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Social and personal normative influences on healthcare professionals to use information technology: Towards a more robust social ergonomics

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Abstract

Social structures and processes are increasingly acknowledged and studied within the human factors/ergonomics (HFE) discipline. At the same time, social phenomena are rarely the focus of HFE work, leaving a knowledge gap. The present study directly addresses social and personal normative forces that influence technology use and performance. Social and personal normative influence to use electronic health records (EHR) were investigated using semi-structured qualitative interviews with 20 attending physicians at two US hospitals. Analyses used a comprehensive framework based on leading social scientific theories and revealed numerous sources of influence, including hospital administration, colleagues, patients, clinical and professional groups, government, and one's self. Influence was achieved through different means and invoked different psychological processes. Findings motivate a new view of professionals' technology use as a highly social process occurring in a social context, with implications for research, policy, design, and in general the development of a robust social ergonomics.

Keywords

social ergonomics; sociotechnical systems; social influence; electronic health records; healthcare

1. Introduction

In a paper formulating the fundamentals of human factors/ergonomics (HFE), Wilson (2000) chronicles the discipline's discourse on the importance of social context:

- “Our discipline ... only makes sense in the full richness of the social setting in which people work” (Moray 1994, p.529), and in reply:
- “Social contexts in the workplace have minimal influence on task performance” (Meister 1995, p.116).

Although Meister's claim is not representative of the discipline today, nor has Moray's vision been fully realized. Elsewhere Wilson observes that HFE generally fails to address “the social aspects of performance” (Wilson *et al.* 2003, p.83) and urges the understanding of “the way in which we come to understand other people, and the way that others, and our

relationships with them, may affect how we act” (p.86). More recently, Farrington-Darby and Wilson (2009) contend that there is growing acknowledgement of “the social” within HFE.

Indeed, there are signs of growth in an area that may be called “social ergonomics” (Bannon 1998, Brown 1986). For example, Rasmussen’s (1997) classic model represents an early understanding of the top-down social forces—including public opinion, laws, regulations, and company policies—on safety-related actions. Social and cultural factors are firmly entrenched in other aspects of safety science as well (Choudhry *et al.* 2007, Hofmann and Morgeson 1999, Woods *et al.* 2010). The subdiscipline macroergonomics, or organizational ergonomics, has foundations in sociotechnical systems theory and explicitly deals with sociotechnical systems and the social processes therein (Hendrick and Kleiner 2002, Kleiner 2006) including, for example, psycho-social factors related to work-related musculoskeletal disorders and technology change (Carayon 1993, Carayon and Smith 2000, Carayon *et al.* 1999). Broader-scale social factors are often central within the “cultural ergonomics” movement that has been building over the last two decades (Aykin *et al.* 2006, Bradley 2006, M. Kaplan 2004, Smith-Jackson and Wogalter 2000). HFE research taking a distributed cognition perspective (Hollan *et al.* 2000) necessarily takes into account the cognition and interactions that occur in real world social contexts. Similarly, collaboration, coordination, teamwork, and computer supported cooperative work (CSCW) are implicitly social-cognitive processes that are accumulating interest in HFE (Gorman *et al.* 2010, Salas *et al.* 2010).

Nevertheless, explicit social theory building and testing activities are largely missing in HFE, perhaps because social factors are merely treated as part of the context (e.g., Maguire 2001)—or, worse, as nuisance factors to be controlled—rather than as focal constructs (Farrington-Darby and Wilson 2009). This criticism applies in particular to HFE studies of technology design, use, and performance, although there are exceptions such as work in cognitive systems engineering/joint cognitive systems (Hollnagel and Woods 2005, Woods and Hollnagel 2006), human-technology “teamwork” (Dekker and Woods 2002, Klein *et al.* 2004), trust in and through technology (Hoffman *et al.* 2009, Lee and See 2004, Montague *et al.* 2009, Parasuraman and Riley 1997), and the Computers Are Social Actors studies of Ness and colleagues (e.g., Ness and Moon 2000). Of present interest, HFE noticeably lacks research and theory concerning the social and personal normative forces that influence professionals’ technology use within organizations.¹ It is this gap that the present paper begins to fill, by presenting findings from a study of physicians’ perceptions of social normative influence (from others) and personal normative influence (from oneself) to use electronic health records (EHR) systems.

1.1. Social influence, normative influence, and the case of EHR use

On the wave of decades of social science research (e.g., Asch 1955, Fishbein and Ajzen 1975, Merton 1957, Salancik and Pfeffer 1978), it has become axiomatic that one’s behavior

¹This is not the case in other disciplines that study technology in organizations such as information systems or organizational psychology; for example, “rarely have information systems (IS) researchers so unanimously agreed on the importance of a specific topic as in the case of determining, measuring, and defining social influence” (Eckhardt *et al.* 2009, p.11).

is shaped by perceptions of how one *should* behave. Physicians frequently encounter the message that they should use health information technology (IT), particularly EHR, for patient care, as illustrated in the following passage:

“[W]e need to upgrade our medical records by switching from a paper to an electronic system of record keeping. ... And that will not only mean less paper-pushing and lower administrative costs, saving taxpayers billions of dollars; it will also mean all of you physicians will have an easier time doing your jobs.” – President Barack Obama, remarks at the Annual Conference of the American Medical Association, June 15, 2009.

An EHR is “an electronic record of health-related information on an individual that conforms to nationally recognized interoperability standards and that can be created, managed, and consulted by authorized clinicians and staff across more than one health care organization” (National Alliance for Health Information Technology 2008, p.6).² EHR functionality typically includes the storage and retrieval of data (e.g., medication list, laboratory results, history of care), patient-provider and provider-provider messaging, and less typically computerized provider order entry (CPOE) and clinical decision support for diagnosis and therapy decisions (e.g., diagnostic aids, medication allergy alerts). Such systems are not as prevalent in the US and Canada as they are in other nations (Jha *et al.* 2009, Jha *et al.* 2008) but prevalence rates are on the rise (Furukawa *et al.* 2008) and are expected to keep rising in the US due to EHR-promoting legislative reforms (Blumenthal 2010).

