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Seven years after Meaningful Use: Physicians' and nurses' experiences with electronic health records

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Although the federal government's Meaningful Use electronic health record (EHR) implementation program resulted in some successes, there have been many challenges. The purpose of this study was to obtain detailed empirical data to better understand physicians' and nurses' experiences with EHRs. We conducted in-depth interviews with 30 physicians and nurses from two large health systems that were focused on attaining Stage 3 Meaningful Use criteria. Thematic framework analysis identified themes related to perceived benefits and challenges with EHR use. Participants appreciated benefits such as real-time patient data and easier access to information. Challenges included lack of interoperability across units, and this seemed to underlie many other noted challenges such as increased workload, insufficient training, and the perceived need for workarounds. Two key findings included mixed messages about trust in the EHR's information and its interference with interpersonal relationships. Results suggest that conservation of resources theory may be a useful strategy for understanding behaviors that enhance or undermine effective EHR use. Implications for policy and practice are discussed.

In 2009, the passage of the Health Information Technology for Economic and Clinical Health (HITECH) Act created incentives for electronic health record (EHR) adoption (HealthIT.gov, 2015). HITECH's *Meaningful Use* program, managed by the Centers for Medicare & Medicaid Services (CMS), intended to move providers beyond EHR basics, tying financial incentives to increasingly sophisticated

use of EHRs for decision support over time (Blumenthal & Tavenner, 2010). However, as of 2014 only 2% of U.S. hospitals and 12% of physician practices had systems that could meet the *Meaningful Use* criteria (DeAngelis, 2014). In 2016, CMS announced the existing *Meaningful Use* program would be discontinued and replaced because of persistent resistance, problems, and concerns with EHR use (AHIMA,

Key words: culture of silence, electronic medical records, electronic health records, meaningful use, workarounds

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2016). Nonetheless, EHR utilization is continuing to move forward.

In theory, the EHR is simply a digital form of the traditional medical chart, but in practice, evidence suggests that it is a “third agent” during patient care encounters that diverts clinicians’ attention, decreasing interpersonal, relational time with patients and other providers (Montague & Asan, 2014). One survey of primary care physicians and practice managers identified six substantial or moderate barriers to communication and coordination of care with EHRs (Cohen & Adler-Milstein, 2016, p. e148): difficulty sending or receiving information electronically, complexity of required workflow changes, lack of provider and practice staff time, direct financial costs, EHR design and function, and competing priorities. However, other than one study that examined provider perceptions prior to HITECH (O’Malley, Grossman, Cohen, Kemper, & Pham, 2009), there are few empirical studies directly investigating clinician perceptions of how EHRs impact their experiences and abilities to coordinate care long after the initial implementation.

The purpose of this study was to better understand the experiences of clinicians who had been using EHRs for many years in organizations well past the initial implementation stage. By delving into the experiences of adept users, we expected to enhance insights for EHR policy and practice. Building a deeper understanding of clinicians’ experiences is especially important because of policymakers’ continued commitment to advancing and enhancing EHR use. For example, the proposed Medicare payment changes resulting from the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA) tie reimbursement to EHR use (CMS, 2016).

Specifically, we qualitatively examined the experiences of physicians and nurses whose organizations were focused on complying with Stage 3 of *Meaningful Use*. Stage 1 of *Meaningful Use* required organizations to adopt and implement EHRs. Stage 2 required them to gradually begin performing specific EHR tasks that would facilitate coordination of care across settings (HealthIT.gov, 2015). Stage 3 required greater proportions of patients to be covered by Stage 2 activities (e.g., minimum of 50% in Stage 3 vs. minimum of 10% of patients in Stage 2; Cohen & Adler-Milstein, 2016). Incentive payments were linked to tasks such as the creation and transmission of a patient’s *Summary of Care* (Cohen & Adler-Milstein, 2016) or implementing drug-drug/allergy interaction checks (Blumenthal & Tavenner, 2010).

However, even with financial incentives, EHR compliance has faced barriers and resistance. This is due, in part, to the fact that successfully implementing Stages 2 and 3 required significant changes to an organization’s internal care processes and also depended on external efforts that were beyond providers’ control (Cohen & Adler-Milstein, 2016). Although an integrated EHR system can positively impact the process of care coordination, interoperability between EHRs across different provider organizations is not the norm (O’Malley, Reschovsky, & Saiontz-Martinez, 2015). Thus,

in order to meet *Meaningful Use* requirements, providers needed not only to learn and utilize the EHR technology in their own organization but also to continue to supplement this EHR usage with phone calls, facsimiles, e-mail, and regular mail to coordinate care with other providers (O’Malley et al., 2009, 2015).

