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Field Investigation of Ambulatory Clinic Exam Room Design with respect to Computing Devices: A Pilot Study

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Abstract

The Department of Veterans Affairs (VA) has developed a new exam room design standard that is intended to facilitate a greater degree of patient centeredness. This new design includes a wall-mounted monitor on an armature system and a moveable table workspace. To date, however, this design has not been formally evaluated in a field setting. We conducted observations and interviews with primary care providers and their patients from three locations within the Phoenix VA Health Care System, in a pilot study comparing the new exam room design standard with the older legacy exam rooms. When using the new exam room layout, providers spent a greater proportion of time focused on the patient, spent more time in screen-sharing activities with the patient, and had a higher degree of self-reported situation awareness. However, the legacy exam rooms were perceived as better facilitating workflow integration. Provider and patient debrief interviews were supportive of the new exam room design. Overall, our field study results suggest that the new exam room design does contribute to a greater degree of patient centeredness, though more thorough evaluations are required to support these preliminary results.

INTRODUCTION

Substantial research has been conducted on the impact of the electronic health record (EHR) on provider-patient interactions in ambulatory care. However, challenges persist regarding how to effectively integrate the EHR into patient visits and clinical workflow, while maintaining patient-centered care (Saleem et al., 2014; Frankel & Saleem, 2013). Providers have long been concerned about the potential for computer use to negatively impact their relationship with a patient (Ash, Chin, Sittig, & Dykstra, 2005; Gadd & Penrod, 2000; Linder et al., 2006; Mitchell & Sullivan, 2001). The additional complexity introduced by

computerized systems and the EHR can create substantial challenges for provider-patient communication, by interfering with the course of communication and interpersonal aspects of the provider-patient relationship, including trust (Kazmi, 2013; Alkureishi et al., 2016; Crampton, Reis, & Shachak, 2016). For example, research by Frankel et al. (2005) examined a clinic wherein an EHR had been utilized in the back office for 10 years and had recently become available in the exam room. Their results demonstrated that the addition of the EHR made verbal and nonverbal provider-patient communication more complex and, at times, challenging. Computers were often placed where wiring was available, irrespective of where other furniture and instruments were located in the exam room. This placement of computers unfortunately had adverse ramifications for both the provider and his/her patient. For instance, such placement often resulted in situations in which the provider was forced to sit with his or her back to the patient in order to enter information, which compromises synergies between the patient and provider. That is, providers could have experienced communication barriers with their patients by not having direct eye contact with his/her patients. On the other hand, thoughtfully integrating computers and the EHR into the patient visit may help enhance, rather than negatively impact, the provider-patient relationship, when patient centeredness is maintained (Weiler et al., In Press). Thoughtful integration of exam room computing may benefit the patient as well. For example, Pearce and colleagues demonstrated that patients used three signaling behaviors in relation to the computer on the provider's desk (screen watching, screen ignoring, and screen excluding) to influence the behavior of the doctor (Pearce, Arnold, Phillips, Trumble, & Dwan, 2011). Patients were able to draw the provider's attention to the computer and even used the computer to challenge their statements. Due to the pressure that many health care systems have, resulting from seeing more patients in a short amount of time, there is a distinct need for more evidence-based guidance for integrating computing into the exam room. Such integration is especially needed since it is a critical component to delivering timely and efficient patient-centered care.

Existing evidence supports several behavioral and communication practices for promoting provider-patient interaction with the use of exam room computing (Patel, Vichich, Lang, Lin, & Zheng, 2017). Evidence-based behavioral and communication practices have been ranked from those that have the most to the least amount of evidence available for each strategy (Patel et al., 2017): (1) using the computer and/or EHR to facilitate conversation; (2) adjusting exam room design; (3) sustaining eye contact with the patient while typing; (4) keeping separate the clinician's typing and patient interaction; (5) talking to the patient while focusing on the computer; (6) using a physical posture that allows the clinician to face the patient most of the time; (7) inviting the patient to view the monitor before the patient asks; and (8) informing the patient about the functions and role of the EHR.

