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Supporting medical communication for older patients with a shared touch-screen computer

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ABSTRACT

Objective: Increasingly health care facilities are adopting electronic medical record systems and installing computer workstations in patient exam rooms. The introduction of computer workstations into the medical interview process makes it important to consider the impact of such technology on older patients as well as new types of interfaces that may better suit the needs of older adults. While many older adults are comfortable with a traditional computer workstation with a keyboard and mouse, this article explores how a large horizontal touch-screen (i.e., a surface computer) may suit the needs of older patients and facilitates the doctor–patient interview process.

Method: Twenty older adults (age 60 to 88) used a prototype multiuser, multitouch system in our research laboratory to examine seven health care scenarios. Behavioral observations as well as results from questionnaires and a structured interview were analyzed.

Results: The older adults quickly adapted to the prototype system and reported that it was easy to use. Participants also suggested that having a shared view of one's medical records, especially charts and images, would enhance communication with their doctor and aid understanding.

Conclusion: While this study is exploratory and some areas of interaction with a surface computer need to be refined, the technology is promising for sharing electronic patient information during medical interviews involving older adults. Future work must examine doctors' and nurses' interaction with the technology as well as logistical issues of installing such a system in a real world medical setting.

1. Introduction

Globally, the proportion of people over age 60 compared to younger populations is growing at a rapid rate [1]. The World Health Organization estimates that there will be 1.2 billion people over age 60 by 2025 and 2 billion by 2050. For the United States, in 2011 the first wave of the 78 million baby boomer generation will turn 65 and thus begin a two-decade period of rapid growth in the older adult population [2]. As people grow older, they typically experience an increase in health care conditions. According to the Center for Disease Control (CDC), osteoarthritis, heart disease, cancer, and diabetes are chief chronic diseases among older adults [3]. These are persistent conditions that require regular medical attention. Managing medical care is challenging for everyone, but this is particularly difficult for older adults with declining physical, visual, hearing, or cognitive abilities.

While the older generation is growing at a rapid rate, so is the prevalence of technology in health care settings, generat-

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ing new challenges for older patients. A shift in computing research now places increased emphasis on understanding human interaction with computer systems rather than focusing solely on technology development. The discipline of human-centered computing encourages the design of new types of interfaces that are appropriate for the growing population of older adults and their health care needs. The introduction of computer display systems into doctor–patient interaction presents an opportunity to design and develop interfaces that suit the unique needs of older patients and improve medical communication. This article explores older adults' perspectives on the utility and appeal of a horizontal multiuser, multitouch computer display for health care communication.

1.1. *Communication challenges for older patients*

Communication about and management of one's medical care is challenging for people of all ages. Effective doctor–patient communication is tied to a variety of outcomes such as patient satisfaction, emotional health, compliance with medical recommendations, and symptom resolution [4]. Effective communication between a doctor and patient is also associated with lower rates of medical errors [5,6]. Medical care is typically an ongoing process that involves communication among a variety of people, including doctors, nurses, specialists, lab technicians, the patient, family members, and insurance providers. Each meeting with a medical professional involves an often challenging process of information exchange frequently made more difficult because of limited time and differences in knowledge levels among participants. Emotional stress may make it particularly difficult for patients to communicate effectively or accurately remember instructions from the doctor.

The effects of aging place additional demands on physician–patient interaction [7–9], making clear and effective communication even more challenging. In fact, older patients may desire more information but receive less from physicians than younger patients [10,11]. Ensuring that older patients receive desired medical information in an effective manner is a challenge central to the goal of this exploratory research study. Ways in which physicians can enhance communication with an older patient are for the doctor to sit face-to-face with the patient, to write down information for them, and to use charts and visuals to augment a verbal explanation [12]. Presenting digital medical records and patient information on a shared computer display has the potential to aid medical professionals and older patients in communicating more effectively.

