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Review

Review

Developing an evidence base of best practices for integrating computerized systems into the exam room: a systematic review

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ABSTRACT

Objective: The introduction of health information technology systems, electronic health records in particular, is changing the nature of how clinicians interact with patients. Lack of knowledge remains on how best to integrate such systems in the exam room. The purpose of this systematic review was to (1) distill "best" behavioral and communication practices recommended in the literature for clinicians when interacting with patients in the presence of computerized systems during a clinical encounter, (2) weigh the evidence of each recommendation, and (3) rank evidence-based recommendations for electronic health record communication training initiatives for clinicians.

Methods: We conducted a literature search of 6 databases, resulting in 52 articles included in the analysis. We extracted information such as study setting, research design, sample, findings, and implications. Recommendations were distilled based on consistent support for behavioral and communication practices across studies.

Results: Eight behavioral and communication practices received strong support of evidence in the literature and included specific aspects of using computerized systems to facilitate conversation and transparency in the exam room, such as spatial (re)organization of the exam room, maintaining nonverbal communication, and specific techniques that integrate the computerized system into the visit and engage the patient. Four practices, although patient-centered, have received insufficient evidence to date.

Discussion and Conclusion: We developed an evidence base of best practices for clinicians to maintain patient-centered communications in the presence of computerized systems in the exam room. Further work includes development and empirical evaluation of evidence-based guidelines to better integrate computerized systems into clinical care.

Key words: electronic health records, patient-clinician communication, health information technology, evidence-base

BACKGROUND AND SIGNIFICANCE

A large body of literature has demonstrated interpersonal communication is central to patient-centered care and has a direct impact on care processes and outcomes.[1] Effective interpersonal communication between clinicians and patients is essential to informed decision making and to the collection of additional psychosocial information including social context, values, preferences, and issues specific to complex disease management. High-quality communication has also demonstrated improvements in patient satisfaction, psychosocial functioning, and patient outcomes for a wide range of chronic conditions.[1]

The introduction of health information technology systems, electronic health records (EHRs) in particular, is changing the nature of how clinicians interact with patients.[2,3] EHRs are increasingly infiltrating clinical practice in the United States due to recent legislation requiring all public and private health care providers and other eligible professionals to adopt and demonstrate "meaningful use" of EHRs.[4,5] As of 2015, 56% of all office-based physicians and 95% of all eligible and critical access hospitals have demonstrated meaningful use of certified health information technology through participation in the Centers for Medicare and Medicaid Services EHR Incentive Programs.[6]

Five review articles published over the past decade have provided some support for the fact that use of computerized systems during patient encounters can significantly interfere with the direction of communication, the interpersonal aspects of patient–clinician relationships, trust, and the sense of partnership between the 2.[2,7–10] Examples of such detrimental effects include loss of eye contact, excessive amounts of gaze on the computer screen, and cognitive interruptions due to needing to collect larger volumes of data that may not be pertinent to the present visit. It has also been reported that as a result of EHR adoption, professional dissatisfaction is on the rise, and nearly half of a clinician's time during a patient's clinic visit is now being devoted to "clerical work" of limited direct value to the patient.[11,12]

Newly implemented health information technology applications such as EHR are not always seamlessly integrated within existing clinical environments, resulting in inefficiencies and workarounds.[13] Over the past decade, many recommendations have been offered in the literature on better incorporating EHR into clinical encounters while maintaining a patient-centered approach.[7,9] Examples of such recommendations include repositioning of the computer in an exam room, sequencing of communications to ensure adequate eye contact and interactions, and explanations of how and why the clinician is attending to computerized information.[2,14,15] To date, only a few attempts have been made to synthesize this body of work.[2,7,9] These include Duke et al.,[7] which tried to incorporate the attributes of patient-centered care into a skills-based model to integrate the use of EHRs in a patient-centered manner, and 2 reviews conducted by Shachak and colleagues[2,9] to provide a qualitative assessment of strategies and techniques employed by clinicians described in the literature to maintain rapport.