Theoretical Framework

This study was exploratory and inductive; therefore, we had no initial conceptual model. However, as addressed in the Discussion, data analysis suggested conservation of resources (COR) theory (Hobfoll, 1989, 2001) as a useful explanatory model for understanding EHR challenges.

Background—Identified Benefits and Challenges

When medical care is complex, coordination among health care providers is needed to provide effective medical treatment. Accurate and timely exchange of information is essential for providing appropriate health care services at appropriate times (Blumenthal & Tavenner, 2010). An integrated EHR system can improve the care coordination process (Friedman et al., 2016), and this was the intention of *Meaningful Use*.

EHRs should improve coordination and integration of care due to improved availability of real-time data at the point of care (O’Malley et al., 2009). In theory, EHRs facilitate more efficient transfer of information across settings, increase quality and accuracy of data, and decision support (Bernat, 2013). EHR use appears to improve accuracy of biomedical data capture, and patient portals tethered to the EHR may improve patient engagement and adherence to treatment (Rathert, Mittler, Banerjee, & McDaniel, 2017), outcomes that are incentivized in the new MACRA policy (PatientEngagementHIT.com, 2016). A longitudinal survey of primary care clinicians showed that perceptions of information timeliness and accuracy improved as EHR use increased, but even then only 52% of clinicians said they “usually” or “always” got complete and timely information, for example, when patients were transferred across treatment sites after hospital discharge (Graetz et al., 2014). The potential benefits of EHR use are not yet fully realized.

Editorials written by experienced physicians decry problems they have encountered using EHRs. They cite problems managing pressures to achieve error-free data entry while simultaneously becoming better at patient-centered care (Ventres & Frankel, 2010). They also cite concerns that, because EHRs were designed primarily for billing (DeAngelis, 2014), the EHR has transformed the medical record from a document that recorded and summarized the patient’s full “story” to a tool that captures data along unrelated pathways for billing justification (Bernat, 2013; Toll, 2012). User interfaces usually contain “deeply nested menus” (Street et al., 2014, p. 318) that require users to

scroll through numerous menus and pages during care encounters for even the simplest of tasks (Embi et al., 2013).

This literature reports concerns that EHRs interfere with users' abilities to communicate with patients in ways that enable them to develop therapeutic relationships (Ventres & Frankel, 2010). Several studies of workflow found that care providers spend less time engaging with patients and more time looking at the medical record when it is located on a computer than when it is located on a paper chart (Asan, Smith, & Montague, 2014). A recent systematic review of the physician–patient communication literature found that EHR use may interfere with nonverbal communication during patient encounters, which may interfere with providers' abilities to discern important emotional and psychosocial cues that could help with diagnosis and treatment planning (Rathert et al., 2017).

Although not studied directly, mistrust in the accuracy of EHR information has emerged in several studies of EHR use. Providers have said it often is “obvious” that other clinicians entering data had not actually read the historical medical notes, and this led providers to distrust the information (Embi et al., 2013). The use of the copy and paste function to “enter” data in EHRs is increasing rapidly, and evidence suggests its use contributes to errors (Embi et al., 2013; Weis & Levy, 2014). One survey found that nearly one third of primary care physicians cited a lack of trust in the accuracy of EHR information as a barrier to successfully achieving *Meaningful Use* Stage 3 (Cohen & Adler-Milstein, 2016).

The Present Study

The purpose of this study was to conduct an in-depth examination of frontline EHR users' experiences as their organizations pursued compliance with Stage 3 of *Meaningful Use* after having implemented EHRs at least 5 years prior. Two research questions were investigated: (a) How do care providers experience the EHR in its role in care coordination? (b) What is the role of provider trust in the EHR during care coordination? The goal was to explore the providers' lived experiences and perceptions of using EHRs several years after initial implementation, when they are ostensibly more experienced with EHRs, to inform management and policy efforts to fully realize the promise of EHRs. During the study, it was announced the *Meaningful Use* program would be discontinued, and a new incentive program would be rolled out (AHIMA, 2016). This study is particularly timely since it can inform the development of future EHR systems, processes, and incentives.