1.2. *Electronic medical records*

Electronic medical records (EMRs) are changing the way medical information is managed and communicated to patients. The introduction of EMR systems and their effects on workplace practices in a medical setting is a well-studied topic within medical informatics (see [13] for a review), yet EMR systems are studied primarily with respect to use by physicians and nurses. There are only a few studies that focus on patient use such as viewing, interacting with, or helping to document one's medical history (e.g., [14,15]).

Fig. 1 – Mutiuser, multitouch surface computer by Mitsubishi [21]. Older adult viewing medication types and pill shapes.

EMRs have an impact on patients in terms of patient satisfaction [16], physician–patient interaction [17], and patient care [18]. The size and location of the computer display presenting an EMR may introduce new problems for effective communication and coordination among the physician or nurse, patient, and family or caregivers who attend the visit. For example, many exam rooms now contain a computer workstation that displays the patient's medical history. The doctor may be required to take detailed notes during the consultation, thus directing their attention toward the computer instead of the patient. An older patient who is hard of hearing may rely on lip reading and facial cues to understand spoken dialogue. Interaction is complicated when the doctor turns away from the patient to face the computer monitor. Work by Pearce et al. [19] describes body orientation of doctors and patients when computers are present in the medical interview, suggesting that some doctors and patients pay more attention to the computer than each other. Similarly, Rouf et al. [20] suggest that a computer in an exam room may have a greater effect on doctor–patient interactions involving less experienced physicians. That is, patients who saw a medical resident were more likely to report that the computer decreased interpersonal contact in the medical interview compared to patients who saw experienced physicians. While research is beginning to examine the effects of EMRs on patients, studies have yet to focus on the impact of technology in the medical interview for older patients who may be unfamiliar with or uncomfortable with such systems.

2. Surface computing: a large multiuser touch-screen

A surface computer is a large, horizontal touch-sensitive computer that allows multiple people to interact with digital media simultaneously (see Fig. 1). Unlike traditional computer workstations, touch screens do not require people to manipulate or

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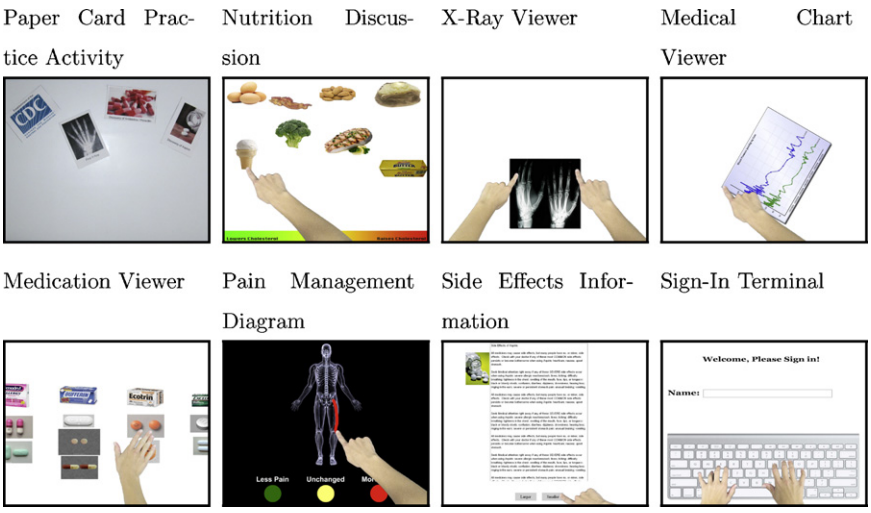

Fig. 2 – Overhead view of practice activity (top left) and seven sample health-related activities.

control an input device such as a keyboard or mouse. The horizontal form factor of a tabletop allows multiple people to sit and interact simultaneously with a single computer. The large size of a surface computer provides a shared workspace where people may lay out and manipulate images and other visuals pertinent to conversation. Surface computing systems are now publicly available from companies as commercial products (e.g., Microsoft Surface, the SMART Table) and in many research labs as experimental prototypes. The proliferation of surface technology makes it important to understand how older adults, a large, growing, and yet relatively unaddressed user group, interact with and react to such technology. Furthermore, it is critical to understand how this type of shared digital workspace might function in cooperation with EMR systems and positively impact the medical interview process.

