Facilitators and Barriers to Smartwatch Use Among Individuals with Chronic Diseases: 
A Qualitative Study

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Introduction

Wearable devices like smartwatches contain multiple features that promote health, like step-tracking, access to fitness apps, and heart rate monitoring (Tudor-Locke, Williams, Reis, & Pluto, 2002). These devices track energy expenditure, encourage increased exertion, and promote awareness of daily physical activity levels (Beighle, Pangrazi, & Vincent, 2001). They can provide customized feedback to users that allow caregivers to more accurately monitor health (Boletsis, McCallum, & Landmark, 2015) and keep track of long-term health data (Jovanov, 2015). These features can be especially helpful for individuals with chronic diseases given that these conditions require active monitoring and a lifelong commitment to physical activity. However, there are barriers to smartwatch use that need to be considered, such as cost and wearability (James & Harville, 2015). Therefore, it is imperative that health professionals and care providers assess the feasibility of smartwatch use before making recommendations for their use among patient populations.

The goal of this project was to conduct a needs assessment of smartwatches for middle-aged adults with chronic diseases. Few studies have looked at the potential that smartwatches have in health interventions and the majority of work that has been done in this area has focused on software development (Lutze & Waldhor, 2015) and the functioning of specific features (Kalantarian, Alshurafa, Nemati, Le, & Sarrafzadeh, 2015). This work is important, but overlooks the benefits and drawbacks of how these devices may be used in everyday life to manage care. Given this, the current study was driven by the following inquiries:

RQ1: Do patients with chronic conditions report interest in using smartwatches to monitor their health?
RQ2: What is the likelihood that patients with chronic conditions will engage with smartwatch technology?
RQ3: How do individuals with chronic conditions describe the reasons for which they would use a smartwatch to monitor their health?
RQ4: Is there a need for smartwatches among individuals with chronic conditions?

Methods
All participants were employees of a regional health clinic and were recruited by a clinic administrator after the researchers received approval from a university Institutional Review Board. Employees were informed of the study and those interested/qualified contacted the principal investigator to arrange meeting times. All data collection took place at a regional clinic and participants received $25 for their time.

Of the 27 total participants (21F), 25 participated in the interviews (two opted-out of the interview). All 27 completed the questionnaire. Participants were between the ages of 42 and 65 and had such chronic diseases as type 2 diabetes, hypertension, and obesity. They were asked about their comfort with using technology, the role that technology plays in their lives, their likelihood of trying new technology and using smartwatches, the extent to which they talk with members in their social networks about technology, and potential barriers to smartwatch use. Interview length ranged from 15 to 45 minutes.

Participants reported having a variety of educational backgrounds, which included high school (n=7), trade school or associate degree (n=9), college degree (n=9), and graduate school (n=2). Participants’ self-reported races included Caucasian (n=12), Hispanic or Latino (n=7), African American (n=7), and Pacific Islander (n=1).

Analysis
After reading through the transcribed interviews multiple times, the researchers worked together to create and refine a codebook based on the themes that had emerged. An independent coder conducted an inductive, emerging thematic analysis. The coder was trained by the primary investigator. After reviewing an initial transcript together and clarifying definitions in the codebook, the two independently coded a subset (20%) of the transcripts. After establishing reliability (the percentage of agreement was 93%), the trained rater coded the remaining transcripts.1 Transcripts were coded for the presence or absence of each theme.