Gaps in the literature remain with respect to whether existing recommendations are adequate to strengthen the clinician–patient relationship and subsequently improve patient health outcomes. Prior reviews predominantly focus on the impact of EHR use on patient-centered communication and less so on examining the body of work that develops and evaluates solutions.[2,7] While Crampton and colleagues[9] recently reviewed strategies and techniques adopted by clinicians to ease use of computers in clinical encounters, their effort did not attempt to produce a list of actionable recommendations that could help to mitigate the impact. Thus, we believe that there have been no studies directly examining the evidence base for best practices on seamlessly integrating EHR in the exam room in a manner that preserves patient-centered communication by minimizing disruptions due to computer use and leveraging EHR as a tool to facilitate conversation. Such evidence could provide a practical guidebook on how best to accommodate computerized systems in the exam room and strengthen clinician-training initiatives on EHR use.

Through a literature review, the purpose of this study was to (1) distill "best" behavioral and communication practices recommended for clinicians when interacting with patients in the presence of computerized systems during a clinical encounter, (2) weigh the evidence of each recommendation based on the Levels of Evidence Pyramid that provides for both the quality and amount of evidence available[16], and (3) rank evidence-based recommendations for EHR communication training initiatives for clinicians. The evidence base derived, based on strength of empirical support in the literature, represents current best known practices for incorporating computerized systems such as EHR in the exam room. This study was part of a larger project supported by the Agency for Healthcare Research and Quality to develop and evaluate an interactive training intervention teaching clinicians best practices for communicating with patients in the presence of computerized systems in the exam room.

METHODS

Data sources and search strategy

A systematic search of the literature through July 2015 was performed using several databases including PubMed, Scopus, Cumulative Index of Nursing and Allied Health Literature (CINAHL), Engineering Index, Institute of Electrical and Electronics Engineers (IEEE) Xplore, and Association of Computing Machinery (ACM) Digital Library. The search strategy included search queries with a Boolean combination of Medical subject heading (MeSH) terms such as patient–physician communication and practices, EHR, and patient room setting, customized for each literature database (see Supplementary Appendix 1). Only English, full-text articles were selected for further review. The literature search was performed by a trained research assistant (JV) in consultation with health sciences and engineering librarians, where they refined search queries, screened titles, and retrieved abstracts for potentially eligible studies. Reference lists of selected papers were further examined to identify other relevant articles.

Inclusion criteria

In order to select relevant studies, we established the following inclusion criteria: (1) the study must involve or discuss an interaction or communication between a patient and physician or other health care provider, (2) the observation must take place in an exam room, (3) the study must involve the use of a computerized system during the interaction, and (4) the study must include a focus on behavioral or communication strategies to facilitate patient-centered communication. Studies not meeting these criteria were excluded.

Data extraction and analysis

Abstracts of all papers identified from the literature search were independently read and assessed by 2 reviewers (MP, KZ). In the absence of an abstract, full-text papers were retrieved and reviewed. Agreement between the 2 reviewers was assessed for each article, and was initially 48%. Most of the disagreements were whether a study truly qualified as an empirical study, or whether the setting in which a study took place was truly exam rooms. Discrepancies were resolved through group discussions with both reviewers and further examination of the study. Agreement was brought to 100% through this process.

The literature search and screening processes were managed in RefWorks (ProQuest, Ann Arbor, Michigan, USA). Two individuals (IL, JL) abstracted information from the final set of articles that met inclusion criteria, including study setting, research design (e.g., sam-