2.1. *Interaction design for older patients*

A range of age-related factors affects an older patient's ability to effectively and comfortably interact with medical providers and with health related technology systems. Older adults often experience an overall slowing of movement as well as difficulty with fine motor activity and coordination [22]. Osteoarthritis (OA), a chronic and degenerative disease, is highly prevalent among older adults in the United States and is the leading cause of disability [23]. While OA may make interaction with traditional computer workstations challenging, results reported in this article indicate that interaction with a large touch-screen computer is manageable for older adults with this condition or who have limited dexterity. Loss of or reduced vision is also common. Six and a half million Americans over the age of 65 have a severe visual impairment (e.g., diabetic retinopathy, glaucoma, or age-related macular degeneration) [24]. About one-third of Americans between the age of 65 and 74 and half of Americans over 85 report hearing loss [25]. Individuals with hearing loss rely on interpersonal cues to understand face-to-face conversation (i.e., exploiting the gestures and facial expressions of other people). A patient's ability to monitor cues such as facial expressions and body language is disrupted when the doctor or nurse is facing a small personal computer instead of the patient. Finally, aging often results in a decline in memory. One memory loss condition is Mild Cognitive Impairment (MCI), which affects approximately 5.4 million Americans over the age of 70 [26]. Age-related changes in memory and cognitive ability also necessitate that computer interaction is easy and quick to learn.

2.2. *Design of a prototype system*

We implemented a prototype system using a Mitsubishi DiamondTouch table [21] and the corresponding Flash development toolkit. This is a large (75 cm × 60 cm) top-projected capacitive tabletop system with a display resolution of 1280 by 1024. The interactive surface can uniquely distinguish up to four people all touching the display simultaneously.

We designed seven sample activities to demonstrate the idea of presenting medical information on the surface computer and to solicit particular forms of interaction from participants. The activities allowed the research team to observe how well older adults could perform the following actions: select objects or buttons, bimanually manipulate images (move, rotate and resize), scroll through series of images, use a finger to draw or highlight parts of a diagram, enter text via a virtual keyboard projected onto the display, and read text-based information presented at various sizes on the screen.

The content of each activity was derived from observations made during our ongoing field work, feedback from health care professionals, and our research team's prior experience designing technologies for health care support. Fig. 2 illustrates the activities that were evaluated. In the current design, content is not patient specific and was preloaded into the system for the laboratory evaluation. The goal was to simulate an experience interacting with medical information. The prototype, when installed in a clinical setting, will be adapted to include dynamic information from a patient's EMR while maintaining the multiuser and multitouch capabilities.

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Table 1 – Characteristics of sample population of older adults. Device experience indicates number of participants who have used a single touch device (e.g., store check-out, airport check-in, bank automatic teller machine) or a multitouch device (e.g., Apple iPhone).

	Education			Limitations		Computer usage			Device experience	
	High school	College	Grad school	Corrected vision	OA	Daily	Monthly	Less then monthly	Single touch	Multitouch
Age										
60–69	2	6	0	7	2	7	0	1	8	3
70–79	1	5	0	6	5	4	1	1	5	2
80–89	0	3	3	5	3	6	0	0	5	1
Gender										
Male	1	4	2	7	2	5	0	2	5	2
Female	2	10	1	11	8	12	1	0	13	4
Total	3	14	3	18	10	17	1	2	18	6

3. Method

We conducted a laboratory-based study involving 20 older adults (age 60–88; mean age = 73.4, stdev = 9.9; 13 females) to understand how this population might react to using a surface computer in a medical context. All participants came into our laboratory to participate in the study. See Table 1 for the characteristics of the sample. This study also involved 10 younger adults (age 19 to 26; mean age = 20.7, stdev = 2.2; 6 females) performing the same tasks as a benchmark to understand older adult performance. The analysis below focuses on older adult data except where noted.