Results
Nine themes emerged among the interviews. Sixty-eight percent (n=17) reported wanting to use smartwatches to take control of the condition, 64% (n=16) expressed interest in a device that provides motivation for engagement in physical activity, 36% (n=9) described an interest in smartwatches if they could be used as replacements for inconvenient health devices (i.e., blood pressure monitoring devices), and all of the participants reported wanting more access to their health data. All of the participants reported having discussions about smartwatches with family members and friends, but 88% (n=22) indicated that they would be more motivated to purchase a smartwatch if their doctors recommended they do so. Eighty percent (n=20) reported that cost would be the biggest barrier to use and approximately half of the participants (n=12) reported that

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1 The majority of themes were coded as present, rather than absent, in a significant number of transcripts. Therefore, there was a prevalence bias in the coding that prevented Cohen’s kappa from serving as an appropriate measure of inter-coder agreement (Cicchetti and Feinstein, 1990).
wearability would be an issue (comfort and style of the smartwatch). Additionally, 32% (n=8) indicated that they would only be interested in using a smartwatch if it were user-friendly and easy to use. Table 1 contains definitions of each theme and examples from the transcripts.

The questionnaire was composed of 47 Likert-type items (1 = “Strongly Disagree,” 5 = “Strongly Agree”) measuring technology knowledge, new communication technology use, health technology use, and attitudes toward wearables. The mean scores for self-reports of technology knowledge (Cronbach’s $\alpha = .91, M = 4.83$), comfort with using new communication technologies (Cronbach’s $\alpha = .85, M = 4.09$) and comfort with using health technology (Cronbach’s $\alpha = .94, M = 4.51$) were higher than the mean score for attitudes toward wearables (Cronbach’s $\alpha = .84, M = 3.90$).

Furthermore, 88.89% agreed that using wearables would be helpful, 77.78% believed that wearables would be easy to use, 96.30% believed that wearables would be a good idea, and 88.89% reported that using a wearable device would be fun. However, only 51.85% said they would consider using wearables in the next three months and a smaller number of participants (33.33%) reported that people who influence their behaviors have encouraged them to use wearables.

Discussion and Conclusions

The lower mean score for attitudes toward wearables suggests that even though participants viewed themselves as competent technology users, they still had some reservations about using wearable devices. Participants reported high levels of comfort with using new communication technologies and yet, only about half of the respondents indicated interest in using a wearable in the near future. Additionally, only one-third of the participants reported that those close to them have encouraged them to consider using wearables, highlighting the need for communication among social network members when promoting these devices. This suggests that there are opportunities for doctors to bring up the use of wearables with their patients, especially given that nearly 90% of the participants said that they would be more inclined to use smartwatches if their doctors suggested they do so.

Findings from the interviews suggest that participants are interested in using smartwatches for purposes of controlling their conditions and for being motivated to engage in healthy practices. The step-tracking function was the most appealing feature of the smartwatch and led a few of the interviewees to comment on the benefits of having a device that prompts them to partake in healthy behaviors (physical activity and diet). It should also be noted that the majority of participants reported being tech-savvy and expressed interest in learning more about smartwatches. This information is helpful for answering RQ1 (Do patients with chronic conditions report interest in using smartwatches to monitor their health?) and RQ2 (What is the likelihood that patients with chronic conditions will engage with smartwatch technology?). Participants reported wanting more access to their health data and, because they were all employees at a health clinic, described that the patients they interact with also want more access to their doctors and to their health information. This feedback sparked a discussion about the role of technology in patient care. Namely, that electronic medical records provide patients with more access to their care providers and allow them to be owners of their information in ways that were not possible with paper records. Given this, it would be interesting to look
at how smartwatches and EMRs can be used in conjunction with one another to better inform doctors and patients of patient progress.

With regard to RQ3 (How do individuals with chronic conditions describe the reasons for which they would use a smartwatch to monitor their health?), it seems that, if cost was not an issue, interviewees would report doctor recommendation as the biggest reason for using a smartwatch. Other reasons had to do with improving time management and making it easier for the individual to monitor his/her health. Additional works needs to be done before drawing conclusions about RQ4 (Is there a need for smartwatches among individuals with chronic conditions?). While there was certainly an interest in smartwatch use among the interviewees, the question of whether there is a need for smartwatches in this context remains to be seen.