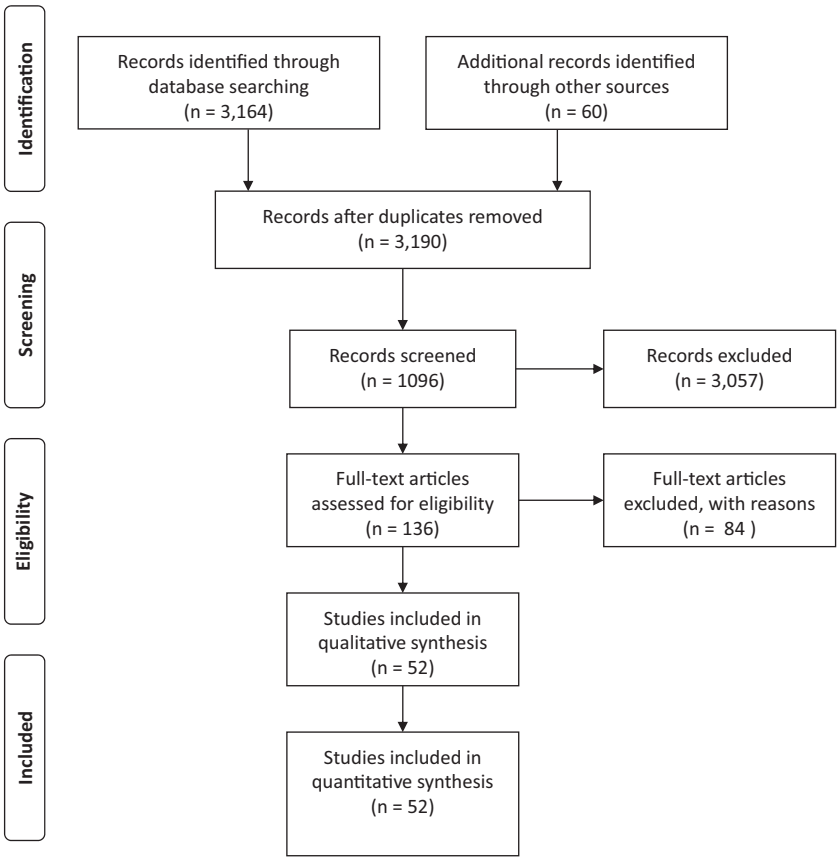

Figure 1. Literature search and screening processes.

ple, outcome measures, data collection methods), and findings related to the effects of behavioral and communication techniques with patients in the presence of computerized systems in the exam room. Due to the heterogeneity of study designs evident in the articles meeting inclusion criteria, extracted evidence also included descriptive information, expert opinion, and significant associations reported with patient-centered outcomes. Expert opinion papers included provided stand-alone information that did not critique studies already included in the review.

Recommendations were distilled based on consistent support for behavioral and communication practices across studies. We defined a practice as receiving strong support from the literature if it had been studied and recommended in more than 10 papers, among which at least 5 were observational studies or randomized controlled trials. Practices that did not meet this criterion were deemed as receiving weak support from the literature at the time when this review was conducted.

RESULTS

Figure 1 shows the PRISMA diagram describing the literature search and screening processes. Of the 3190 articles that resulted from the literature search, 1096 were considered relevant based on the title, of which 136 full articles were retrieved and reviewed based on relevance obtained from the abstract. If the abstracts did not make relevance clear, the full-text article was always pulled. Of the 136 full articles reviewed, 52 articles met the inclusion criteria. A detailed summary of each of these 52 articles is provided in Supplementary Appendix 2.

General trends

The majority of the studies reported in these articles were empirical investigations,[3,17–60] except for 7 opinion pieces.[14,61–66] Most of the empirical studies were conducted in the United States (n = 26),[19–24,27,29–34,35,40–42,45,48–50,52–55] followed by Commonwealth countries (n=14)[17,25,26,28,36,38,43,44,46,47,51,56,58,59] and the Middle East (n = 4).[18,37,39,57] These empirical studies covered a variety of health care settings, including large health systems (n = 2),[17,34] regional hospitals (n = 3),[21,26,37] primary care clinics (n = 30),[3,18–20,23,24,27–31,33,35,38–40,42–44,46–49,51,53–55,57–59] a specialty clinic,[25] a surgical clinic,[36] Veterans Affairs settings (n = 3),[32,41,50] in addition to 3 studies conducted in simulated laboratory settings (n = 3).[22,45,52]

The majority of these empirical studies used qualitative methods (n = 29),[3,17,18,20–25,27–29,32,35,36,39,41–44,46–48,51,53,56–59] followed by mixed methods (n = 8),[26,30,31,33,34,45,50,54] cross-sectional surveys (n = 4),[37,38,40,49] and randomized controlled trials (n = 3).[19,52,55] Computing devices studied included stationary computer workstations (n = 29),[3,17,19,20,23–25,28,29,31,32,34–36,38,39,41–47,50,51,54,56,58,59] computers on wheels (n = 2),[22,27] digital assistants (n = 2),[21,40] iPads,[26] or unspecified technology (n = 9).[18,30,33,37,48,49,52–55] Nineteen of these studies focused on EHRs,[17,18,22,23,29,30,33,37,39,41–42,48,50,52,53,55,57] and the remaining studies involved other types of computerized systems (e.g., order entry and decision support) or did not explicitly specify EHRs.