Research on health IT shows that a hospital’s or clinic’s implementation (i.e., purchasing and installing) of EHR or another technology does not guarantee that it will be appropriately used (Holden 2010, Holden and Karsh 2009). Sometimes, clinicians actively resist using EHR (Lapointe and Rivard 2006) or work around it, for example, by using paper alternatives (Saleem *et al.* 2009). Further, studies of inpatient and outpatient EHR systems report that physicians use certain key functions of EHR infrequently or not at all (Lærum *et al.* 2004, Simon *et al.* 2007). It is conceivable that the nature of EHR use and disuse can explain recent studies showing little or no benefit of EHR for quality and safety of care delivery (Chaudhry *et al.* 2006, Garrido *et al.* 2005, Linder *et al.* 2007, Parente and McCullough 2009, Zhou *et al.* 2009).

As an instance of deliberative human behavior, the use of EHR is presumably influenced by social and personal normative forces; certainly, this is a foundational assumption for attempts by vendors, managers, politicians, and professional societies to persuade physicians to use such systems (Ford *et al.* 2009). Yet, there is almost no research on the social forces that shape health IT use, much less EHR use, by clinicians, and the existing research is limited (for exceptions, see, e.g., Bartos *et al. in press*, Fung *et al.* 2009, Van Akkeren and Rowlands 2007). Consider the broadest systematic research of this sort: survey studies based on the Technology Acceptance Model (TAM) that assess “subjective norms,” defined as a

²As an anonymous reviewer pointed out, EHR systems are dissimilar from many of the technologies, such as enterprise resource planning (ERP) systems in manufacturing, found in prior HFE studies. One key difference is that EHRs contain data on patients, not on production systems, and therefore must meet privacy requirements such as the US Health Insurance Portability and Accountability Act’s (HIPAA) Privacy Rule.

respondent's perception of the extent to which "important others" think that he or she should use some health IT. Holden and Karsh's (2010) review of 22 TAM studies in healthcare revealed that only eight studies measured subjective norms. Of those, four found a relationship between measures of subjective norms and self-reported measures of intention to use or actual use of health IT. Holden and Karsh also identified a number of limitations in the conceptualization and measurement of subjective norms in health IT research, including (1) vague references to "important others" rather than to specific individuals or groups; (2) alternatively, no consistency between studies naming specific referents (e.g., "pediatricians" in one study, "senior management" in another, and "colleagues, superiors, and subordinates" in a third); (3) an overemphasis on influence exerted through being directly told to use or not use IT; and (4) no identification of the psychological processes by which important others might influence IT use (Holden and Karsh 2010). In addition, TAM studies do not investigate social influence to *not* use IT; studies do not identify all of the converging sources of social influence, focusing on only one source (e.g., colleagues); some sources such as political pressure are often ignored; personal influences, including moral norms, are rarely considered (but see elsewhere [B. Kaplan 2001]); and there is little discussion of the content of persuasive arguments made by important others or the channels through which arguments are communicated. The preceding limitations hinder the development of HFE theory about how social forces shape professionals' technology use behavior and performance; this prohibits the development of appropriate policy and design solutions.

2. Methods

The present study used semi-structured qualitative interviews, analyzed using a comprehensive analytic framework, to address the gaps in our understanding of social and personal influences on health IT use, particularly the use of EHR by physicians. Study details are provided below and in other publications (Holden 2010, Holden *in press*). The study was approved by institutional review boards (IRBs) at the researcher's institution and at both study hospitals.

2.1. Sample and setting

Twenty attending physicians participated, recruited from two US hospitals (eleven from Hospital 1, nine from Hospital 2). A purposive (non-random/non-probability) convenience sample was used to recruit participants and an attempt was made to recruit participants who could diversify the sample on the following attributes: familiarity with health IT, comfort with technology in general, and age. Physicians were informed of the opportunity to participate through presentations at meetings, postings, and e-mail solicitations.

Hospital 1 was a not-for-profit 448-bed tertiary care community hospital in the Midwest. Hospital 2 was a regional not-for-profit 440-bed tertiary care community hospital in the same Midwestern city as Hospital 1. Hospital 2 was a member of a faith-based multi-hospital system. The two hospitals served nearly identical populations. At the time of the interviews, both hospitals were using the same top-ranked national brand of inpatient EHR but they were at different points of the timeline for implementing EHR components. Hospital 1 had an EHR with data retrieval but not data entry functionality. At the time of the

interviews (June-September 2007), they had this system for about three years and were just beginning to implement computerized order entry. Two participants from Hospital 1 worked in the hospital unit that was first to implement an order entry addition to the EHR and those participants provided additional data on their first few weeks of using order entry. Hospital 2 had both data retrieval and data entry (documentation and order entry) capability. The data repository and documentation portions of the EHR were in place at Hospital 2 for about 9 months and order entry for about 7 months at the time of the interviews (January-February 2009).

Participants all had inpatient responsibilities. They represented diverse specialties: general medicine (n=10), anesthesiology (n=2), obstetrics/gynecology (n=2), psychiatry (n=2), cardiology (n=1), orthopedics (n=1), ophthalmology (n=1), and rheumatology (n=1). Ten participants also provided data on their use of EHR (the same vendor's ambulatory EHR) for outpatient care. Fifteen males and five females participated, distributed across the following age groups: 30-39 (n=6), 40-49 (n=7), 50-59 (n=6), 60+ (n=1). Participants had practiced medicine an average of 15 years (range: 4-32).

2.2. Data collection

An interviewer trained in human factors engineering and psychology conducted all interviews, each lasting one hour. Every interview was audio-recorded, with permission of the participant. Participants were not compensated for participating.

A semi-structured interview instrument was used to elicit beliefs or perceptions about EHR use, including three specific questions about social influence to use EHR:

- “Are there any individuals or groups who would approve of or encourage you using [the system]?”
- “Are there any individuals or groups who would disapprove of or discourage you using [the system]?”
- “Is there anything else you associate with other people's views about you using [the system]?”

Four specific questions were used to elicit beliefs about personal normative influence:

- “What comes to mind when you think of those individuals who use [the system]?”
- “What adjectives or demographics describe individuals who use [the system]?”
- “What are the ethical or professional implications of using [the system]?”
- “What personal convictions (values, morals, principles) do you have about using [the system]?”

Participants were asked to respond as fully as they could, were permitted to “stray off-topic,” and were encouraged to return to address prior questions at any point in the interview.

Questions were based on guides for writing questions eliciting normative beliefs (Ajzen 2002, Ajzen and Fishbein 1980, Francis *et al.* 2004) and on definitions of the constructs of interest (Ajzen 1991, Bandura 1977, Fazio 1986, Fishbein and Ajzen 1975, Triandis 1977). All questions were tested using mock interviews with a physician colleague and four HFE researchers and students. Ad-hoc probes were used to obtain clarification and additional information (e.g., “How much control do [others] have over whether you actually [use EHR]?”).