Method

Study Design

This study used a qualitative, phenomenological approach to inductively examine EHR user experiences used in an

in-depth semistructured interview design with a critical incident technique (Gremler, 2004). The critical incident technique has participants discuss specific, significant situations related to the research topic. This approach allows respondents to determine freely and in their own words which incidents are relevant within the research framework. The method is useful when a phenomenon has not been studied extensively.

Participants

We used a purposive, snowball sampling design to recruit participants who worked in specialty practices and also conducted rounds in at least one of two large Midwestern hospitals. We chose specialty practices because we assumed these providers would be more familiar with use of EHR information across different settings (i.e., to coordinate care), as specialists receive patient referrals from a variety of health care settings and also make hospital rounds. The two hospitals had different EHR systems and had been using EHRs for different periods of time, but both were focused on attaining *Meaningful Use* Stage 3 at the time of the interviews. One hospital had been using its EHR for 5 years, and the other for 12 years.

Participants were recruited by one study author. She contacted acquaintances at the two hospitals to obtain contact information for all physicians and nurses working in these two systems. We aimed for a wide range of ages and gender mix. Participants were individually invited to the study via e-mail. When they agreed, the investigator asked those individuals for names of other potential interviewees. No one who was invited to interview declined. No compensation was provided. All participants consented and were promised confidentiality. Interviews were held at participants' offices, recorded, and transcribed. The study received institutional review board approval.

One of the investigators conducted in-person interviews with 15 physicians and 15 nurses. Interviews took 30–60 minutes. Participants reported practicing between 2 and 34 years and had used EHR technology for 2–20 years. Table 1 shows participant characteristics. Physicians were interviewed first, and we reached data saturation with 15 interviews. We then decided to recruit nurses from similar practices to our sample to determine if their experiences were different. Ultimately, including nurses in the sample did not change any themes.

Measures

To start, participants were asked to think of a chronically ill patient they had seen recently, which was followed by questions about using the EHR during that encounter. Participants were then asked more broadly about the benefits and challenges of the EHR specifically for

Table 1								
Study participant characteristics								
Job title	n	Gender (Female/Male)	Age (years)		Years in practice		No. of years using EHRs	
			Range	Average	Range	Average	Range	Average
Physician	15	27%/73%	31–62	43	2–26	14	2–11	6
Nurse (includes RN, LPN, NP)	15	87%/13%	21–59	35	2–34	9	2–20	6.4
Note. EHR = electronic health record.								

coordinating patient care. They were asked directly if they trust the EHR’s information to be accurate. Then they were asked about EHR use in general, such as how the EHR could be improved and what advice they would give for new users.

Analysis

Data were analyzed ($n = 30$) using an exploratory thematic framework analysis (Green & Thorogood, 2004). In this approach, no preconceived hypotheses are put forth; the aim is to gather data, identify themes, and map these themes to broader concepts. Framework analysis is particularly suited for identifying policy- and practice-related findings because participant stories remain intact during analysis rather than being broken apart to identify new theoretical elements (Green & Thorogood, 2004). This facilitates identification of themes and then relevant, established conceptual frameworks. There are five steps: (a) *familiarization* with data, (b) identifying major themes and *coding*, (c) systematic application of codes (*indexing*), (d) comparison of data within and across cases (*charting*), and (e) examining relationships among the themes or *mapping and interpretation*. Two authors completed each step independently, then met to compare codes, discuss any disagreements, and come to consensus. They used a constant

comparison process to ensure no shift in the application of codes (Green & Thorogood, 2004).

Results

Summary of Results

There were six themes categorized as “benefits of EHR use” (Table 2) and six categorized as “challenges” (Table 3). Notably, challenges were mentioned much more frequently than benefits. In general, participants accepted the EHR as being inevitable, the “new normal,” and highlighted the potential of EHRs to improve quality of patient care. For example, they believed EHRs should help minimize human error due to system checks and elimination of illegible handwriting. At the same time, there was near consensus that the EHR’s potential has not yet been realized, and the biggest overall challenge is the lack of interoperability and/or standardization. This problem seemed to be the source of many of the other perceived problems, such as increased workload and the need for workarounds.