Over time, this body of literature has evolved from a focus on the general presence of computerized systems in the exam room to specific behaviors and contexts that shape communication and behavior with patients. There has also been an evolution of study design from qualitative to more quantitative approaches to quantify

the impact of computerized systems on communication, and greater ability to generalize findings as a result.

Recommended behavioral and communication practices

The results of our analysis show that a total of 12 distinct behavioral and communication practices have been studied and recommended in the literature for promoting clinician–patient interaction in the presence of computerized systems in the exam room. These include strategies that consider spatial (re)organization of the exam room, maintaining nonverbal communication, and specific techniques that integrate the computerized system into the visit and engage the patient. These 12 recommended practices are listed in Table 1.

For each practice, we assessed the strength of evidence based on the total number of supporting studies as well as the nature of the studies (controlled trials vs observational studies vs expert opinion, with descending levels of support). The results are visualized in Table 1 using a heat map, with darker red colors indicating strong support, yellows indicating moderate support, and darker green colors indicating weak support.

Of the 12 recommended behavioral and communication practices, the following received strong support of evidence in the literature, ranked from most to least amount of evidence available for each strategy: (1) using the computer to facilitate conversation, (2) adjusting room design, (3) maintaining eye contact with the patient while typing, (4) separating typing and patient interaction, (5) talking to the patient while gazing at the computer, (6) using a postural style that allows the clinician to face the patient most of the time, (7) inviting the patient to look at the screen before the patient asks, and (8) informing the patient about the functions and role of the computer. Each of these 8 practices has been studied and recommended in more than 10 studies, among which more than 5 are observational studies or randomized controlled trials. Five other practices have also been discussed in the literature but the empirical evidence supporting them is still insufficient: (9) greeting the patient and accompanying companions before beginning the interaction, (10) telling the patient the purpose of logging off/securing the computer is for his/her privacy, (11) reviewing the visit with the patient after finishing with the computer, and (12) using other aids for documentation purposes (e.g., clinic staff, transcriptionist). Below, we describe each of these strategies in detail.

Using the computer to facilitate conversation

Twenty-two studies support the strategic use of information in the computer to facilitate conversation during clinical encounters.[14,18–23,26,27,29,36,44,45,47,48,51,52,56,62–65] Experts have elaborated on a number of benefits from this practice. First, it provides an opportunity to interact and share decisions with patients.[14,23,26,27,29,44,51,56,62,63,65] Second, it allows patients to better understand trends in their health using data that could be readily visualized.[18,22,36,45,47,65] Third, it also confirms that the chart reflects the patient's own understanding of what happened during the visit,[29,47,48,64] and lets the patient know the provider is aware of his/her health.[18,21,22] Observational work with videotaped consultations has shown that computerized systems in the exam room can be used as an effective tool to guide the conversation.[20] This finding was further confirmed by 2 randomized controlled trials examining physician use of EHR systems.[19,52]

Adjusting room design

Seventeen studies provide support for adopting a flexible room design to accommodate computerized systems in the exam room.[3,14,17–19,25,27,31,34,36,48,51,52,54,57,59,61] On the one hand, research evidence from the literature supports the notion that poor room design can have significant adverse impact on communication, the clinician–patient relationship, and workflow.[3,31,34,52] For example, in a longitudinal study using videotapes of primary care visits, Frankel and colleagues[3] observed that the awkward physical placement of computers in the clinic made communication particularly challenging, as clinicians had to sit with their backs to the patients. On the other hand, ensuring the mobility of the computer screen so that it could be readily shared with both the clinician and patient has been shown to facilitate direct interaction with the patient and engender a more interpersonal communication style.[17–19,25,27,36,48,51,54,57,59] For example, in a randomized controlled trial, Almquist et al.[19] showed that, compared to controls in a standard room, an experimental group of patients who had their exam room configured so that the computer monitor could be shared with the patient demonstrated improved decision making and greater patient satisfaction. Recommended practices therefore include arranging the computer so that the patient can simultaneously view the record, and using mobile computers and/or devices that allow for easy repositioning of the screen.[14,61] Adjustable and moveable furniture can also help to orient the room layout to be more patient-centered.