2.3. Analysis

Transcribed interview passages were first organized by source of influence, using a hierarchical classification of normative beliefs to assign one or more classification codes (e.g., social influence > approve-encourage > external entities > political entities > federal government) to each relevant passage. The initial classification structure was based on the definitions of social and personal influence from two social-cognitive theories of behavior, namely Ajzen’s Theory of Planned Behavior (TPB, Ajzen 1988) and Triandis’ Theory of Interpersonal Behavior (TIB, Triandis 1977). Sub-classification within theoretically-defined categories was inductively and iteratively developed from the data. During the course of this initial analysis, additional categories related to social and normative influence outside of the original definitions (e.g., “learning from others”) were also created and the complete coding scheme was applied to all interview data. All responses, regardless of which question triggered the response, were analyzed for instances of social and personal normative influence.

Secondary analysis applied a comprehensive framework of social and normative influence, presented in Table 1, to the pre-classified data. The framework in Table 1 expanded the original social-cognitive TPB/TIB framework by synthesizing numerous theories from the social science and information systems literatures, although still largely anchored to social-cognitive theory so as to match the theories underpinning data collection. The framework directed the analyst to address each of the following for each identified source of influence: (a) the direction of influence (i.e., encourage vs. discourage); (b) relation between source and target of influence; (c) content of and channels through which persuasive messages were communicated; and (d) the means of influence or the psychological processes involved. QSR NVivo 8 (Cambridge, MA) software was used for storing and coding data.

A single analyst (author R.J.H., who also conducted all interviews) analyzed the data.

To ensure data and analytic quality and validity (Mays and Pope 2000, Spencer *et al.* 2003), the analyst/interviewer carefully attended to his role in shaping the data and to negative cases, attempting to highlight, not conceal, deviant or contradictory data. Although procedures to protect confidentiality prevented the researcher from validating analyses with interview participants, manuscripts were shared with clinician contacts at the two study hospitals with a solicitation for feedback and corrections. In the results, verbatim quotes and the duplication of “in vivo” terms used by respondents provide readers with the ability to assess the correspondence between original data and the analyst’s interpretation. Throughout, an attempt was made to portray the data in a way that fairly and accurately

represented participants' perceptions, rather than attempting to build a case for or against EHR use or constructing an artificially balanced perspective.³

3. Results

Below, interview findings pertaining to social and personal influence are reported, organized by source of influence or referent. For each referent or group of referents information is provided on the direction of influence, the relation of the referent to the physician, the arguments used by the referent to influence physicians, the channels through which influential communication was conveyed, and the means of influence and corresponding psychological processes involved. The findings are summarized in Table 2.

3.1. Hospital and clinic administration

The most commonly mentioned source of social influence was a physician's (local) hospital administration. Physicians with outpatient (i.e., primary care) practices also often mentioned their outpatient clinic administration. Of the 13 physicians explicitly asked about the entity that most influenced their EHR use behavior, six (46.2%) said it was their hospital or clinic. Hospital and clinic influences were exclusively positive—i.e., encouraging EHR use.

Although all physicians were formally affiliated with their respective hospitals, only one physician used personal language (*"my employers"*) to make explicit her relationship to the hospital. Two physicians spontaneously named specific clinic or hospital leaders (e.g., *"I mean ... by hospital administration, the person who communicates to us are, is our liaison ... they're the ones who send us the e-mails that say what's going on"*); another did so when prompted to name the face associated with hospital pressure to use EHR. The rest used impersonal language such as *"the hospital," "the administrative bodies," "the leadership,"* and *"their rules,"* suggesting social distance between physicians and the hospital. Four physicians commented that the hospital argued for EHR use by appealing to EHR's benefits for quality and safety of patient care, for example: *"[Hospital Leader], is a big patient safety advocate and will frequently, you know, refer to the fact that, you know, [EHR] is going to make things so much better and safer."* About as many physicians mentioned business reasons (productivity, efficiency, better billing) as the arguments for EHR use communicated by the hospital, and one physician described a third argument: *"that's part of their message, that this is kind of the way medicine is going, and we need to do this..."*

The hospitals communicated their encouragement of EHR explicitly using channels such as campaigns, training sessions, and e-mail. Additionally, the hospitals' massive expenditures on the EHR system and technical support were seen as an implicit message that physicians should use EHR, as illustrated in this exchange:

Interviewer: How do you hear about their approval of it?

Respondent: Well, the fact that they're buying it #laughter# you know?

³As it turned out, participants reported mainly encouragement, and to only a much lesser extent discouragement, of EHR use. Further, as reported elsewhere (Holden 2010, Holden in press), participating physicians reported about an equal number of positive and negative beliefs about EHR use.

The hospital or clinic influenced EHR use predominantly through administrative controls—*“they’re kind of making us use the technologies”*—and by eliminating alternative options:

Respondent: I mean, approving is not the right word ... they’re coercing me to use it.

Interviewer: So how do you, how do they coerce you?

Respondent: Well, by simply making that the only place where the information is available.

3.2. Fellow physicians

Physicians often described the opinions of their physician colleagues about EHR use and indicated that these physicians may also be a source of social influence. Stated an ophthalmologist, *“other than, you know, listening to what I, myself, tell myself, I think I probably listen to my partners the most.”* In fact, of the 13 physicians who were asked, six named fellow physicians as the entity most strongly influencing them. Fellow physicians mainly encouraged but sometimes discouraged EHR use, or as one physician put it, *“it’s very mixed on the physician side, but I think most physicians you speak to who have been using electronic health record[s] don’t want to go back to the way it was before because of the advantages and I think the potential that they see. So I think in general the physicians are supportive.”*

Not surprisingly, respondents used language that revealed social affiliation with fellow physicians (*“my colleagues,” “my partners,” “other physicians in my department”*). One physician described that she was most strongly influenced to use EHR by a *“techie”* colleague *“because he’s a father figure.”*

Describing the integrated and collaborative nature of patient care, respondents explained why fellow physicians might encourage one another to use EHR, for example, *“having a clear, consistent line of communication for the next person that is coming on is very important”* or as another physician stated,

“Because we want to be able to share information with each other and I guess if like one third of our colleagues were not using the system, then that brings down the quality of the data, so it makes sense for all of us to be involved in the system. So there is some, I think, there’s some kind of peer pressure to make sure that we’re using it.”