There were no major differences in perceptions based on age, gender, profession, or organization. Contrary to stereotypes, older participants recognized the value of EHR use even though they had spent years using paper charts,

Table 2		
Benefits of electronic health records: Emergent themes, subthemes, and example comments		
Major themes	Corresponding subthemes	Example comments
Benefits	• Ease of information retrieval • Ease of reviewing history and trends over time • Real-time information • Ease and confidentiality of information sharing • Ability to review patient info prior to seeing patient • Includes reminders and alerts	• “The ability to see all care encounters without having to sift through hundreds or thousands of pieces of paper.” (Nurse, age 38) • “...the time I do spend with patients now is ‘informed’ time. I am able to see the patient when there are known and reviewed factors before I even enter the exam room.” (Physician, age 47) • “Using electronic health records with a terminal in the exam room also gives the patient a sense of collaboration and control in working with me.” (Physician, age 49).

Table 3

Challenges of EHRs: Emergent themes, subthemes, and example comments

Major themes	Corresponding subthemes	Example comments
Lack of standardization	– Different EHR systems do not talk to each other – Different offices/hospitals use different systems – Different units even within the same organization develop their own strategies that others do not understand – Need for a nationally standardized tool	"It drives me nuts how each [unit] has their own system, their own way of doing things or their own rules...sometimes I am here until the wee hours of the night trying to put my notes into the system." (Physician, age 32)
Increased workload	– Time restrictions – Delays due to others – Rework (due to delays) – Too much information (user must sift through irrelevant information to find what is relevant) – Additional work (many fields in EHR are not relevant for present situation but must still be addressed) – Need to track prior clinicians down to clarify – Logging into different systems; getting "timed-out" of system	"Some of the questions are relevant to the patient but, many are just busy work and time consuming." (Physician, age 51) "...there is redundancy in EHRs. Same things repeated which cause providers to spend extra time figuring out what someone else means." (Nurse, age 28)
Overreliance on technology	– Lack of critical thinking – Systems updating or "going down" – Trouble accessing different systems	"When our computers go down, when our phones break, our lives come to a grinding halt. This is the same in the hospital but there we don't have time to wait." (Nurse, age 59) "New professionals entering the field have lost the critical thinking piece of a patient's management. They are too focused on what is in the EHR and not true bedside assessment." (Nurse, age 46).
Interference with relationships	– Loss of patient stories – Loss of subtle information gleaned from talking directly with other providers	"Before, I was sitting in front of the patient taking handwritten notes in a chart. I was looking at them, talking to them, and we were able to build a true rapport based on trust." (Physician, age 44) "I seem to lose the stories about the patients.... Sometimes you need to see their faces, hear their voice, and look for subtle clues. I cannot hear their fears in software. I cannot calm them in software." (Physician, age 36) "More and more it seems the focus is on finishing the EHR and filling in all the boxes instead of listening to the patient." (Nurse, age 28)
Insufficient training	– Training as a "one-shot" effort during implementation – Training needs are on-going – Problem learning on the job while providing patient care – Organization expects people to learn on the job – "Young people" think they can learn on the job	"Don't assume you [a clinician] have time to 'pick it up' on the job, as many young people do. This is too important to learn on the fly...a way needs to be developed which will give clinicians the needed training but not stop us from doing our jobs." (Physician, age 44)

(continues)

Table 3		
Challenges of EHRs: Emergent themes, subthemes, and example comments, Continued		
Major themes	Corresponding subthemes	Example comments
Trust in information	– “It depends...” – Acquiescence, “why wouldn’t I trust it?” – Loss of information due to numbers being transposed or codes meaning multiple situations	“Trust is a strong word...depending on who entered the information before it could be totally screwed up.” (Physician, age 31)

Note. EHR = electronic health record.

and younger participants were aware of the technology’s propensity to interfere with relationships. One exception was that several more experienced participants noted that young clinicians may rely on technology for answers rather than thinking through unusual situations. Another exception was that younger participants were more likely to blame problems with the EHR on the EHR system itself or processes necessary for compliance. In contrast, older participants were more likely to blame problems on other users, others’ general lack of competence, or lack of caring about the quality of one’s work.