Maintaining eye contact with the patient while typing

Sixteen studies provide support for the importance of maintaining eye contact with the patient especially while typing.[3,17,23,27–29,32,35,37,39,41,42,50,52,54,57] Studies with videotaped observations and physician and patient interviews have revealed that physicians are fully aware that maintaining eye contact is an essential part of communication,[3,17,23,27–29,32,35,54,57] and that breaks in eye contact can be inversely related to the use of psychosocial questions, emotional exchange,[39,52] and the normal flow of interpersonal communication.[41] Several studies have also demonstrated that maintaining eye contact with the patient is associated with higher levels of patient satisfaction.[37,42,50,51]

Separating typing and patient interaction

Fifteen studies support the practice of separating typing from patient interaction whenever possible,[3,14,17,18,23,24,27,28,30,42,44,48,55,57,66] or interacting with the computer through brief, short typing sessions.[42] Studies with videotaped observations and physician and patient interviews have revealed that separating typing and patient interaction is preferred to minimize negative effects on communication.[17,18,23,28,30,48,55,57] Five studies provided direct empirical evidence confirming the benefits of this practice.[3,24,27,42,44] For example, Chen et al.[27] and Pearce et al.[44] both found that patients viewed the interaction with the physician as the most important element in the encounter, and they often felt uncomfortable when physicians exclusively focused on the computer during periods when they needed to type. While it can be difficult to implement, this practice has been shown to be very effective in maintaining patient centeredness during the clinic visit.[24]

Talking to the patient while gazing at the computer

Twelve studies encourage clinicians to continue the conversation with the patient while using the computer.[3,18,24,26,28,34,41–43,48,50,63] Several of these studies show that a simple yet effective strategy is to

Table 1. Evidence base for recommended behavioral and communication practices for integrating computerized systems into the exam room.

