Concerns of Primary Care Physicians for Video-Based Visits

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Abstract
Video conferencing is now a reality for primary care appointments. Although typical systems akin to Skype have been deployed for video appointments, it is not clear how these systems should be designed to meet the real needs of doctors. We conducted contextual interviews with family physicians to explore how to support video-based appointments with patients. Our findings reveal challenges in different themes and presents insights on design implications to support doctors' control in the workflow, privacy protection, and camera work for mobile devices.

Author Keywords
Mobile video communication; primary care appointments; computer-mediated communication.

CSS Concepts
• Human-centered computing~Human computer interaction (HCI)~Empirical studies in HCI

Introduction
Telemedicine systems use video conferencing technologies to distribute healthcare services over distance. With the prevalence of video communication, we are now seeing a proliferation of video conferencing apps (e.g., MDLive, Babylon) that are marketed as ways for patients to meet with family doctors for a

range of situations. It differs from common specialist consultations in that a wide scope of medical situations can be involved and followed with socio-technical issues. Previous studies of telemedicine systems for supporting primary healthcare have mainly looked at user acceptance, feasibility, and accessibility [2,5]. In contrast, there is little research that explores user needs and potential design challenges from a socio-technical perspective.

We explore video appointments to understand how doctor-patient communication would be different from in-person appointments from the perspective of doctors. We interviewed twelve family physicians using a scenario-based method where participants were shown six pre-recorded scenarios covering various types of appointments. Our findings reveal challenges including limited capabilities for controlling the flow of an appointment, issues with camera work, and challenges with privacy protection. These suggest potential design opportunities in future work to mitigate these challenges to better support video conferencing for primary care appointments in the home.

Related Work

Telemedicine systems were initially employed to support the distribution of healthcare services to less developed and remote areas. They also support patients who face difficulties in seeing a doctor in-person such as older adults, or those with disabilities or recurrent diseases [9]. Extensive research has been conducted to investigate medical communication in particular specialties among medical professionals, between doctors and patients, and for long-term patient care [7,8]. Within these fields, patients' situations have already been well examined. When appointments occur over a video call, medical professionals only need to follow-up with limited visual and vocal communication. However, when it comes to general medical appointments over video, situations can become unpredictable and doctors may need to do various types of examinations. This means that accompanying challenges which do not exist in face-to-face visits could come up in video-based scenarios.

Previous research on primary care appointments focuses heavily on user acceptance for technology, feasibility, accessibility, time and expenditure, and health outcomes [2,5,10]. There is little research that looks at the socio-technical aspects of video appointments in primary care, and how the socio-technical challenges could affect the use of video conference or the reverse. For example, [1] explored challenges of bodily communication in video visits for physiotherapy. Such examinations can be broader in general consultations and socio-technical issues that come with the use of video conferencing could be obstacles to the deployment of video-based doctor appointments. Our work differs from prior work in investigating a broader set of appointments, including those with potentially large privacy concerns. We also explore technology design issues and workflow challenges.

Exploratory Study Method

We conducted a study to explore what aspects family doctors valued the most during in-person appointments; what appointment types would be appropriate for using video conferencing; and what challenges and concerns exist for video-based appointments.

Scenario 1: Cold

Scenario 2: Fall while jogging

Scenario 3: Sleeplessness

Figure 1: Screenshots from video scenarios 1~3. Each video depicts a medical situation. There are three views in each video, from left to right: third-person view in the patient's home, camera view of the patient, and camera view of the doctor.

We recruited twelve family physicians within the age range of 31-58 (Avg=42, SD=9), with years of practice from 2-32 (Avg=13, SD=10). Four participants used video conferencing and five of them used telephone appointments with their patients some of the time. We intend to spot as many challenges as possible for video appointments. Thus, we purposely include doctors using video visits, along with doctors who have intentions, hesitations and resist it to have a broader perspective to understand the potential influence of video conferencing for doctor appointments.

Semi-structured interviews were conducted to acquire an in-depth understanding of doctors' previous experiences and their perceptions about video-mediated appointments. The interview contained two sections. In the first section, participants were asked about appointment experiences in-person, over telephone or video, and viewpoints of video visits. In the second section, six pre-recorded video scenarios depicting varying video-based appointments were shown to participants to inquire about their reactions. Each scenario contained actors as doctor and patient.