Benefits of EHR Use

Nearly all participants highlighted one or more of six benefits to EHRs (Table 2). More than half (n = 17) mentioned a benefit being the ability to see patient information in “real time,” particularly for complex chronic patients requiring many visits and extensive coordination. Nearly half (n = 13) mentioned reviewing patient history and seeing trends in patient health and treatment over time. Other benefits included ease of information retrieval (n = 9), ease of sharing information with other providers (n = 6), and helpful reminders and alerts (n = 2). Two physicians also noted that they like the way EHRs can improve interactions among providers, patients, and their family members. However, many participants (n = 8) qualified statements about benefits by saying “in theory” or “ideally, if everyone uses it correctly....”

Challenges of EHR Use

Participants mentioned challenges much more frequently than benefits using EHRs. Six themes emerged, with numerous subthemes (Table 3).

Increased workload. This challenge was mentioned most frequently, with 25 of the 30 participants mentioning one or more of four dimensions: (1) *Time restrictions:* This seemed to stem from increasing pressure to see more patients or from the context being fast-paced. Given the benefit of and need for “real-time” information, practitioners felt pressure to

keep records updated and often felt rushed to see patients without fully reviewing the EHR. The *Summary of Care*, emphasized in *Meaningful Use* Stages 2 and 3, requires providers to input summary information at the time of patient referral. Participants who felt too busy to input data sometimes participated in workarounds that delayed “real-time” information. (2) *Time delays:* Delays partially stemmed from upstream providers not inputting data in a timely manner. In such cases, current providers had to make phone calls and track down information. (3) *Rework:* This often occurred if the EHR did not include the necessary information or if it was uninterpretable and the previous provider could not be reached for clarification. (4) *Too much information:* EHRs include information from all patient encounters, and much of it was not relevant for the current encounter. Providers were required to sift through all the information to find what is relevant. Participants noted they usually get 200 or more pieces of electronic information a day, making it challenging to effectively sift through it all to identify what is relevant.

Provider overreliance on technology. Half of the participants (n = 15) described situations in which they regularly lost access to the EHR for reasons such as the system “going down” or updating or a module from a different unit being offline. Information important for care may be inaccessible when systems go down, but care providers cannot allow this to inhibit care of the patient. However, more than one third of the participants (n = 11) pointed out that many clinicians simply do not know how to chart or make decisions without the EHR.

Interference with interpersonal relationships. More than half of participants (n = 16) emphasized that the EHR interferes with meaningful relationships with patients. The expectation that they document care immediately required clinicians to focus on the EHR rather than look at patients, read their body language, or pay attention to their stories. Participants indicated the EHR should not replace in-person, interdisciplinary rounds or verbal communication during hand-offs, but it often is expected to. Aside from making sure information is conveyed, the EHR has interfered with old-fashioned brainstorming for problem solving.

Insufficient training. More than half of the participants ($n = 16$) mentioned that insufficient training with EHRs posed barriers to communication and care coordination. Some clinicians said they are required to learn EHR processes “on the fly” or teach others, and this is dangerous given their need to focus on clinical care literally at the same time. Some participants implied that training opportunities exist, but “other” clinicians choose not to get themselves trained.

Trusting EHR information: It Depends. When asked directly if they trust the accuracy of EHR information, all participants stated initially that they trusted the information in the EHR was accurate and up to date. However, an interesting pattern emerged when asked “how often” the information was accurate. Estimates of accuracy ranged from 75% to 98%, with most ($n = 11/18$) estimating 90%–95% of the time. However, one-third ($n = 10$) qualified their answers with, “it depends on...” who entered the data, what unit entered the data, or what hospital the record came from. Furthermore, later in the interviews, when asked what barriers EHRs pose to care coordination, most participants contradicted their earlier responses, asserting that inaccurate data, unclear notes, or lack of timely data entry regularly caused problems in care delivery. Most participants attributed data inaccuracies to human error; few blamed the EHR system itself.

As the contradictions surrounding trust emerged, we returned to our initial trust codes to reexamine participants’ responses. From this reanalysis, we identified a subtheme we termed *acquiescent trust*, which meant that some participants appeared to trust the EHR’s information unquestioningly. That is, when asked if they trusted the information to be accurate, many participants responded in terms such as, “of course...why wouldn’t I trust it?” We identified 17 participants who indicated some form of acquiescent trust, and this did not differ between professional groups (eight physicians, nine nurses). Most of these participants implied or stated directly that to mistrust the information would be calling another clinician’s professionalism into question. In addition, as discussed below, many participants exhibited nonverbal cues that they were uncomfortable with this question.