Respondents reported that fellow physicians who opposed EHR used counterarguments including the difficulty of doing data entry and the extra burden that this imposed; that EHR brought about undesirable changes in workflow; that EHR intruded on patient-physician interaction; that the time costs of using EHR reduced productivity and income; and that the EHR software was not yet perfected and *“they’re then put in that position of having to help develop the product.”*

Colleagues related their opinions of EHR mainly through interpersonal communication. However, few of the communications were described as explicit attempts to influence peers.

Colleagues are nevertheless likely to influence one another's opinions and behavior through less direct processes, including informational social influence, conformity, and social learning (Fulk 1993) (see Table 1). Informational social influence refers to "an influence to accept information obtained from another as *evidence* about reality" (Deutsch and Gerard 1955, p.629). In this case, it would mean that physicians who heard about fellow physicians' experiences and opinions of EHR may have interpreted their colleagues' accounts as evidence about the EHR system, thus altering their own opinions and subsequently their behavior. This is especially likely to occur when one trusts the source of information (e.g., a close colleague) and when one has little personal experience with the target behavior (e.g., has not used a certain EHR feature). Take for instance the following comment by an obstetrician whose hospital's EHR had no data entry functionality yet, remarking on his fellow physicians' influence: *"So they're not trying to influence me as much as they, you know, group-think is like, 'Oh, this ... [data entry] is going to make it slower for me.'"* It is possible that an accumulation of such comments from fellow physicians will lead one to believe that using EHR with data entry functionality will truly slow down work, predisposing a negative attitude that might affect how and perhaps even whether one will use data entry when it becomes available. Similarly, others' behavior may be interpreted as accurate information about an EHR. One physician commented, *"I'm telling you, I know that there are docs, I know docs who have retired from practice earlier because this was sort of the last straw."* Physicians might infer from colleagues' premature retirement that using EHR is undesirable; they might alter their behavior to match, perhaps by resisting implementation, by not using the full extent of EHR features, or by working around the system.

Theories of conformity further suggest that by observing the behavior of others around them, physicians may learn about and attempt to conform to what appear to be the social norms for behavior (Cialdini and Trost 1998). One motivation to conform is to gain or preserve social status. Thus, being around fellow physicians who extensively use EHR may influence one to do the same in order to fit in. One physician described such a situation:

"The fact that we're in an environment where people may not want to use the systems, but do use the systems, you know, they actually rely on them now... And there's sort of a cultural issue here, so I guess if there wasn't a culture where everyone was cool with accessing these systems, I would be much less excited about using this system."

Many physicians described how physicians around them worked around EHR (e.g., writing orders on paper and having a nurse enter them electronically), used it selectively, or used it poorly (e.g., not updating information in the EHR, expecting others to do it). If such behaviors were common enough among important social agents, they may have been interpreted as social norms worth conforming to or at least not blatantly violating.

A final way that physicians in the study may have been influenced by their physician colleagues without being directly persuaded to alter their EHR use behavior is through social learning. This refers to the acquisition of behavioral patterns by observing others (Bandura 1977, Fulk 1993). By observing (or being shown) a fellow physician using EHR in a seemingly advantageous way, one may emulate that behavior not only to improve one's

social standing (as in the case of conformity) but also because it may improve one's work. For example, physicians described how *"we sort of teach each other"* and that *"the things you don't know ... you stumble upon by working with someone else or working with a colleague that says, 'Oh, you can get this information and then [they] show you how to do it.'"* Research on social learning shows that even when observed behaviors are not meant to be taught they may still be learned. Thus, when and how surrounding physicians use EHR may influence fellow physicians' own use. That influence can be desirable or undesirable. For example, several physicians noted that too many colleagues copy and paste whole clinical notes rather than importing only the most important contents from prior notes and adding only new, relevant information to subsequent notes. It is possible, therefore, that through observing others' note writing, some physicians will find the practice of indiscriminate copy-and-pasting bothersome and will not do it themselves whereas others may see it as a useful time-saving behavior worth replicating.

3.3. Patients

Several physicians spontaneously mentioned patients as a source of social influence; those who did not were asked explicitly about patients' opinions about physicians' use of EHR. Physicians believed that when patients had opinions about EHR use, those opinions were predominantly positive (*"I think patients in general are very happy about it"*) and that patients wanted their physicians to use EHR (*"They think that that's the way that it should go"*). Reasons for patients' approval of EHR use, as related by physician respondents, included access to records that go *"pretty far back;"* access to their own medical records via a patient portal; possibly improved safety and quality of care; the perceived clarity, thoroughness, and portability of the record; the potential reduction in duplicate tests; and because patients *"like what they think is new and efficient."* One physician commented, *"I think the patients feel like they're getting better care by having [EHR]. I don't think they necessarily understand what that truly means."*

Three physicians explained why patients may instead discourage EHR use. Said a psychiatrist, *"my paranoid patients hate me putting anything on the Internet about them because they're just sure that their enemies are going to get it."* The remaining physicians explained patient's disapproval in terms of worsened patient-physician interaction:

"I think some patients don't like it. It changes the interaction with patients, so that you may be looking at a screen and typing while they're talking ... It certainly made it a little more challenging, and I know some patients have expressed that they don't feel as much of the personal connection that used to be there."

Although physicians may not seek acceptance into the social group from patients as they do from fellow physician peers, they may nevertheless have a high motivation to comply with patients' wishes. One physician, when asked which social entity influenced him the most, replied, *"well, it ought to be patients,"* and it is possible that other physicians share this sentiment.

However important the patient opinion might be, eight physicians said that patients, especially hospital inpatients, were not even aware of their physicians' EHR use. *"The patient doesn't see me do anything with the [EHR],"* said one anesthesiologist. *"You know, it*

isn't to the point where I have a computer in front of me while I'm talking to a patient."

Similar comments were made by a rheumatologist, cardiologist, obstetrician, ophthalmologist, orthopedist, and two family medicine physicians, suggesting that lack of awareness was not strictly confined to one specialty or patient population. As one respondent summed up:

"They don't know. I mean, I think the patients aren't aware, at least my patients aren't aware, and I even have savvy patients. I don't think it affects how they perceive the hospital and the care. They're more concerned about nurses seeing them on time and getting their bedpans and their needs met."