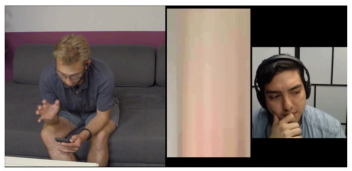
We designed six scenarios shown in Figures 1 and 2, which were chosen based on the following criteria. First, we wanted common medical inspection methods to be covered in the scenarios, including inquiry, observation and palpation. Second, we expected a variety of camera work could be presented in the videos, e.g., capturing different body parts by orienting the camera to different directions. Third, we wanted the scenarios to cover topics with potential privacy concerns at varying levels. Several scenarios contained no such concerns while others could be sensitive in terms of conversation or what would be shown on camera. Scenarios include: A) *Cold*: the patient is asked to show the inner mouth with a phone camera; B) *Fall while jogging*: the patient is asked to uncover their abdomen area and palpate different locations; C) *Sleeplessness*: The patient described sleeping issues and alcohol addiction; D) *Drugs*: the patient is asked about drug use and feels awkward; E) *Domestic abuse*: the patient described partner abuse; F) *Private parts*: the patient showed their private parts with the mobile phone camera.

We decided to use a method building on scenario-based design and video prototyping method [4,6] for two main reasons. First, our scenarios might not exist in reality, which might be difficult for participants to imagine if they had never conducted such appointments over video. Second, we did not want to infringe on participants' privacy as some topics that we wanted to explore were private or sensitive in nature. Alternative methods might include exploring video visits in-person or role-playing. However, there could be critical ethical challenges as observing actual appointments or role-playing could be extremely intrusive and awkward for patients if appointments are about sensitive topics. In contrast, pre-recorded videos would avoid such risks and allow us to gauge all participants' reactions to the same situations. In addition, we were able to explore multiple scenarios with each participant rather than a subset of them.

All the interviews were fully transcribed and independently coded by two coders. Then the coders discussed and shaped the themes following common qualitative analysis strategies.

Scenario 4: Drugs

Scenario 5: Domestic abuse



Scenario 6: Private parts

Figure 2: Screenshots from video scenarios 4~6.

Losing Control During Video Visits

Participants talked about being able to control the space and context of an appointment when done in-person because they could easily follow the procedures that were needed. Video appointments were seen as affecting this control and flow because the camera's video or audio may restrict what they want to do.

Control was seen as being especially problematic for situations like the *Showing Private Parts* scenario that participants watched. When in-person, doctors could follow a standard protocol to protect patients' privacy. For example, patients would have a private space to change their clothes; doctors could expose only parts of a patient's body for the exam. In contrast, participants generally felt it not appropriate to have a patient expose their private parts over video as it was difficult to control the camera view. Thus, they were limited in terms of how they were able to conduct the appointment.

Control was also limited for situations like the *Domestic Abuse* or *Sleeplessness* scenarios. Participants said they were able to provide support such as protecting patients from being harmed or suicidal in the office. In contrast, it would be tricky to give instant assistance during video appointments as doctors might not know the patient's location.

If there's any concern about the patient being psychotic, aggressive or suicidal, where you can't act right now to provide them with support. –P9, Female, 58

Second, an important part of appointments was the ability to identify aspects that were affecting a patient to disclose all the information needed. In this way, our participants felt that they controlled the context of the appointment, what they saw, and what they could use to come up with a diagnosis when appointments were in-person. With video appointments, participants felt like they could lose control over what they were capable of noticing because not everything might be shown on camera. A specific instance was the *Domestic Abuse* scenario. The camera view during a video appointment could easily limit this ability to discover physical abuse. The doctor could lose control over performing the exam they would want.

Cause the abusers of kids, they will abuse them in places where the clothes are covered… So when you're doing an exam where you lift up their shirt …wait, a big hand mark here on the back. But obviously if the person on the video is the abuser, they're not going to show them. –P2, Male, 31

Examination and Camera Work

Participants who already did video-based appointments said they most often did psychiatric consultations over video as they did not usually require physical exams via palpation or a large amount of camera work to see the participants. Most often it was good enough to just see the patient's face. Even still, seeing a patient's entire body was seen as being valuable. Participants said that they would like to see patients' body language and behavior, such as fidgeting with one's hands or feet. This information could be lost if patients held their phones or the entire body was not present.

Participants also told us that their inspection of a patient happened not only in the exam room, but also outside of the appointment in the waiting room. They would often glimpse at how patients looked when waiting, how they interacted with staff, and how they

walked into the office. This kind of auxiliary information was able to provide doctors with important clues about patients' overall status. They believed that their clinical gestalt, which was built with years of experience, was helpful to provide additional insights. Participants felt this kind of information could easily be lost over video.