A researcher followed a written script to guide participants through a series of tasks. Participants were told that there were going to try out a new type of computer that could appear in the doctor's office of the future. The first task involved getting the participant comfortable in an adjustable office chair and situated at the table. The participant then manipulated paper information cards spread out on the table surface (at this point the display was off, see Fig. 3). The goal of this first activity was to ensure that the participant was comfortable at the table while interacting with the entire surface.

Fig. 3 – Participant (age 88) getting situated at the computer and in the adjustable chair during the paper card task.

After the paper-based task, each participant completed seven brief activities (each lasting about 5 min) on the multitouch surface. The ordering of activities was randomized between subjects. For each activity, the moderator first explained the activity context (e.g., "Suppose the doctor made an X-ray of your hand and now wants to review it with you."). Then she asked the participant how they would perform the task (e.g., "If you want to make this X-ray larger, how might you do that?") and observed their behavior. The participant was encouraged to try the action several times. After each activity, the participant rated the activity's usefulness (on a five-point Likert scale) and gave qualitative feedback on the idea.

Participants completed a pre- and post-activity questionnaire to assess demographic information, computer experience, and attitude toward computers. After completing all activities on the surface computer, we used a structured interview to examine each participant's reaction to surface computing as well as ideas for using this technology in a medical setting. Participants performed activities individually, but if two or three participants came to the study together, we allowed them to do the structured interview as a group to encourage discussion. Two researchers were present for all sessions and took detailed notes. Each session was video recorded by two cameras, one mounted directly above the table and another positioned in the corner of the testing room. Qualitative feedback during each activity, pre- and post-activity questionnaires, the structured interview at the end of each session, as well as behavioral observations of system use were analyzed.

4. Results

Results detail observations of and participant feedback regarding overall system usability, appeal of application ideas, and the perceived benefits and challenges of using this type system in a real world medical setting.

4.1. *System usability*

Older adults in this evaluation found the system quick to learn and easy to use. On average, each person figured out each action for the first time in less than ten seconds (see Table 2). Time to figure out each action was calculated based on when

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Table 2 – Amount of time it took older adults to figure out each action (reported in seconds). No data is reported for the time it took to figure out reading text (i.e., medication side effects).

Time to figure out actions (in seconds)				
	Mean	StdErr	Min	Max
Move images around	2.2	0.54	1	11
Rotate medical graph	4.0	0.85	1	13
Highlight parts of diagram	4.5	2.0	1	41
Type on virtual keyboard	8.0	2.6	1	42
Enlarge or shrink X-ray	9.6	2.2	1	40
Scroll through medications	9.6	2.6	1	40

the participant initiated movement toward the interface until they successfully performed the action.

We were surprised by how well older adults interacted with the multitouch computer. Participants enjoyed touch interaction and called it "fun" and "easy." One woman said, "I like the touch-screen. I think it's kind of fun and less intimidating for someone who has not used a computer," (Age 67, Female). Another woman commented, "It's very easy to use, easy to read and manipulate, which makes it extremely user friendly," (61, F). A man explained, "I'm not intimidated by this because I can use my hands and move things around. I can play with it and figure it out," (60, M). We encouraged participants to perform each action multiple times, especially actions that have a high level of arm movement such as scrolling through medicine types. While our data do not assess whether these actions will fatigue users over time, not a single older adult mentioned that an action might become tiresome. Nevertheless, future work in which such a system is placed in a real world setting for extended use should address the issue of fatigue.

