers are still in their infancy also, even in states with relatively sophisticated efforts in these areas (e.g. the CRIST system in Maryland). Voluntary efforts to share information between providers can help in some cases, but most of these are just starting, and they depend on providers’ willingness to participate and don’t seem to interface directly with the EHR so much as creating another layer of communication that providers have to check. Most sites definitely felt like they were just beginning to see the benefits in both of these areas, either because they were new to the software or because they had only recently devoted staff time to figuring it out. (One site had signed an agreement to participate in a provider-to-provider system the same day as the interview was conducted.)

Although most informants reported that their CHCs had used EHRs successfully to share information, coordinate care, and identify quality improvement issues (sometimes including addition of or changes to staff roles), they universally saw EHRs as having a negative impact on productivity. Consistent with other studies of EHR implementation and productivity (Fleming et al. 2014, Frogner et al. submitted), informants at all sites saw initial declines in productivity after introducing EHRs due to the time required for staff members to be trained on the EHR and slower workflows as they got used to using them during patient visits. While productivity at most sites eventually improved again, many informants reported that they did not think productivity would ever fully “recover” to pre-EHR levels—

primarily due to the added burden of using EHRs for quality reporting to a variety of entities including HRSA and CMS (for Meaningful Use), where information must be recorded in very specific places in the EHR even if this level of specificity is not necessary for communication and patient care. Informants at all of our study sites said they used their EHRs for UDS quality reporting to HRSA, this is a relatively recent change for CHCs, which did most of their UDS reporting using manual chart reviews as recently as 2009 (Shi 2012).

Our findings suggest that the combined “learning curve” and ongoing time requirements of using of EHRs for both UDS and Meaningful Use reporting has created new burdens for providers and support staff that cannot easily be surmounted even through software optimization or provider and staff learning. This has led CHC leaders to “pick and choose” Meaningful Use measures to focus on rather than trying to meet all of the criteria because of the negative effect on productivity and the staff burden required to meet the criteria to maximize their incentive payments. The financial benefits of compliance with all criteria are simply not worth the staff time or burden in some cases. The burdens of using EHRs for quality reporting were complicated further by continuous upgrades to EHR software (Goldberg et al. 2012), especially for sites that had done significant customization on their EHRs to make them more useful for collecting reporting data. Frequent upgrades introduce many navigation challenges and occasional unpleasant surprises when data reporting changes after an upgrade, raising the possibility that CHCs could be “dinged” on quality measures if back-end customizations used to meet these requirements were lost or data extraction procedures for reporting changed with the upgrades.

Based on feedback from a variety of stakeholders, CMS has recently taken steps to reduce the burdens of Meaningful Use on providers and staff members by proposing significant changes to reporting requirements for physician offices (including CHCs) as part of the Medicare Access and CHIP Reauthorization Act (MACRA). The goals of the revised program, titled “Advancing Care Together”, include improved interoperability and ease of use, as well as greater flexibility of requirements (Slavitt & DeSalvo 2016). The new program reduces the number of required reporting measures from 18 to 11 and allows physicians “to select the measures that reflect how technology best suits their day-to-day practice”. It also allows physicians to report as groups rather than individuals and attempts to “provide multiple pathways to success” for quality reporting (Slavitt & DeSalvo 2016). These changes are scheduled to take effect in January 2017, requiring CHCs and other practices to make yet another series of decisions and adjustments—although the promised flexibility of criteria and simplification of reporting will likely be a welcome change given their past experiences with Meaningful Use, especially if the new criteria are more easily integrated with UDS quality reporting requirements. As these changes play out, HRSA could have a key role to play in facilitating opportunities for CHCs to give feedback to guide HRSA, CMS, and EHR vendors feedback on their experiences and suggestions for streamlining updates and facilitating reporting while reducing burden on providers & staff members.

Limitations

This study has several limitations. The UDS data (2014) we used to identify potential sites does not include information on any CHCs that have implemented EHRs in 2014 or later, so the newest EHR adopters could not be included in the pool of potential participants. Also, because participation was

voluntary, participants that are willing to be interviewed may not be representative of all CHCs. For example, most of the CHCs we successfully recruited were large relative to the universe of all CHCs, and it is possible that their experiences of using EHRs are distinct from that of smaller CHCs which may have greater limitations on hiring and staffing, technological capability, and collaborations with outside providers. Our findings were also limited by the variability of informants’ tenure in their CHCs relative to their EHR implementation timelines. In at least one case, all informants who were willing to participate had started working at the CHC after EHR implementation was complete, meaning that they could not speak as directly to the pre- and post-implementation experiences as informants at other CHCs who had lived through the EHR implementation experience more directly. These informants still offered a valuable perspective on how working with EHRs influenced staffing decisions and patient care in the CHC, but they could not speak directly to how these aspects had changed relative to pre-EHR days. On the other hand, other informants whose tenure with their CHCs had long preceded EHR implementation could talk about the initial as well as the subsequent experiences of EHR implementation.

Conclusion

Use of EHRs in CHCs continues to grow, and CHCs are finding creative ways to adapt staff roles and models to use them to improve coordination and quality of care. It will be important for HRSA to continue to support CHCs in implementing EHRs, particularly their use in meeting reporting requirements (e.g. UDS and Meaningful Use). Participants expressed some concern that UDS and Meaningful Use reporting requirements are sometimes overly burdensome and do not necessarily measure indicators of quality care. HRSA could consider regularly convening a group of CHC administrators and providers to give feedback and recommendations on EHR designs, UDS and Meaningful Use implications that could then be shared with EHR vendors and CMS regulators (as well as HRSA itself). Given the ongoing reported challenges with maintaining productivity levels post EHR implementation, it will also be important to continue to monitor productivity trends at CHCs as they adopt new technologies and care models.

Table 1. Participant Characteristics

Role	Site	Size*	Rurality	State
Chief Medical Officer	1	Small	Rural	Maryland

Nurse	1	Small	Rural	Maryland
Quality Improvement Manager	1	Small	Rural	Maryland
Chief Medical Officer	2	Large	Urban	Maryland
Director of Health Informatics	2	Large	Urban	Maryland
Chief Executive Officer	3	Large	Rural	Pennsylvania
Chief Medical Officer	3	Large	Rural	Pennsylvania
Director of Clinical Informatics	3	Large	Rural	Pennsylvania
Chief Medical Officer	4	Large	Rural	Pennsylvania
Chief Operating Officer	5	Large	Rural	Virginia
Director of Clinical Operations	5	Large	Rural	Virginia
EHR administrator	5	Large	Rural	Virginia
Nurse	5	Large	Rural	Virginia
Nurse Case Manager	5	Large	Rural	Virginia
Practice Manager	5	Large	Rural	Virginia
EHR administrator	6	Small	Urban	Virginia
Executive Director/Physician	6	Small	Urban	Virginia

*Small = fewer than median total FTEs in mid-Atlantic CHCs (73), large = more than median total FTEs

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