Recommended practice	Total number of supporting studies	Randomized controlled trials	Observational studies	Expert opinion	Citations
A. Practices receiving strong support in the literature					
1. Using the computer to facilitate conversation Invite the patient's thoughts Let patient know you are aware of his/her health care Share decisions with the patient, for example, pharmacy choice Talk to the patient about the information you are viewing and how that fits with your understanding and the patient's understanding	22	2	15	5	Ventres et al.,[14] Al Alawi et al.,[18] Almquist et al.,[19] Als et al.,[20] Alsos et al.,[21,22] Anderson et al.,[23] Baysari et al.,[26] Chen et al.,[27] Doyle et al.,[29] Kumarapeli et al.,[36] Pearce et al.,[44] Piper et al.,[45] Ridsdale et al.,[47] Shield et al.[48] Swinglehurst et al.,[51] Taft et al.,[52] Pearce et al.,[56] Baum et al.,[62] Gaffey et al.,[63] Nusbaum et al.,[64] White et al.[65]
2. Adjusting room design Desk surface is a shared space for clinician and patient Adjustable chairs arrange the screen so patient can view the record	17	2	13	2	Frankel et al.,[3] Ventres et al.,[14] Adams et al.,[17] Al Alawi et al.,[18] Almquist et al.,[19] Barker et al.,[25] Chen et al.,[27] Fonville et al.,[31] Gadd et al.,[34] Kumarapeli et al.,[36] Shield et al.,[48] Swinglehurst et al.,[51] Taft et al.,[52] Ventres et al.,[54] Shachak et al.,[57] Pearce et al.,[59] Baker et al.[61]
3. Maintaining eye contact with the patient while typing	16	1	14	1	Frankel et al.,[3] Adams et al.,[17] Anderson et al.,[23] Chen et al.,[27] Dowell et al.,[28] Doyle et al.,[29] Frankel et al.,[32] Gibson et al.,[35] Kushnir et al.,[37] Margalit et al.,[39] McGrath et al.,[41] Montague and Asan,[42] Street et al.,[50] Taft et al.,[52] Ventres et al.,[54] Shachak et al.[57]
4. Separating typing and patient interaction Interact with EHR through brief, short typing sessions focusing solely on the EHR When speaking to patients, stop typing and focus on the patient	15	1	12	1	Frankel et al.,[3] Ventres et al.,[14] Adams et al.,[17] Al Alawi et al.,[18] Anderson et al.,[23] Asan et al.,[24] Chen et al.,[27] Dowell et al.,[28] Fiks et al.,[30] Montague and Asan,[42] Pearce et al.,[44] Shield et al.,[48] Wager et al.,[55] Shachak et al.,[57] Booth et al.[66]
5. Talking to the patient while gazing at the computer Use verbal and nonverbal backchannels such as affirmative speech (e.g., "ok," "I see," "mm-hmm"), and nodding Ask the patient's permission to type notes as you talk	12	0	11	1	Frankel et al.,[3] Al Alawi et al.,[18] Asan et al.,[24] Baysari et al.,[26] Dowell et al.,[28] Gadd et al.,[34] McGrath et al.,[41] Montague and Asan,[42] Newman et al.,[43] Shield et al.,[48] Street et al.,[50] Gaffrey et al.[63]
6. Using a postural style that allows the clinician to face the patient most of the time	12	1	7	4	Frankel et al.,[3] Anderson et al.,[23] Asan et al.,[24] Doyle et al.,[29] Frankel et al.,[32] Gibson et al.,[35] Rhodes et al.,[46] Swinglehurst et al.,[51] Theadom et al.,[53] Ventres et al.,[54] Pearce et al.,[58] White et al.[65]
7. Inviting the patient to look at the screen before the patient asks Invite the patient to view data on screen	11	1	7	3	Ventres et al.,[14] Adams et al.,[17] Al Alawi et al.,[18] Almquist et al.,[19] Als et al.,[20] Anderson et al.,[23] Chen et al.,[27] Shield et al.,[48] Baker et al.,[61] Gaffrey et al.,[63] White et al.[65]
8. Informing the patient about the functions and role of the computer Make a brief statement about the reason the computer is in the exam room (to help access medical records and results during visit) Introduce the computer to the patient and tell the patient what you are doing on the computer	11	1	7	3	Ventres et al.,[14] Al Alawi et al.,[18] Als et al.,[20] Anderson et al.,[23] Barker et al.,[25] Gibson et al.,[35] McCord et al.,[40] Wager et al.,[55] Pearce et al.,[56] Baker et al.,[61] Baum et al.[62]
9. Greeting the patient and accompanying companions before beginning the interaction	7	0	5	2	Ventres et al.,[14] Anderson et al.,[23] Pearce et al.,[44] Strayer et al.,[49] Swinglehurst et al.,[51] Pearce et al.,[56] Baker et al.[61]
10. Telling the patient the purpose of logging off/securing computer is for his/her privacy	4	0	4	0	Gadd et al.,[34] Leveille et al.,[38] Ridsdale et al.,[47] Ventres et al.[54]
11. Reviewing the visit with the patient after finishing with the computer	3	0	0	3	Baker et al.,[61] Baum et al.,[62] Nusbaum et al.[64]
12. Using other aids for typing purposes (e.g., clinic staff, transcriptionist)	2	0	2	0	Asan et al.,[24] Montague and Asan[42]

use affirmative speech (e.g., "ok," "I see," "hmm"), and nodding while interacting with the computer[3,24,28] so that the patient would not feel neglected.[18,34] Outcome data also support this practice. For example, Street et al.[50] found that a higher percentage of silent time was significantly associated with lower ratings of patient-centered communication, and Montague and Asan[42] showed that patients reported higher levels of satisfaction when their physicians talked to them when using the EHR.