Workarounds and Culture of Silence

In mapping our themes to the broader literature, we examined some key frameworks within which to better understand and interpret our empirical findings (Green & Thorogood, 2004). The content themes from the interviews were linked to the higher level constructs of “workarounds” and “health care as a culture of silence.” A *workaround* is a way of addressing a perceived block in workflow by informally revising the process to get around the blockage. In health care, workarounds are differentiated from other reasons for not following protocols (e.g., shortcuts, deviance), because a person performing a

workaround has the patient’s best interest at heart (vs. his/her own self-interest, for example) and believes he or she would follow the protocol if not for the workflow blockage (Halbesleben, Rathert, & Bennett, 2013). We did not directly ask participants about workarounds, nor did participants use this term, but the concept clearly emerged in the examples they shared. Many participants who felt comfortable with EHRs appeared to have adapted by developing workarounds. The most frequent ones mentioned were delaying data entry until the end of the shift, developing short-cuts or their own codes to include in summaries of care, or attempting to have verbal conversations with other providers. Others mentioned workarounds more broadly, suggesting that sometimes formal processes need to be abandoned in the interest of the patient.

A second construct, *culture of silence*, seemed to permeate and influence participants from both health systems. A culture of silence, or organizational silence, has been defined as “a collective-level phenomenon of saying or doing very little in response to significant problems that face an organization” (Henriksen & Dayton, 2006, p. 1539). Eight physicians and five nurses indicated they were uncomfortable speaking up. They implied or stated directly that it was not safe to speak up about inaccuracies or problems with the EHR, saying that to do so (even in a confidential, anonymous interview) would be “ratting out” or “calling out” colleagues.

In addition to our mapping of comments and themes, our nonverbal data supported these additional constructs. Nonverbal data can add context and explanation beyond verbal responses to interview questions and may include pointing, thought checking, fidgeting, head nodding or other facial expressions, and hand gestures. (Oliver, Serovich, & Mason, 2005). For example, roughly 60% of participants lowered their voices when they described specific workarounds. Many of these individuals ($n = 7$) looked around as if to see who might overhear the conversation prior to responding. Still others paused, smiled uncomfortably, shook their heads side-to-side, or just stared at the interviewer, particularly to questions about barriers to EHR use or inaccurate information coming from another EHR user.

Respondents appeared to carefully choose, first, *if* to respond to the question and, second, *how best* to respond to the question. For example, one nurse laughed when asked about EHR barriers and then shook her head without directly answering the question. One experienced physician had purchased a small rolling cart that she used to wheel a laptop computer between patient exam rooms. She refused to use the desktop computers in the exam rooms as they caused her to turn her back on her patients. She felt the ability to look at her patients was crucial and therefore developed her own EHR use process. Though this workaround was extremely helpful to her practice and might be beneficial for other physicians, this physician had not shared her idea with others. These nonverbal

data, combined with the interview responses, were evidence that suggested a culture of silence permeated both organizations.

Discussion

This study was one of the first to take an in-depth look at perceptions of integrating EHRs in the daily practice of medicine from care providers who had been using EHRs for an extended period of time. Our results provide a more nuanced explanation for challenges previously expressed in the nonempirical literature. For example, our approach identified frequent challenges that appear to increase clinicians' workloads while using EHRs, even though in theory it should reduce workloads and even though these EHR users were very experienced. Ultimately, information exchange and coordination were not as efficient as expected. Perhaps most importantly, participants noted that the EHR may interfere with relationship building, face-to-face collaboration, and building clinician–patient rapport.

One surprising finding was that older physicians and nurses seemed to better understand and believe in the “potential” of what the EHR could do for health care if existing problems are more successfully addressed. In contrast, younger physicians and nurses expressed the most frustration with EHRs and were more likely to blame inaccurate data and delays in getting needed information on the EHR system or processes rather than other users. This finding is contrary to the conventional wisdom that older people are more resistant to technology and more frustrated with it. One factor contributing to greater frustration among the younger participants is that those who have grown up with technology may be more likely to know what “user-friendly” technology is. Thus, they may have higher expectations of ease of use that collides with cumbersome EHRs, which often force clinicians to enter data in ways that are illogical in relation to how they want to interact with patients. Such issues should be considered as EHR vendors pursue improved usability.