An important aspect of surface computing for the older adult population is how the technology affects people's perceptions of their ability to interact with a computer. To assess this, at the beginning of the study participants rated their agreement with six statements pertaining to computers in general. After using the surface computer for about 30 min, participants rated their agreement with the same six statements pertaining to this particular experience. Fig. 4 illustrates the results. Compared to younger adults who rated the same statements, older adults tended to disagree more strongly with negative statements about their experience with surface computing. Self-report data suggest that interacting with the surface computer was less intimidating, less frustrating, and less overwhelming for older adults compared to their usual experience with computers.

When designing a hardware and software system for older users, it is important to take into consideration the unique needs and limitations of this population. For example, compared to fine motor movement required by a traditional mouse, the touch-sensitive surface allows whole-handed and multifinger input. This is particularly important for older adults with limited motor ability and changes in dexterity, perhaps due to hand tremors or OA. Many older adults used two or more fingers to move images around on the display rather than touching precisely with a single finger. A couple participants experienced hand tremors while moving an image, but

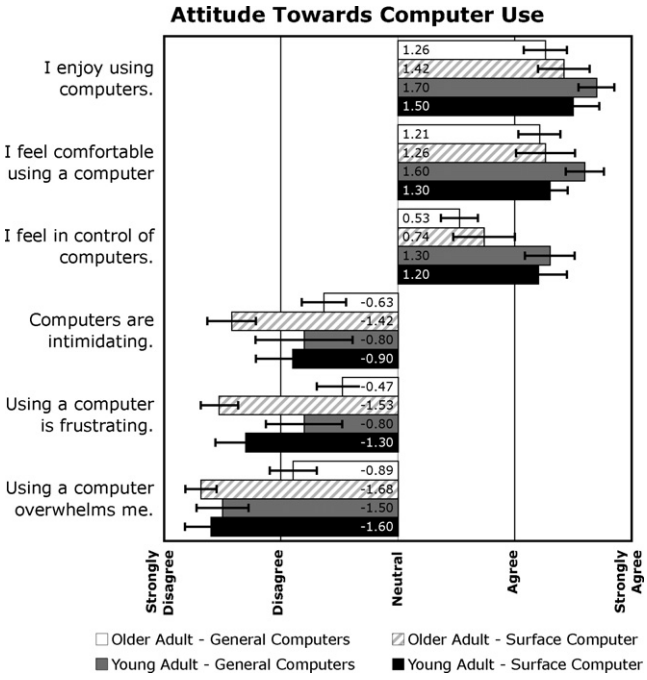

Fig. 4 – Agreement ratings for statements about attitude toward computer use measured with a five-point Likert scale ("strongly disagree" is −2, "neutral" is 0, and "strongly agree" is 2.). Older adults more strongly disagreed with negative statements about the surface computer.

these participants were still able to successfully move objects across the display. A woman commented, "This would be very good for people with arthritis or who have hands that don't work right," (70, F). Another participant said, "I like the ease of using it and moving stuff around. Would be helpful no matter what age you are. Even if you have arthritis you could touch," (60, M).

4.2. *Appeal of application ideas*

During the study older adults rated (on a five-point Likert scale) the usefulness of each activity idea. Fig. 5 illustrates responses. All ideas received an average score of "somewhat useful" or better. In addition to quantitative feedback on the application ideas, participants provided qualitative feedback regarding why they liked certain ideas. Several participants commented on the value of viewing a medical graph or chart side-by-side with a doctor. One woman stated, "I was thinking about the graph because I graph my own cholesterol history. Then I have goals for the cholesterol. Right now I'm saying them verbally, but I'd love to have them on the [surface computer] so it's a picture and the doctor agrees to them," (65, F). A man explained, "Would be nice to see how your blood pressure is today and how it has been over the past two months. For example, if I'm taking medicine for high blood pressure, does the medicine help? See the change over time," (88, M). Other participants liked the pain management diagram that allowed them to highlight parts of a human figure to facilitate discussion of pain. Specifically, participants thought it would help them articulate and document exactly where pain is located: "It specifies exactly where the pain is and that's a lot