Physicians believed that inpatient's unawareness could partially be attributed to physicians using EHR in the hall or at the nurses' station, rather than in the patient's room. This could be contrasted to the outpatient clinic, where *"we're seen with a computer terminal right there as we're talking to them, very different."*

Additionally, some physicians were not aware of their patients' opinions:

"You know, patients would be a very important constituency, and I have no idea, actually, whether they're positive, negative, or neutral. And I guess I can say that I really never asked any of my patients, like kind of how do you feel about me having access to all this information about you? So, I really don't know, and I imagine there'd be a wide spectrum of responses. So I guess I should know more, but I don't know about that constituency."

3.4. Intra-organizational clinical groups

Three physicians identified the internal quality improvement group as a source of social pressure. Other mentioned groups were the hospital compliance staff, a group responsible for integrating inpatient and outpatient information, the physician's clinical department, and the physician practice group. As with the hospitals and clinics, those groups only encouraged and did not discourage EHR use.

In contrast to the impersonal language physicians used to refer to their hospitals and clinics, physicians spoke of *"our department"* and *"our practice groups,"* suggesting belonging to those groups. One physician spoke of being an insider of a quality improvement group whereas others referred to such groups as outsiders (e.g., *"the quality people," "the compliance folks"*). According to physicians, the groups had different motives and thus used different arguments to achieve compliance. Quality improvement groups, stated one physician, are

"people who are trying to get us to do really good chronic disease management, people who are looking at outcomes and trying to figure out how can you measure outcomes... now we have the capability because ... the information is captured in a way that most of the time is searchable and sort of dissectible ... So those people are ecstatic about this."

An interviewee who was a member of the quality improvement group also identified easy analysis of a large set of outcomes data as the group's reason for encouraging EHR use, and

especially emphasized that the group encouraged uniformity in EHR use (*“if you have everyone autonomously using the electronic health record in their own way you can’t coalesce data”*). Not surprisingly, this physician strongly personally believed that using EHR had quality improvement benefits, suggesting that through his affiliation with the group he shared or internalized its rationale for EHR use. For the compliance group, the rationale was to integrate documentation and billing so that patients were charged for the actual treatment they received. The group integrating inpatient and outpatient information argued for using EHR to gain operational efficiency and cost savings. For the hospital physician practice group, the arguments were multiple: *“the promise for greater efficiency, better outcomes, especially in an environment where public reporting of those things is becoming more prominent.”*

Unlike the hospital and clinics, intra-organizational groups were not spoken of as controlling or forcing physicians to use EHR. It is possible, therefore, that these groups sought compliance rather than obedience.

3.5. Extra-organizational professional groups

Five physicians mentioned professional organizations such as the national and state Academy of Family Physicians, the American College of Physicians, and the American Medical Association. Physicians referred to the professional societies as *“interested in quality and outcomes”* and *“more around the outcomes and safety piece.”* For the most part professional groups were described as advocates of EHR as a useful tool if not necessarily persuading physicians’ use behavior. A physician explicitly identifying herself as an orthopedist described how her professional society might still indirectly influence her behavior:

“Most orthopods are very technology-oriented, because we need to [use it for] our surgery and everything, and so the Academy [American Association of Orthopaedic Surgeons] also is very technology-oriented. And not that they say, ‘Oh, you know, electronic records are, are good,’ but there’s a lot of information out there about electronic records, and even in our own offices that ... yeah, would influence you to say this is a good way to go.”

Another physician’s comments showed identification with a professional group and the internalization of the group’s preference for EHR:

Respondent: This is a group of psychiatrists who are techies. #indicating on computer # There’s my boys. And so--

Interviewer: This is an organization?

Respondent: Yeah, I’m going to join it ... Very, very fun. So, they encourage it.

3.6. Extra-organizational advocacy, legal, and regulatory groups

Physicians mentioned local and national organizations of which they were not members that advocated EHR use, including the local patient safety collaborative; the state collaborative for healthcare quality; the state medical society; and the Leapfrog Group, a national patient safety advocacy group. For the most part those groups were believed to pressure hospitals

and clinics to adopt EHR systems, although they may also have influenced physicians' beliefs:

Respondent: ... Leapfrog made recommendations, and I think the hospitals are listening to those recommendations, because they're a powerful group of people ...

Interviewer: Do you feel like they have any impact on your own opinion, or ...

Respondent: I mean, I think that they have some very interesting suggestions. I mean, it's been a while since I've read the information they put out, but, I think it makes me think that some of the stuff that's being implemented is worthwhile.

Physicians perceived social pressure from malpractice carriers, whose ability to defend physicians increased with more legible documentation, and from payers (insurance companies, Centers for Medicare & Medicaid Services [CMS]), who also benefited from clinical documentation that was easier to access, read, and track. Another physician mentioned that CMS and the Joint Commission, an accrediting organization, see *"potentially some of the safety and quality potential of [EHR], and so I think there's strong support."*

Finally, nine physicians believed that *"the government is obviously encouraging this."* The influence of the government, particularly the federal government, was especially salient for physicians at Hospital 2, where interviews took place in January and February 2009, during which time EHR was a key topic for the Obama administration and in debates surrounding the American Recovery and Reinvestment Act, with over \$20 billion eventually allocated to stimulate health IT adoption. As one physician put it, *"Well, I know the Obama administration is very pro-technology, and I know, I believe I read that there was gonna be some push for subsidizing conversion to [EHR]. And so that creates the expectation that we all should go to [EHR]."* Other physicians believed that government support would soon be supplemented by requirements, e.g., *"the Feds are coming after us. #sighs# You know, there are going to be governmental requirements—Feds, state, who knows—for electronic medical records."*

3.7. Personal normative influence

The source of personal normative influence is one's self, although it is shaped by the social groups to which one belongs or has belonged. Personal norms might thus reflect, for example, the internalized opinions of a professional organization or other sources described above. At the same time, because personal norms may be jointly shaped over long periods of time by many social agents and not exclusively professional ones, they may have a unique influence on professionals' use of technology. Personal norms include (a) *moral beliefs*, or ethical positions that motivate a particular behavior and (b) *role beliefs*, or one's perceptions of the behavior appropriate to someone in their role.

Although six physicians reported not having any moral beliefs pertaining to the use of EHR, two others believed that using EHR was a moral obligation and the right thing to do because using EHR improved patient safety and quality of care. In the words of one anesthesiologist:

"Personally, my view of this is that this is the future of medicine. [Not using EHR] would be like saying fifty years ago 'Wow, I'm not really sure I believe in the germ

theory, and this whole thing about antibiotics,' you know, this is where medicine is going. I think that it's an incredibly powerful tool that can tremendously enhance the quality of healthcare in this country."