Using a postural style that allows the clinician to face the patient most of the time

Related to adjusting room design, 12 studies support using a postural style that allows the clinician to face the patient for most of the visit in order to communicate patient-centered body language.[3,23,24,29,32,35,46,51,53,54,59,65] In several studies, researchers found that clinicians who were able to maintain positive nonverbal behavior and/or an interpersonal style of interaction tended to position both their head and torso toward the patient while interacting with the computer.[3,23,24,32,46,51,53,54] In another study of video-recorded simulated physician–patient interactions, Gibson et al.[35] observed that physicians who faced the patient while using the computer generated greater patient reciprocations in terms of conversation. Similarly, through a series of semistructured interviews with physicians, Doyle et al.[29] reported that physicians found it easier to maintain eye contact with the patient by appropriately positioning themselves toward the patient, especially in the context of using EHRs in the exam room.

Inviting the patient to look at the screen before the patient asks

Eleven studies provide support for inviting the patient to look at the screen with the health care provider before the patient asks.[14,17–20,23,27,48,61,63,65] This practice has been shown to encourage patient participation in building their medical chart[14,17,18,23] in addition to avoiding periods of silence and promoting patient activation.[48,61,63,65] In a study of videotaped consultations with follow-up patient surveys, patients reported that they wished to, but thought they were not allowed to look at the screen while GP was using it,[20] suggesting that it is a good practice for health care providers to initiate an offer to share the screen with the patient. In other studies, researchers found positive feedback when physicians swung the computer screen to the patient's view to invite the patient to work through the medical record with them,[27] and patients reported that they greatly appreciated this practice.[19]

Informing the patient about the functions and role of the computer

Eleven studies provide support for providing patients information about the functions and role of the computer.[14,18,20,23,25,35,40,55,56,61,62] Recommendations also include explaining to the patient what needs to be done on the computer and why it is essential to patient care.[14,18,23,25,55,61,62] For example, in 3 qualitative studies of videotaped consultations of physician–patient interactions, it was observed that physicians who explained that they were consulting the EHR had interactions of greater patient engagement,[35,56] and patients often asked what the computer was being used for.[20] Further, in a survey study regarding patients' perceptions of physician PDA use, McCord et al.[40] found that physician communication was rated more favorably by the patient if the physician explained the purpose of using the device.

Recommended behavioral and communication practices receiving weak support

The literature has also provided support of 4 other behavioral and communication practices that generally align with patient-centered communication, but the empirical evidence supporting their efficacy is currently lacking. These practices include: (1) greeting the patient and accompanying companions before beginning the interaction, (2) telling the patient the purpose of logging off/securing computer is for his/her privacy, (3) reviewing the visit with the patient after finishing with the computer, and (4) using other aids for documentation purposes (e.g., clinic staff, transcriptionist).

Seven observational studies and expert opinion papers included in our review provide support for greeting the patient and accompanying companions before beginning the interaction or before turning to the computer.[14,23,44,49,51,56,61] Four studies suggest that it would be beneficial to inform the patient that logging off or securing the computer is an important practice to assure the privacy of their information.[34,38,47,54] Although no empirical evidence associated with patient outcomes has been reported, 3 expert opinion papers recommend reviewing the visit with the patient after finishing using the EHR.[61,62,64]

While using other aids for documentation purposes such as clinic staff, transcriptionists, medical scribes, or dictation tools has become increasingly popular, only 2 studies that we reviewed provide direct empirical evidence supporting the benefits of this practice. In a mixed methods study of videotaped observations in primary care clinics, Asan et al.[24] found that physicians who were able to maintain positive nonverbal behaviors during the clinic visit were those who used aids to help manage data entry such as nurse scribes or voice dictation. Similarly, in another observational study of videotaped encounters, Montague and Asan[42] found that patients reported higher levels of satisfaction with physicians who used aids to facilitate data entry.