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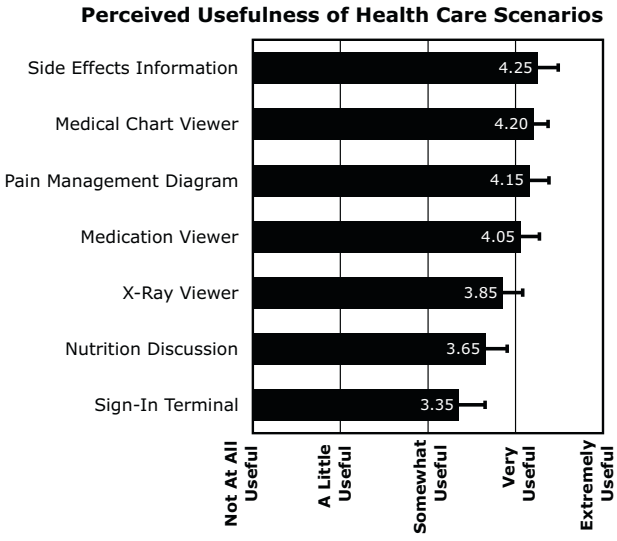

Fig. 5 – Older adult ratings for perceived usefulness of each application idea measured with a five-point Likert scale ("not at all useful" as 1 to "extremely useful" as 5).

easier than saying 'doctor, I feel it over here or over here'. It's very graphic, a good idea," (84, F). With respect to the medication viewer, several older adults said that it would be helpful to have illustrations of common medications or medications that were on their records. They suggested that scrolling through images of medication packaging and pill shapes would help them remember which medications they are taking and the dosage: "I think showing the medicine like they did because sometimes I don't remember all the stuff unless I bring it with me. I think that's a good trigger for remembering things," (68, F). This was echoed by another woman, "I like the medication thing. That was really good. Especially for people our age, we forget the names of them," (70, F). Finally, being able to view and manipulate an X-ray image was also well-received by participants. One woman commented, "I like the thing about enlarging the X-ray. Usually they have it up on the screen. You're kind of looking at it, but it's nice to sit and be able to say 'this part' and touch it," (74, F).

4.3. *Perceived benefits of the system*

Participants talked enthusiastically about using a surface computer in a medical setting and their feedback was very positive. They articulated, from a patient's perspective, how the computer would fit into the workflow of a medical visit. Participants stated that the system was easy to use, fun, and engaging. "I think all of them [doctor's offices] should have one. Once they see it and see how easy it is and how easy they can get their information. There would be no confusion as to what someone had written," said one man (75, M). A woman commented, "I like this kind [of computer] because it's interactive, it's engaging, it's new," (62, F).

One surprising finding from this study is that several older adults independently articulated the connection between current EMR systems in medical facilities and the surface computer. One woman explained, "This would be useful for the new idea of computerizing all of the office medical records. This would be compatible with that," (88, F). The integration of EMRs and the surface computer was perceived as a strong benefit of this approach, and some participants even commented that the system would help eliminate paper records, a key feature of EMRs: "I was thinking it would be good for a doctor's office and for your health records. I know my doctor gave me a big stack of papers to take home. I had to take them home. He didn't want to store them either. I wonder if the lab could plug into it and put your results on it, and your other doctors too," (70, F).

Participants commented that the large form factor of the tabletop surface was good for viewing information with a doctor or nurse. In particular, the ability to make text and images larger was a positive feature of the surface computer. One man said, "It's big, you can see what you're doing. I think it's excellent, it doesn't intimidate you because it's so big and you can see exactly what you're doing. When you enlarge something or make it smaller, you know that if you made it too small you could turn around and enlarge it again," (75, M). Another commented, "It's very good, especially for a nearsighted person. You have a nice big table," (88, M).