Another anesthesiologist, however, questioned whether it was always right to computerize certain aspects of care. Other moral reservations about using EHR included the resultant ability to track or monitor physicians' actions; the possibility that an unauthorized individual could access information when a physician stepped away from the computer after logging in; and the possibility of a security breach. In fact, 10 of the 17 physicians who were asked directly about moral norms expressed "*reservations and concerns about ... the ability to safeguard the information,*" particularly that "*somebody could hack in there*" or that "*way too much information collected about way too many people*" could otherwise fall into the wrong hands. At the same time, physicians believed that compared to regular e-mail, EHR enabled a secure portal for sending patients confidential messages and that compared to paper records the EHR better restricted access of patient information to authorized personnel.

With respect to role beliefs, physicians variously identified themselves in personal terms such as a typist; an average system user; a savvy user; an adventuresome computer user; someone who liked computers; and a member of "*the new generation*" of physicians. Mentioned professional identities included a physician; a medical director; a highly paid, highly trained professional; a professional in a complex job; and a member of a professional group resistant to change. Role theory indicates that to the extent that EHR use is a typical behavior for someone in a particular role, a person identifying themselves with that role will be influenced to use EHR. Thus, the respondent self-identifying as a younger, "new generation" physician might have been more compelled to use EHR than his older, more experienced counterparts. A medical director might similarly have been influenced to use EHR extensively to set an example. Physicians who were comfortable with computers in general may have been influenced to fully explore EHR, as expected of "a computer person."

That certain EHR use behaviors are expected of certain roles was made evident by study physicians as they named the characteristics associated with users and non-users of EHR. According to interviewed physicians, the following types of people were more likely to use EHR and to be facile with it: younger people; physicians just starting their practice; those who grew up with computers or used computers in their private lives; people comfortable with computer use; faster typists; people open to change; people with more respect for the team; physicians engaged in quality improvement; physicians in certain specialties (primary care physicians; technology-driven specialties such as radiology, anesthesiology, and orthopedics).

The opposite types (e.g., older, less comfortable with technology, members of certain specialties such as surgery) were perceived by interviewed physicians to be less likely to accept EHR or use EHR effectively. Accordingly, several physicians explained that their self-identified role was incompatible with certain aspects of EHR use, as the following three examples illustrate.

- A cardiologist noted that a physician must “*appear professional*” (a role characteristic) but that the EHR’s template-driven clinical notes give the opposite impression because they are obviously computer-generated. To convince physicians to use EHR would require that the notes “*don’t look like kindergarten output.*”
- An anesthesiologist explained his reservations about learning to type in orders rather than giving them verbally during surgery by stating that he was not an office worker, but rather had a “*clinical-based job ... where you can’t always just hang up the phone and go attend to that task.*”
- Several physicians invoked their roles as highly-paid medical professionals to make the point that direct data entry into the EHR was not a task befitting them (see Holden *in press*), for example, “*you’re taking your highly paid ... physicians who really, I think from a pure business standpoint, their job should be to make medical decisions, not to do data entry*” or “*someone who’s hired to do data entry: big deal. That’s what they’re hired for. That’s what—you’re not hired for that.*” (Many interviewed physicians expressed difficulty taking on a data entry role because of the cognitive demands of data entry including difficulty concurrently entering data and attending to patients [see Holden *in press*].)

4. Discussion

People are social creatures and it is no surprise that IT users are influenced by social forces (Lamb and Kling 2003). Introductory students of HFE are plainly informed that “individual behavior is a function of the social context” (Wickens *et al.* 2003, p.492). In spite of such truisms, HFE research and research on health IT/EHR largely ignore this “pivotal contribution of social agents” (Fulk 1993, p.941). To fill this research gap, the present study elicited information from hospital physicians about the many social and personal normative influences that might shape their EHR use behavior and thus their performance.

Findings revealed largely positive social influence, with only fellow physicians and patients disapproving or discouraging EHR use. The negative influence of fellow physicians cannot be ignored because the close relation and similarity between physician colleagues increase the strength of their social influence (Salancik and Pfeffer 1978). Additionally, “due to specialization and professionalism in the practice of medicine, physicians tend to hold the opinions and suggestions of their peers in high regard” (Yi *et al.* 2006, p.355). Thus, fellow physicians are a powerful referent with whom physicians may be highly motivated to conform or comply. Additionally, psychologists in the 1980’s began to notice that minority opinions can affect one’s attitudes and behaviors, sometimes causing major changes to private attitudes even while public behavior conforms with majority opinion (Wolf 1987). Even if not actively discouraged from using EHR, physicians’ behavior may be otherwise influenced, as posited by theories of informational normative influence, conformity, and social learning (see Section 3.2). With respect to social learning, as the interviews showed, physicians turned to one another for advice on how to use EHR; this accords with others’ findings that new IT applications are associated with informal “over-the-shoulder learning”

(Twidale 2005) and collaborative adaptation of IT (Majchrzak *et al.* 2000). Such co-discovery of IT means that surrounding social agents (e.g., fellow physicians) may greatly shape each others' behavior (Gallivan *et al.* 2005). Yet, seeking the assistance and advice of others, ubiquitous social activities at work (Brown 1986, Wilson *et al.* 2003), are easy to ignore during research or design when the dominant view on computer use is of a "lonely end user laboring in isolation" (Nardi 1993, p.103)

Studies suggest that the "indirect social influence" of associates' opinions and behavior operates by biasing the kind of information people are exposed to (Denrell 2008, Salancik and Pfeffer 1978). For example, if one learns to use EHR from a fellow physician who uses only 10% of EHR functionality, one may come to use only 10% as well due to biased exposure and not necessarily from a desire to gain social recognition. Having supportive peers when using new IT can also decrease anxiety about using IT, thus indirectly encouraging IT use (Thatcher *et al.* 2007).

The scientific literature on IT has well established that people in the workplace—colleagues and supervisors—influence one another's IT use directly and indirectly (Fulk 1993, Gallivan *et al.* 2005, Harrison and Leberge 2002, Jaspersen *et al.* 2006, Venkatesh *et al.* 2003). Although colleagues' influence was well represented in this study, individual supervisors were not often mentioned; instead, physicians were influenced by their employing organizations—hospitals or clinics. Hospital and clinics sought obedience using administrative controls. This is notable because means-control influence, or what some study physicians called "being coerced" or "forced," typically results in only public compliance, or compliant behavior "only under conditions of surveillance by the influencing agent" (Kelman 1958, p.54). Indeed, a recent analysis of two famous organization-wide EHR failures argues that means-control or "hard influence" tactics contributed to those failures by provoking staff resistance (Bartos *et al.* in press). In contrast, when influence is exerted by making credible arguments, it is more likely that one will internalize a positive opinion of the behavior and will behave as the situation dictates, irrespective of surveillance.