Our study focused on the second of these ranked strategies ("adjusting exam room design"), which can assist with the first ("using the computer and/or EHR to facilitate conversation") and third ("sustaining eye contact with the patient while typing") ranked strategies, as well as some of the others. Adjusting the exam room design was our focus, as it is both strongly supported by available research evidence and seems to be highly related to other evidence-based strategies for promoting provider-patient interaction. Recommended exam room design practices include placing the computer and monitor so that the patient can

concurrently view the EHR with the provider, and using computers that allow for easy adjustment of the position of the screen (Baker, Reifsteck, & Mann, 2003; Ventres, Kooienga, & Marlin, 2006). Furniture that is adjustable and easy to move has also been reported to facilitate a more patient-centered room layout (Patel et al., 2017). These recommended design practices are incorporated in the Department of Veterans Affairs (VA) new exam room design standard (Weiler et al., In Press).

The new exam room design includes a wall-mounted monitor on an armature system for ease of (re)positioning, as well as a table for workspace that is easy to move and that can rotate against the wall or rotate outward to form a consult surface for a keyboard or printed materials that can be shared with the patient and family members. In the past, computers were introduced into the legacy exam rooms with the desk and computer fixed to the wall in a way that encouraged the provider to turn their back to the patient while using the EHR. The Veterans Health Administration (VHA) and VA Office of Construction & Facilities Management decided that the new exam room design should minimize the dependency of a built-in desk, which seemed to facilitate a “move-in and occupy” mindset. The new exam room design is intended to free providers to move from one exam room to another.

Our research objective was to evaluate the new exam room design, specifically in comparisons to the older legacy design, using both laboratory simulation and field study methods. The laboratory simulation study found broad support for the new exam room design and is reported elsewhere (Weiler et al., In Press). Here, we report findings from a pilot field study. The field study took place within the Phoenix VA Health Care System, one of the few VA sites that have so far implemented the new exam room design standard.

METHODS

Study Design

For our Institutional Review Board (IRB)-approved study, we conducted observations and interviews with primary care providers and their patients from three locations within the Phoenix VA Health Care System to compare the new exam room design standard with the older legacy exam rooms. One community-based outpatient clinic (CBOC) had recently implemented the new exam room design standard in the primary care rooms, which included a wall-mounted monitor for ease of (re)-positioning. The other two locations were the primary care clinics in the main, tertiary care facility and primary care clinics in an annex building close by. Both of these two locations had the older legacy exam rooms, with a desktop computer on a stationary desk, generally located in the corner of the room.

For this field study, two members of the study team (JS and DW) conducted observations of provider-patient interactions and self-reported satisfaction with encounters in the new and legacy exam rooms in order to assess the impact of the new exam room designs. Over the course of one five-day work week, we collected data in both the new exam rooms, located in the CBOC, and legacy exam rooms, located at the main facility and annex. We spent 1–2 hours with each primary care provider, observing one or more patient encounters.

Participants

We enrolled 11 primary care providers into our study and observed 18 of their patient encounters. Six of the primary care providers (10 patient encounters) were from the CBOC with the new exam room design, and five primary care providers (eight patient encounters) were from the main facility and annex, with the older exam room design. Of the six providers from the CBOC, five were physicians and one was a nurse practitioner. Of the five providers from the main facility and annex, four were physicians and one was a nurse practitioner. Each of the providers had extensive experience in their respective primary care clinics.

Dependent Measures

We collected measures of patient-centeredness (i.e., the extent to which the provider focuses on the patient vs. the computer), screen sharing, situation awareness, and workflow integration in both the new exam rooms and legacy exam rooms (Table 1). We recorded time estimates in handwritten observations for time the provider was focused on the patient vs. the computer, as well as for time the provider spent in screen sharing activities with the patient. For workload integration and situation awareness, we used subjective rating instruments that providers could complete relatively easily (with minimal disruption) after the patient left the exam room. Each of these brief measures were strategically chosen to minimize disrupting the provider's work and flow of the clinic. We recorded handwritten estimates of time using a stopwatch application on a smartphone as we were not permitted to video-record the patient encounters for more precise estimates.