Several older adults mentioned specifically that they wanted to see what the doctor is seeing and that the large display would enable this. Two participants commented directly on the problem of viewing a medical record on a small computer display: "I think that the doctor's office is the place to do this.. You go to [a medical provider] and the doctor is over here looking at the computer screen. We'd have to get behind the doctor to look at the computer screen," (65, F). Her friend elaborated, "Oh yeah, we'd have to practically get on top of him and get in his space," (67, F). More specifically, several participants thought the large display would be good for helping catch mistakes on their medical records: "My primary care physician was running down my list of diagnoses because I thought some of them were wrong. She was scrolling down and would read them to me. It would have been much better if I could see them too. The opportunity to catch mistakes would be doubled when you have two people, tripled when you have three people," (65, F).

Some participants explained that shared images on the large computer display might improve how well they or other older adults are able to understand medical information provided by the doctor: "This might be very useful in clinics where they provide health care to low income people who don't speak English. So the graphics part would be useful. You're dealing with a lot of minorities who don't speak English, particularly with the older generation. I think it would be extremely useful where they can't explain what they're seeing, and possibly putting some of this material in that particular language," (84, F). Similarly, other patients indicated that shared images on the display would help them more clearly articulate their concerns to doctors. One man said, "I like the visuals. The pictures help, if you have the pictures there, [the doctor can] say 'okay, now I know what you want'," (60, M).

4.4. *Concerns regarding system use*

While overall older adults were positive about how a surface computer might enhance their interaction with a doctor or their medical information, several concerns about system

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use were raised. Many participants liked the large display for sharing information with medical professionals, but a few participants mentioned that the size of the display may be intimidating in a doctor's office. A smaller display, about half the size of the current surface computer, may be less intimidating to this user group. Determining the most appropriate display size requires further exploration, especially considering that smaller multitouch computers are less expensive and increasingly available (e.g., HP TouchSmart, 3 M LCD display).

Patients have the right to view their medical records, but perhaps certain information is intended for medical staff only. Furthermore, should all information presented on the shared display be modifiable by the patient? A couple older adults explained that patients have a right to view their medical information, but at the same time, not everything should be modifiable by the patient: "[Patients] might reach in and mess things up. They'd almost have to lock it," (67, F). Another woman explained, "It's owned by the doctor. We'd at least ask permission, or we'd have to be invited [to use it]," (65, F). Shared display systems for health care need mechanisms to control access to certain information. Some surface computers such as the DiamondTouch can detect individual users (i.e., distinguish between touches by the doctor and patient) and thus control access to various parts of the shared display in a medical setting.

Most participants brought up concerns about interacting with the system under more authentic conditions. Concerns ranged from how long it will take patients to adjust to the system, how it might change communication between the patient and doctor, and interacting with an unfamiliar technology when a patient is sick or nervous. One man said, "Initially I think it should be close to somewhere where someone can answer questions so you actually feel that this is connected with the people you're seeing. Also giving people the option. You have the option to sign in. Say that it's just something you're trying out," (64, M). Another woman commented, "It will take some training for the first time," (86, F). One man was opposed to the idea: "It would just take too much time for the patient to work it out. He's going to be looking up for help. I just don't think it will be any use at all. [The doctor] never has a chance to go beyond the top page of the chart, when he is supposed to be ultimately familiar with it. This just adds another layer of complications that he doesn't need and would waste his time," (85, M).