DISCUSSION

EHR use is rapidly increasing. The Meaningful Use clause of the 2009 American Reinvestment & Recovery Act was developed with the intent to better engage with a more modern infrastructure for health care delivery through computerized systems. In order to be eligible for an EHR Medicare incentive program, the clause urges eligible providers and care delivery systems to use certified EHR in a meaningful manner to improve quality of care and patient safety, engage patients and families, and improve population health outcomes.[67] Meaningful Use has been rolled out through a phased approach; however, meeting its criteria is extremely complex and difficult for clinicians when little is known about the evidence base for best practices to accommodate the presence of computerized systems in the exam room. It is not surprising that there have been studies suggesting quality of patient-centered communication is affected and professional dissatisfaction among clinicians is on the rise.[2,7,9,12,68]

Our review of the literature confirms findings from prior reviews[2,7–10] in several ways: (1) when used improperly, computerized systems could interfere with patient-centered interactions, and (2) behavioral and communication practices employed by clinicians to maintain rapport and patient-centered interactions have been increasingly described in the literature. We expand a first attempt to consolidate the literature on strategies and techniques to maintain patient-centeredness in computerized clinical settings put forth recently by Crampton and colleagues.[9] Compared with prior reviews, this study fills a critical gap in the literature by exclusively examining the evidence for specific, practical strategies for

seamlessly integrating computerized systems such as EHRs in the exam room. Our findings confirm the use of practical strategies for good computer use habits posed by mnemonics developed by experts and delivery organizations, such as Prepare, Orient, Information gathering, Share, Educate, Debrief and Let the patient look on, Eye contact, Value the computer, Explain what you are doing, Log off.[69,70] Our findings also provide the basis for developing an evidence-based practical guidebook for clinicians, health care delivery systems, and EHR training initiatives.

Our analysis of the literature reveals that using computerized systems while interacting with a patient can be made easier when the focal point of the visit remains on patient engagement; use of the computer, especially for entering data, should be considered a secondary objective. That said, when used properly, the computer can also be turned into an effective tool for enhancing patient engagement. Several behavioral and communication practices shown to be effective in improving patient-centered outcomes include ones that bring the patient directly into the interaction between the clinician and the computer; e.g., using the computer to facilitate conversation and adjusting room design to allow the patient to view the computer screen alongside the clinician.

These 2 practices received the strongest support from the literature. They enable clinicians to more effectively invite the patient's thoughts, explain complex decision rationales, and promote the patient's understanding of his/her own health—all forms of shared decision making. Shared decision making has been advocated by both the Institute of Medicine and the US Preventative Services Task Force as key to ensuring patient centeredness of care.[71] Such practices turn the computer, which is perceived by many as a barrier to effective patient–provider communication, into a valuable tool for achieving better affective-cognitive outcomes such as improved satisfaction and less decisional conflict among patients.[72]

It should be noted that while conducive to sharing information and decision making with patients, adjusting room design to promote collaboration between patients and providers may not be a feasible reality for some health care systems and practice settings. For example, the architecture of the room (e.g., size, layout) may make it practically impossible for the provider and the patient to both see a computer screen. Further, other recommendations distilled from this review may also be difficult to enact as a result of the design of the room. Future work is therefore needed in examining recommended behavioral and communication practices and how they can be tailored to various practice settings where changing the existing architecture may not be immediately realized.

There are limitations to the evidence base developed as a result of this review that provide important next steps for research. First, some of these recommendations may not be applicable based on the environment or culture of the practice. Second, we found that relevant studies providing evidence to support these behavioral and communication techniques are few, and the level of evidence is largely limited to observational studies and expert opinion due to the infancy of the research in this area. A next step for research is continuing to build the evidence base using more rigorous, controlled trials that can test the impact of each of these recommendations on patient-centered outcomes, including affective-cognitive outcomes and health status.

CONCLUSION

In this paper, we report a systematic review conducted as a step toward developing an evidence-based practical guidebook for clinicians, health care systems, and EHR training initiatives on specific techniques for maintaining patient-centered communications while accommodating the presence of computerized systems in the exam room. The review identified a total of 12 recommendations that have been discussed and validated in the literature to varying degrees. Further work is needed to continue to build the evidence base for solutions and to test the solutions using more rigorous research designs in order to better assist EHR training initiatives.

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COMPETING INTERESTS

The authors have no competing interests to declare.

CONTRIBUTORS

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SUPPLEMENTARY MATERIAL

Supplementary material is available at *Journal of the American Medical Informatics Association* online.

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