Debrief Interviews

At the end of the patient visit, we conducted a semi-structured debrief interview with the provider and patient separately, to assess their satisfaction with each encounter. All 11 providers and nine patients agreed to be interviewed. For the purpose of this study, we defined satisfaction as the quality of the provider's and patient's experience during the patient visit within the exam room. Questions that were not encounter-specific were only asked once for each provider.

Provider interview questions included:

- What are your current work habits during patient visits related to the exam room computing?
- In what ways, if any, did the different layouts affect your interaction/communication with the patient?
- In what ways, if any, did the exam room layout affect your computerized tasks?
- In what ways, if any, did the exam room layout impact your willingness to share the monitor with the patient to review information on the screen?
- How would you modify the exam room layout design to better suit your needs?

Patient interview questions included:

- Did the computers in the exam room assist or distract from your conversation with the provider?
- Were you interested in viewing any information from the electronic health record on the computer monitor during your visit with the provider?
- Did the provider encourage you to view any information from the electronic health record on the computer monitor? If so, did you understand what you were viewing?

Analysis

The SART instrument for situation awareness contained 10 items that were rated on a Likert-type scale from 1–7. Each of the 10 items map to three subscales for ‘understanding’, ‘demand’, and ‘supply’. A composite SART score for situation awareness (SA) was calculated using: $SA = U - (D - S)$, where: U = summed understanding; D = summed demand; S = summed supply. The WIS instrument was for workflow integration and contained 12 items that were rated on a 5-point Likert-scale. An overall WIS score was derived as a mean across each of the 12 items. Full descriptions of the SART and WIS survey instruments are available in the literature (Flanagan et al., 2011; Selcon & Taylor, 1990). Given the pilot nature of our study, and the small sample size, only descriptive analyses of the quantitative data (Table 1) are presented. The qualitative debrief interview data were reviewed for recurrent themes.

RESULTS

Quantitative Results

Table 2 displays a summary of the results for each of our measures. Providers spent a greater proportion of time focused on the patient, spent more time in screen-sharing activities with the patient, and had a higher degree of self-reported situation awareness. The legacy exam rooms were perceived as better facilitating workflow integration.

Provider Debrief Interviews

We found two themes from provider responses using the new exam room layout: (1) several providers noted how difficult it is to adjust the monitor up and down (e.g., “*It’s hard to adjust the monitor if the provider wants to stand without putting in a work order – it’s bolted at a single level for sitting.*”); (2) several providers expressed enthusiasm for how easy it was to swivel and share the screen with the patient using the wall-mounted monitor with the armature system.

Patient Debrief Interviews

Patients at clinics with both exam room layouts were positive about the provider using the computer during the patient encounter and perceived the computer to be helpful in general. However, patients interviewed at the clinic with the new exam room layout expressed an interest in seeing what was on the computer screen, whereas most patients interviewed at the clinics with the legacy exam room layout specifically expressed that they were not interested in seeing what was on the computer screen.

DISCUSSION

Providers who used the new exam room design spent a greater proportion of time focused on the patient, less proportion of time focused on the computer, and more time spent in screen-sharing activities with the patient, as compared to the legacy exam room design. This suggests that the new exam room design, with a wall-mounted monitor on an armature system for ease of (re)-positioning and easily moveable workspaces, resulted in a greater degree of patient centeredness. Furthermore, providers who used the new exam rooms had greater situation awareness than those who were in the legacy exam rooms. These results imply that the ability to adjust the position of the monitor and to keep it within the view of the patient enhanced situation awareness as related to information sources (the patient and EHR) and potentially the ability to integrate them.