5. Discussion

Observations and feedback from study participants indicate a range of issues that are important to consider in the design and evaluation of shared display systems aimed at supporting medical communication for older patients. First, touch interaction is extremely promising. The ease and speed at which older adults performed actions on the large touch-screen indicates that this type technology is extremely promising for interaction in a medical setting where doctors have limited time and patients may have limited physical abilities. Second, while the larger table-like display has advantages such as added screen real estate for enlarging text and images as well as a shared space for interaction, subsequent research should consider smaller, tilted displays. Feedback from participants indicates that a smaller display may provide sufficient area for collaborative discussion of medical issues without intimidating older patients. Off-the-shelf touch-screen displays manufactured by Dell, HP, and Sony may be a viable option for supporting this type of collaboration. Finally, future systems should incorporate additional input mechanisms. Perhaps touch-input is ideal for most health care scenarios, but occasionally an older patient or medical professional may need a more precise input device such as a stylus. Light-weight physical controls (e.g., SLAP Widgets [30]) also stand to benefit the unique needs of older users and are worth exploring in subsequent designs. For example, older patients with hand tremors might find physical controls easier to manage than touch-input. Exploring the tradeoffs and ideal uses of various input devices for this context is an important aspect of future research.

While the present study is exploratory, results provide a foundation for subsequent investigations of multiuser, multitouch display technologies that may be useful in the medical interview process with older patients. However, there are two primary limitations of this current work. First, it is critical to gain insight from experienced physicians, nurses, and medical administrators on how such a technology might impact current workplace practices in a medical environment. This approach cannot succeed without the support of medical staff. Second, an evaluation of surface technology for health care communication must be conducted in an authentic setting. People act differently when under emotional stress due to an illness or may be more limited in their ability or willingness to communicate when they are sick or hurt. Factors such as hygiene and cleanliness of the touch-screen will be important when the device is installed in a medical facility. Several participants were concerned that doctors are already limited by time, and the surface computer might slow down the medical interview process. Ease of learning for novice users is crucial if the technology is placed in a time-critical setting such as a medical facility. Other logistical concerns with deploying such a system in a working medical environment include: patient privacy, legal concerns of physicians, initial system cost and regular maintenance, time required to prepare system for a patient interview, and the challenges given the wide range of patient abilities and needs.

6. Conclusion

With a rapidly growing older population, expanding use of electronic medical records, and increasingly common involvement of computer technology in medical interview settings, understanding the tradeoff space of factors that influence medical communication for older patients is an important topic for both human–computer interaction and medical informatics research. This article reports results from an exploratory study involving adults age 60–88 using a prototype multiuser, multitouch surface computer for health care communication and management scenarios. The goal was to better understand how a surface computer might facilitate access to and improve collaborative sharing and interaction with medical information. The present study provides insights

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about older users' expectations and concerns about such a system if placed in a medical environment.

Overall, older adults saw potential in using a surface computer and used the system with ease. Some called the technology "fun" and "engaging" while others were concerned that the size might be "intimidating" to older patients. The participants quickly adapted to the prototype system and reported that it was easy to use. They also suggested that having a shared view of one's medical records, especially charts and images, would enhance communication with their doctor and aid understanding. While some areas of interaction with a surface computer need to be refined, the technology is promising for sharing electronic patient information during medical interviews involving older adults. Currently surface computing is growing in availability and decreasing in cost, making it a viable technology for supporting older patients who need to communicate and manage their medical care in an increasingly digital world.

Author contributions

Piper took part in the conception and design of the study, acquisition, analysis, and interpretation of data, drafting and revising the article, and final approval of the version to be submitted. Hollan participated in the conception and design of the study, interpretation of the data, revising the article, and final approval of the version to be submitted.

Conflict of interest statement

There are no financial or personal relationships on part of either author that are a conflict of interest.

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Summary points

What was already known?

- The adoption of electronic medical record systems is introducing more technology, particularly computer workstations, into medical exam rooms.
- Older patients face a wide range of challenges communicating with and understanding medical professionals.
- Computers are often uncomfortable or overwhelming for older adults, further complicating the medical interview process.

What has this study added to our knowledge?

- Older adults saw benefit in having a shared view of electronic patient records, specifically charts and diagrams, during consultation with a doctor.
- A large multiuser, multitouch display such as surface computer may be an effective device for presenting such information to older patients.

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