Although IT research describes social influence from colleagues and supervisors, it often ignores other intra-organizational sources as well as extra-organizational referents. In contrast, this study identified several influential intra-organizational groups, such as quality improvement committees. This is noteworthy because physicians may feel affiliated with, and thus more influenced by, some groups (e.g., department) but not others (e.g., billing/compliance). Additionally, different groups used different arguments to persuade physicians to use EHR. Physicians who value patient safety and quality of care may be more responsive to groups who promote EHR's safety and quality benefits, which are central to physicians' work, than to groups whose main cause is the hospital's profit or legal protection. Extra-organizational social influences are rarely studied but were numerous in this study. As with intra-organizational groups, physicians may differently affiliate with professional, government, and other agencies and may be more or less persuaded by the different messages conveyed by those groups. It is necessary to further explore how physicians are influenced by those sources, particularly by government, given strong government support and funding for EHR, and the possibility of future legislation related to EHR use. Patients, unique to healthcare, are also not considered in other literature on social influences of IT

use, but they are an important social group around whom healthcare is organized. In the present study, many physicians believed that patients had no opinions about their physicians' EHR use, but whether this reflects a true lack of awareness or inaccurate beliefs on the part of physicians requires further study.

Interviews also revealed personal normative pressures. Personal convictions may override external influences when there is disagreement between the two and thus designers and policy makers must gain awareness of, if not actually shape, moral norms and role beliefs.

Further design and policy guidance can be extracted from the findings. Table 3 presents a partial list.

4.1. Limitations and future directions

In the present study, social influence was measured using physicians' self-reports, a common method for such studies, perhaps because social and personal normative influence is strongest when its targets are aware of it (Cialdini and Goldstein 2004). Nevertheless, using alternative methods will allow researchers to better triangulate the phenomenon of social influence to use EHR and other health IT. One option is to use network analysis methods to determine the individuals with whom IT users closely associate and then to estimate the proportion of variation in IT attitudes and use behavior that can be explained by variation in associates' own attitudes and behavior (Hossain and de Silva 2009, Rice and Aydin 1991). Another option is to extract information on social influence from responses to general questions about performance (Paletz *et al.* 2009).

In general, more in-depth research will be needed to better specify the type of factors in Table 1. As an example, further research can address whether persuasive arguments to use IT are processed by clinicians in deep, systematic ways focusing on argument content or, instead, in more shallow, heuristic ways focusing on surface features such as the length of argument (Chaiken 1980).

Only 20 attending physicians from two hospitals participated in the study, limiting generalization to other physicians or professionals. Further work should collect information on social influence from a large sample across different hospitals, geographic locations, and professions using EHR as well as other IT. Large-sample, quantitative survey studies can also provide information on self-rated strength of social influence and motivation to comply, allowing quantitative comparisons as well as the modeling of relationships between social influence, on the one hand, and attitude, behavior, and performance on the other. It should go without saying that future studies must be designed so that they can capture social phenomena. This means naturalistic studies or studies that to some extent replicate the social context (even the presence of other end users or a way to contact them can make a laboratory-based usability study more realistic).

More work is needed to translate findings of social and personal influence into practice. Starting with the more general recommendations in Table 3, designers and policy makers must develop and test specific interventions for encouraging effective EHR, other health IT, and technology in general. Generating further design implications will require continued

development of HFE theory on social influence. Such theory will need to link the social and personal normative influences identified here with characteristics of the technology design, technology implementation, and the work system that could be targeted for intervention. Using theory for practical design is a hallmark of HFE that cannot be replicated in other disciplines that historically have made more progress understanding the social aspects of IT use. A more developed theory will also need to address complex phenomena, such as whether the actual usability of the technology moderates the differential effects of direct social influence from administration and indirect social influence from colleagues.

Finally, for a more robust social ergonomics, further studies must also address important social phenomena besides social influence, for example studies of how technology transforms social structures (e.g., power) and processes (e.g., communication) (Berg 1999), how experts use social strategies (e.g., help seeking) to deal with technological and non-technological workplace challenges, or how designers' cultural assumptions affect the process and content of design (Forsythe 1996).

5. Conclusion

This study used a comprehensive framework of social and personal normative influence to examine perceived pressure on professionals (physicians) to use technology (EHR). With numerous sources of social and personal influence reported by physicians and great variation in how those sources exert their influence, an expectedly complex picture of socially-constrained health IT use emerges. As IT use comes to be viewed as at least in part a social process occurring in a social context, research inquiry, design, and policy making will need to change accordingly. Importantly, the importance of phenomena such as social and personal normative influence on technology use and computer-supported performance should inspire a more robust social ergonomics—or perhaps, better yet, the reliable incorporation of “the social” into contemporary HFE theory, research, and practice. The way forward will require accepting Moray's argument about the importance of “the social” and rejecting Meister's dismissal of it. However, Moray's and others' view of “the social” as simply a “setting” or context within which phenomena of disciplinary interest take place may be misplaced. Rather, we may consider that social phenomena are potentially central, driving forces in many interactions between a human and the surrounding system. For example, the present study showed that social influence operates through and within co-operation interactions (person-other people), organization interactions (person-structure/policy/roles), logistics interactions (person-supply chain/customer), task interactions (person-task), interface interactions (person-technology), contextual interactions (person-society/finance/politics), and personal interactions (person-self).⁴

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⁴These binary interactions are largely based on Wilson's interacting systems model for ergonomics (see Figure 3 in Wilson 2000) but social mechanisms can be discovered in other person-system interactions (see e.g., Carayon 2006, Karsh *et al.* 2006).

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Table 1

Analytic framework of social and personal normative influences on IT use.