An unexpected result was that providers rated workflow integration higher in the legacy exam rooms. The workflow integration instrument included aspects of navigation, functionality, ease of use, workload, and paper-based workarounds. It is possible that most of these elements were not highly related to the layout of the exam room, but instead were more related to the interaction of the provider and computer. Clear conclusions about workflow integration need to be tentative, however, given the small sample size here. In our earlier laboratory simulation study, with a larger sample size, we found evidence that the new exam room design produced a higher degree of workflow integration as compared to the legacy exam room design (Weiler et al., In Press).

In the debrief interviews, providers valued the ability to easily swivel and share the screen with the patient in the new exam room design. Similarly, patients expressed an interest in viewing what was on the computer screen in the new exam rooms as compared to the legacy exam rooms, where the screen was not easily viewable to the patient. These findings support the notion of 'using the computer to facilitate conversation', the #1 ranked strategy for promoting provider-patient interaction with the use of exam room computing, according to a systematic review of the literature (Patel et al., 2017). The new exam room design seems to facilitate this strategy. The new design, by virtue of the ease of (re)positioning the monitor and easily moving the workspace furniture, may also facilitate other evidence-based practices for promoting provider-patient interaction such as: sustaining eye contact with the patient while typing; using a physical posture that allows the provider to face the patient most of the time; and inviting the patient to look at the screen before the s/he asks (Patel et al., 2017).

Limitations and Future Research

There are notable limitations to this field study, which should be taken into account when interpreting the results. We had hoped to recruit more providers and patients to participate; however, recruitment was more challenging than we had anticipated and our sample size was relatively small. Therefore, we only present descriptive analyses without inferential statistics. Furthermore, there are potential uncontrolled factors in the field that may impact comparison between the new exam room design implemented at the CBOC and the legacy exam rooms implemented at the main facility and annex building. For example, the type of providers and/or patients may differ, even though all facilities belonged to the same health

care system. The main facility and annex were located in a downtown urban setting, whereas the CBOC was located in a suburban setting. We intend to conduct a similar, larger study that will address these limitations of sample size and settings.

Conclusion

In a field comparison of new and legacy exam room designs, providers spent a greater proportion of time focused on the patient, spent more time in screen sharing activities with the patient, and had a higher degree of situation awareness when using the new exam room layout with a wall mounted monitor on an armature system for ease of (re)positioning and a moveable workspace furniture. However, the legacy exam rooms received higher workflow integration scores. Provider and patient debrief interviews also supported the new exam room design. Providers valued the ability to easily reposition the monitor and share it with the patient and patients expressed more interest in what was on the monitor in the new exam room design. Overall, our results were supportive of the new exam room design, though strong conclusions are not yet warranted given the small sample employed in the current study.

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TABLE 1

Comparison measures for legacy vs. new exam room designs

Measure	Measuring tool / method
Patient-centeredness	Time the provider is focused on the patient compared to the computer.
Screen sharing activity	Time spent during screen sharing activities with the patient.
Situation Awareness	Situation Awareness Rating Technique (SART: Selcon & Taylor, 1990)
Workflow integration of the computer/EHR	Workflow Integration Survey (WIS: Flanagan et al., 2011)

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TABLE 2

Mean (SD) outcomes for quantitative measures

Measure	Exam Room Type	
	Legacy	New
Proportion of time focused on patient	39.4 (19.8) %	43.6 (25.2) %
Proportion of time focused on computer	58.4 (19.3) %	53.4 (23.4) %
Time spent in screen sharing activities with patient	0 (0) min	1.9 (3.7) min
Situation awareness (composite SART score)	21.3 (4.6)	29.3 (6.3)
Workflow integration (composite WIS score)	4.4/5 (0.5)	3.7/5 (0.4)

Note: Providers spent about 2–3% of time focused on items other than the patient or computer (e.g., paper printouts).