Like Parkinson's… how long you were to kind of stand up, their gates, a little bit shuffled or you're noticing a little tremor…Sometimes I'll hear them checking in with the front staff and they just seemed a bit more confused or something…So you're seeing kind of this interaction with other people ... –P5, Female, 43

Our video scenarios depicted actors capturing various areas of their body with mobile phone cameras. Participants felt that some areas would be easy to capture, yet others, such as the back of one's thigh, could be more difficult. They felt that it could be hard to see what the camera was capturing due to its orientation.

Well, it might not be the best devices and they might not be able to, for example, a person coming in on a rash on the back thigh. –P6, Male, 32

Participants also talked about having to give instructions to patients about how to move their camera to get the best view possible (e.g., "Move the camera left"). This was felt to be challenging to do and participants thought it would take extra time. There was also concern that participants may take photos ahead of time, but due to quality issues or capturing the wrong thing, they may have to redo them based on the doctor's instructions.

Patient and Doctor Privacy

First, participants raised concerns that patients would not be able to know whether there were other people present on the doctor's side as patients would be unlikely to see the whole room with a typical web camera. This was important to them because they wanted to ensure that patients felt they could trust them, and trust could come from seeing the area around them in a video call and knowing nobody else was present.

Second, participants talked about the varied locations in which they were able to conduct a video call on their end. This could affect their privacy as well as the patients' privacy. For example, one participant talked about holding video-based appointments from her home office in the late evening and the possible risk for patients. She said that she made patients aware of the situation and they could accept the risk.

My daughter wakes up in the middle of the night and comes hopping on by, they see in the video camera there's this little kid. But the thing is they know me, they know I'm doing it my home. They know that she is going to sleep in the next room. They accept that risk. –P1, Female, 51

In reacting to the Private Parts scenario, participants talked about the possibility of encountering malicious patients who may exploit an appointment for sexual gratification and thereby infringe on the doctor's privacy and control over what they were seeing. Participants said they usually had a chaperone when doing sensitive exams in the office. On one hand, this ensured patients received an appropriate exam, and on the other hand, it was to protect doctors from being harassed. Participants felt that privacy in a video appointment could be fragile involving examining sensitive or private areas of one's body.

There are also some patients who are, who want to show you their stuff…Creepy, right? And it just feels like this could go wrong. – P1, Female, 51

With a video appointment, there is the potential for either the patient or the doctor to record the video. This could even be done surreptitiously without the other party knowing. Participants generally felt that it was acceptable for patients to record video appointments with the doctor's permission such that they could play back the doctor's instructions or diagnosis as needed. Yet they also had concerns about being exposed to lawsuits if there were malicious patients who recorded the video without asking for permission. One participant said that doctors might also face the risk of being accused of illegitimate video recording of the patient.

Could anything ever come back to me in the future that you know? 'Well, I think the doctor recorded my private exam.' How do I prove that I didn't? Right? If they were in my exam room, like Duh, I didn't record it cause there's no equipment. –P1, Female, 51

Discussion and Conclusion

The physical space for in-person appointments provides doctors and patients with control and privacy. It provides space awareness [3] to prevent 'eavesdroppers' and direct physical assistance to protect doctors and patients from being harassed or having their privacy violated. In contrast, the level of control in video appointments for doctors is much more limited. To help with the space awareness, a previous study in telepsychiatry [11] suggested panning the camera to show the office space. It could be used for primary care appointments, for example, 360-degree cameras to ensure the entire space can be seen. In relation to patients' privacy, many participants were resistant to privacy intrusive scenarios such as examining private parts because, in real situations, patients would likely not properly drape their body to avoid too much exposure. It reveals challenges of controlling the view under media space to protect the privacy. This suggests design ideas such as showing areas only required to be exposed to doctors supported with computer vision algorithms. However, a patient-centered study is likely needed to evaluate the acceptance of this approach.

We also see design opportunities for cameras that would allow doctors to observe patients in different ways: observing patients' whole bodies or particular body parts, or instructing patients to perform certain actions. Appointments over video turns examinations, which work smoothly in-person, to be challenging with mobile phone cameras in the home. Designs for home-based appointments may consider how the video-mediated collaboration between doctors and patients can be assisted with current mobile devices or new equipment easy to be deployed without much cost.

This work-in-progress paper explored socio-technical challenges in video-mediated appointments from the perspective of family physicians. We see design opportunities in terms of how to help doctors control the flow of the appointment, how to design camera solutions in the home collaborating with mobile devices to better support capturing various body parts, and how to mitigate both patients and doctors' privacy concerns. However, future work is needed to refine and mature stronger design implications.

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