Source of influence	
•	Sources external to the clinician are called <i>referents</i> (also, “important others” or “influence agents”).
•	Numerous referents may exert an influence on a clinician’s IT use.
•	Referents may be <i>individuals</i> , <i>groups</i> , or <i>organizations</i> .
•	The source of personal normative influence is internal (i.e., the “self”), although personal norms are shaped by one’s social surroundings.
Direction	
•	Social and personal influence may <i>encourage or discourage</i> clinicians’ use of IT.
Relation	
•	Social relations exist between and within entities at several levels, e.g., dyads, triads, nominal groups, permanent or ad-hoc teams, organizations, communities, large social networks, etc.
•	Referents may or may not belong to a clinician’s social groups/networks (e.g., profession, specialty, organizational rank); similarly, a clinician may or may not <i>identify</i> with the referent group(s).
•	Referents may be individuals with whom a clinician interacts (<i>relational partners</i>) or they may hold a similar, parallel position as the clinician, without much interaction (<i>structurally equivalent partners</i>).
•	Clinicians will have different levels of <i>motivation to comply</i> with different referents.
•	Referents may vary in the amount of <i>social impact</i> they have, based on, for example, the <i>strength</i> of the referent (e.g., credibility as an expert, power, social status) or of the ties between referent and clinician.
Communication channel/network	
•	Referents can use various channels by which to communicate persuasive messages or directives (e.g., informal conversations, official memos, electronic campaigns) or to demonstrate behavioral norms (e.g., public use of IT by referents).
Means of influence / psychological processes	
•	Referents may use persuasive arguments to request or urge clinicians to use IT, seeking <i>compliance</i> (or “acquiescence”). Arguments may vary in content (e.g., the mentioned benefits of using IT). Although clinicians may deeply process arguments, they may also be persuaded by superficial or “distal persuasion cues” (e.g., length of argument, likeability of referent).
•	Referents may have indirect influence by establishing <i>norms</i> for what is typically approved (<i>injunctive norms</i>) and what is typically done (<i>descriptive norms</i>), to which clinicians may <i>conform</i> by engaging in norm-congruent behavior.
•	Clinicians may comply or conform (1) to gain social approval or avoid disapproval (<i>public compliance/conformity</i>), or (2) because they interpret others’ beliefs and behaviors as useful information on how to behave in ambiguous situations (<i>private compliance/conformity</i> or <i>private acceptance</i>). In the case of private acceptance, it can be said that clinicians have <i>internalized</i> the beliefs of those around them.
•	Clinicians who repeatedly observe the behavioral patterns of those around them may <i>learn vicariously</i> and <i>model</i> (or else avoid) those patterns, deliberately or not.
•	Referents in a position of power may give orders or use other forms of behavioral control (e.g., reducing alternatives, enacting rules), seeking <i>obedience</i> .
•	Clinicians may have long-held or invariant personal convictions or <i>moral norms</i> that guide their behavior.
•	Clinicians may have <i>role beliefs</i> about how someone in their position should act. Using or not using IT may be characteristic of this self-defined role. A clinician may therefore use or not use IT to conform to one’s self-defined role or status level and to portray a public <i>image</i> of belonging to that role/status.
•	Clinicians also make <i>self-inferences</i> about their own behavior, for example attributing past IT use to pro-IT attitudes. In this way, continued IT use might be motivated by a desire to be consistent with inferred personal attitudes and with prior behavior.

Source: Adapted from Bandura 1977, Cialdini and Goldstein 2004, Cialdini and Trost 1998, Deutsch and Gerard 1955, Fishbein and Ajzen 1975, Fulk 1993, Kelman 1958, Manstead 2000, Merton 1957, Petty and Cacioppo 1986, Rogers 1995, Salancik and Pfeffer 1978, Schwartz 1977, Triandis 1977, Zanna *et al.* 1987.

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Table 2

Social and personal normative influences on physicians to use electronic health records (EHR).^{*}

Source of influence	Direction of influence	Social relation to physician	Means of influence/ psychological processes
<i>Social normative influence (from others)</i>			
Hospital/clinic administration	Encouraged	Weak affiliation, high motivation to comply	Administrative controls, obedience to injunctive norms
Fellow physicians	Encouraged, sometimes discouraged	Strong affiliation, high motivation to comply	Indirect social influence: informational social influence, conformity to descriptive norms, social learning
Patients	Encouraged, sometimes discouraged	Strong affiliation, high motivation to comply	Persuasion, compliance
Intra-organizational clinical groups	Encouraged	Varying affiliation strength and motivation to comply (group-dependent)	Conformity to injunctive and descriptive norms, compliance
Extra-organizational professional groups	Encouraged	Varying affiliation strength and motivation to comply (group-dependent)	Conformity to injunctive and descriptive norms, compliance
Extra-organizational advocacy, legal, and regulatory groups	Encouraged	Varying affiliation strength and motivation to comply (group-dependent)	Obedience, conformity to injunctive norms
<i>Personal normative influence (from self)</i>			
Moral norms	Both encouraged and discouraged	--	Aligning beliefs and behavior to personal convictions
Role beliefs	Both encouraged and discouraged	--	Matching own beliefs and behaviors to those expected of one's role

^{*} Communication channel/network and nature of persuasive messages not depicted because of insufficient data about this dimension for some sources of influence.

Table3

Select design and policy implications/recommendations based on study findings.

Goal 1. To promote EHR use:

- Promote physicians' internalization of positive attitudes toward EHR use.
 - Respected organizational leaders should visibly promote EHR use.
 - Organization administrations should promote EHR use in other ways besides through administrative controls.
 - Well-respected physician colleagues should promote the use of EHR through both formal and informal channels using arguments that are important to physicians.
 - Intra- and extra-organizational entities should understand the outcomes important to physicians and demonstrate to physicians how EHR use will improve those outcomes
 - Promote physician awareness of existing social pressure to use EHR (e.g., determine and disseminate patients' opinions about their physicians' EHR use).
 - Promote social learning to use EHR in effective ways.
 - Physicians should be exposed to the use of EHR by highly competent users and EHR champions.
 - A forum should be available in which colleagues can share tips and mutually co-discover effective ways to use EHR.
 - Maladaptive EHR use behaviors should not be visible and should be quickly corrected if they are occurring.
 - Promote personal norms compatible with EHR use.
 - Be aware of the roles with which physicians self-identify.
 - Arguments for EHR use and requested EHR use behaviors should not be in conflict with strong personal norms.
 - Redefine expected behaviors for roles (e.g., define data entry as an important communication behavior for all physicians not a "data entry specialist behavior"). (However, normative roles should not solely define how EHR should be used.)
 - Diffuse existing negative opinions about EHR use
 - Consider existing negative arguments about EHR use and address them (e.g., perceived usability problems should be addressed through redesign). Negative opinions may provide insight into redesign needs.
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Goal 2. To improve design of EHR and support physician's cognitive work performance

(Holden *in press*):

- This goal is partly independent of social and personal normative influence. Although not implicated by the present study, design and policy must promote this goal in addition to others.
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