Interpersonal Relationships and Trust

Our study confirmed that the EHR's interference in interpersonal relationships noted in physician commentaries (Toll, 2012; Ventres & Frankel, 2010, remains a problem even years after initial EHR implementation. Interestingly, although the assumption has been that older practitioners who began practicing prior to the influx of computers would have difficulty incorporating this technology into their patient interactions, our data indicated that younger clinicians experienced this challenge as well. One younger physician stated that the reduction in interpersonal collaboration with his patients was a major loss in terms of delivering high-quality care. Other participants stated that they lose too

much of the patient's story because of the amount of time they have to spend documenting in the EHR. Several observational studies have confirmed that clinician use of EHRs results in less nonverbal communication with patients and potentially interferes with communication of socioemotional information that is essential for appropriate diagnosis and treatment planning (Rathert et al., 2017). Indeed, this study noted that EHR use gets in the way of building trust and rapport with patients. Although evidence is mounting that the EHR has changed the clinical encounter, it is yet to be determined how such changes to important clinical dynamics will affect patient outcomes, and correspondingly, how this may affect levels of job satisfaction among clinicians.

Our mixed findings about the extent to which practitioners trust the accuracy of information in the EHR were surprising. On the one hand, most of the participants indicated acquiescent trust, responding defensively when this question was asked. Those who did not indicate they automatically trusted EHR information stated “it depends.” These respondents had learned or formed opinions about the quality of the EHR's data, depending on the previous person or place to have input data. Most participants who expressed concern about data quality problems indicated that they or their units had implemented workarounds or other methods of getting correct information or quietly correcting the data in the record, rather than voicing concerns that might lead to overall process improvements and organizational learning.

That participants used workarounds was not surprising given the challenges they encountered. Those who had adapted appeared to have set up their work routines to get around perceived blockages (e.g., using paper charts and entering data into the EHR later). Our findings are consistent with those of O'Malley et al. (2009), which identified various problems and workarounds during care coordination tasks in ambulatory care prior to *Meaningful Use*. Unfortunately, these problems do not appear to have been resolved with the HITECH incentives and broader EHR implementation. Although workarounds can lead to positive changes, they also have been shown to have negative consequences more broadly for patient safety and quality of care (Halbesleben, Savage, Wakefield, & Wakefield, 2010).

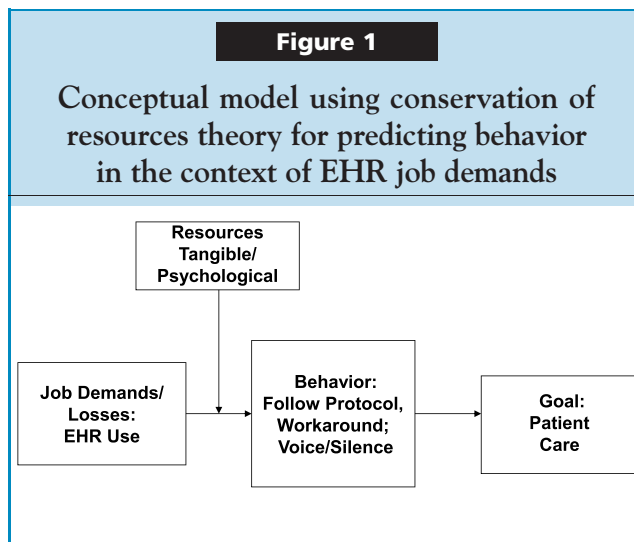
A more surprising finding was that a culture of silence seemed entrenched in both organizations. Although we did not directly examine organizational culture, nearly all participants implied concerns about speaking up. As well, workarounds are one symptom of a lack of psychological safety, which influences speaking up (Edmondson, 2003; Halbesleben et al., 2013). Such attitudes are surprising given the 17 years of focus on addressing problematic *processes and systems* that lead to medical errors sparked by the landmark Institute of Medicine report, *To Err is Human* (Institute of Medicine, 2000).

Future Directions: COR Theory as Conceptual Framework

Our use of a framework analysis approach led to identifying COR theory as a potentially productive explanatory model for deconstructing and addressing some of the subtle barriers that may prevent effective EHR use. COR (Hobfoll, 1989) is a theory of stress positing that people are motivated to acquire and maintain resources in the quest to achieve their goals (Halbesleben, Neveu, Paustian-Underdahl, & Westman, 2014). COR posits that all stress is a response to real losses, perceived losses, or anticipation of future losses (Hobfoll, 2001). When their resources are threatened or lost, workers experience stress and practice defensive behaviors to reduce further losses, which can lead to workarounds and burnout (Halbesleben, 2006) and employee silence (Ng & Feldman, 2012). EHRs can result in loss of expertise, power, and comfort for clinicians (McAleamey, Hefner, Sieck, & Huerta, 2015), all of which are important, yet overlooked, resources. Although policymakers and practitioners have assumed that the EHR would itself be a resource that enhances coordination and quality of care, on the front lines the reality is that EHRs also result in losses of valued resources and place additional demands on users warranting an examination of end-users' resources and their utilization.

Applying COR theory to EHR implementation and use may further our understanding of change management and technology acceptance. COR sheds light on the idea of subtle resource losses and gains, as well as how people may make decisions based on assessment of their tangible and psychological resources and anticipated future losses and gains. It can be predicted that workers will develop workarounds, especially during disruptive innovations such as EHR implementation or changes. If workarounds were systematically identified and examined by managers and organizations, rather than punished, the information they yield could be used to make system and process improvements. Similarly, research examining organizational resources indicates there are many psychological resources that positively affect performance and can be enhanced with little financial cost (Halbesleben et al., 2014). Tapping into this growing body of research around enhancing psychological resources may be a fruitful direction for organizations to improve EHR acceptance and use in health care.

We propose that future research test hypotheses stemming from COR theory (Figure 1). In general, we submit that in the context of EHR demands, clinicians will behave in accordance with perceived resources for their goals of patient care. Those with more perceived resources will be more likely to follow EHR protocols even if those protocols present blockages in work flow, whereas those with fewer resources will be more likely to use workarounds. Similarly, those with more perceived resources will be more likely to voice concerns about challenges with EHRs, whereas those



with fewer resources will be more likely to remain silent. We do not propose that COR theory can explain all behaviors involved in workarounds or organizational silence; however, we posit that research using COR could shed light on areas where incremental improvements to the work environment can be made.

Study Limitations

Although interviews are useful for exploring social phenomena in depth, there are some limitations. There may be some recall bias due to memory lapses or reinterpretation of events. Our sample was small and included only two health systems; thus, we cannot establish generalizability to other settings or worker populations. The aim of this study was to explore a relatively new phenomenon, so lack of broad generalizability is not a concern.

Practice Implications

Given that the incentives for EHR use are being revised, now is the time to pay close attention to the frontline users' experiences during patient care. A key element negatively affecting practice is the lack of interoperability of EHR systems. One public policy option is to provide EHR system vendors with incentives to improve interoperability of systems. Greater interoperability would facilitate fulfillment of the new requirements required in MACRA that providers take specific steps to engage patients in using EHRs to engage in their health care (PatientEngagement HIT.com, 2016).

Second, to be successful, clinicians must be able to trust EHR data and trust that the work processes will reliably and realistically facilitate the practice of high-quality, patient-centered health care. We argue that to improve these processes, it is imperative to listen and learn from clinicians' lived experiences. The knowledge and insights generated

from using the EHR every day are essential for faster, practical improvements. Therefore, a nuanced examination of resources needed versus those available should be included in the decision criteria for managers overseeing EHR implementation and updates that require process changes.

Furthermore, a particularly fruitful avenue for discovering process improvements may lie in studying workarounds. Not all workarounds produce positive results, but workarounds suggest a problem exists. Thus, studying workarounds with frontline workers, who are in the best position to identify efficient and effective process improvements (Halbesleben et al., 2010), should lead to earlier and better resolutions. However, in a culture of silence, this is a daunting task. If people do not feel safe, they are unlikely to speak up or share workarounds. One option is to identify benchmark organizations, in which discussing EHR improvements is a regular part of meetings, for example. In such organizations, resources related to “safe” cultures could be identified and focus on workarounds as a learning tool could serve to make the organizations even safer.

Conclusion

Although there are benefits to EHRs such as increased speed and accuracy of biomedical information transfer, there are still important user challenges that undermine realization of the EHR’s potential to facilitate better care. Greater attention to building sustained mechanisms for learning from end-users is a challenging but promising avenue to anticipate and address problems since the technology and care delivery. Static solutions are likely to fail, so practitioners and policymakers must search for ways to adapt and help the health system effectively adapt and evolve. Examining care provider experiences with a COR lens is a promising avenue for improving EHRs and health care delivery.

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