The generalizability of the findings are limited given the small sample size, but they do illustrate that the participants were interested in using smartwatches if they could help manage their conditions and motivate them to engage in healthier behaviors. Participants also reported being more likely to use a smartwatch if their doctors recommended they do so, more so than if their friends had suggested it. The findings from this study show that there is interest in using smartwatches to help manage chronic conditions, but there are still factors preventing large-scale adoption of these devices. Future work should focus on moving from feedback to persuasion by assessing message features and composition of smartwatch notifications.
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<th>Theme</th>
<th>Definition</th>
<th>Examples</th>
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<td><strong>Facilitators to Use</strong></td>
<td>This theme occurred whenever the participant described wanting to use a smartwatch or other type of technology to gain more control over his/her chronic condition (i.e., diabetes, high blood pressure) and do a better job of living a healthy life. The participant may describe this as wanting more freedom or independence, or explain what they are currently doing to maintain control over their health condition.</td>
<td>“I don't let it get out of control because I remember before me being diagnosed with hypertension, I just didn't like the feeling and it really scared me. I didn't know what was going on.”&lt;br&gt;“If that was available in the stores I would buy it just so I could have that option. If I'm not feeling to well, and I'm not sure what's going on, one of my first go-to's are to schedule an appointment with the doctor, go in and really all I want is for that little, it's like a little device that clips on to your finger and let them do that so I can determine if my oxygen levels are at ninety-nine percent or fifty percent.”</td>
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<td><strong>Taking Control of the Condition</strong></td>
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<td><strong>Access to Health Data</strong></td>
<td>To data: This category occurs when the participant describes having access to his/her health information and data or a patient’s ability to have access to health data. Appears mostly in the context of electronic health records, but some participants did describe the appeal of having a smartwatch that would allow them to have all of their health data and information in one place. To providers:</td>
<td>“I think that them having access to their own health data is definitely something I would say patients like that.”&lt;br&gt;“The option of having a new tool to use and it's pretty cool. Giving me the information, the useful data.”</td>
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Participants described that they like using electronic health records because they give them more frequent access to their care providers.

**Motivation/Guidance**

Interviewees expressed interest in using a device like a smartwatch if it could motivate them to engage in more exercise or offer some guidance for keeping track of regular physical activity. The step-tracking feature and the heart rate monitor were the most attractive features for participants. Some of the interviewees also had an interest in using fitness apps on the smartwatch.

“I don't know all what I should and should not do, it's good to have those things to kind of warn me that I need to pick this pace up.”

“This job has me sitting on a chair and it's going to be tough but I know friends or co-workers that go walking on their breaks, their lunch, as long as you can deal with the heat. If nothing else I said I'm going to walk when I get home. I don't know that I'll get those 10,000 steps in daily. I'm almost sure I won't, but on the weekends I might have a better chance.”

**Social Network**

Some participants described an interest in using smartwatches or other health technologies to encourage fitness among family members and friends. When asked if opinions about smartwatches from members of one's social network would be influential, interviewees explained how their friends/family members use technology.

“Yes. I would love it. I would want to team up with that family member. My daughter is overweight and I would love for her and I to team up together. We do things together a lot. She still lives at home right now. She's going to school. She's older, but she's my friend. I think that she would be more motivated as well, but right now, me, I need to lose 20 pounds because I've gained since I've been operator in this particular room where I am now. But, that would be the best motivator right there. I think just bing bing bing bing. Watch my steps. I walk at break at 9, I walk at
| **Trust in Doctors** | Participants were asked if they would be more motivated to use a smartwatch if a friend or family member recommended it and were then asked if they would be motivated by a doctor’s recommendation to use a smartwatch. The majority of interviewees replied being more likely to use a smartwatch if a doctor recommended it. | “Yeah probably a doctor would be more influential than just say family or friends.”

“If the doctor said you're probably going to get something out of this or this is the best way to monitor this, then I would probably say yes.”

“If a doctor would be recommending that for me, then I am assuming that he would be suggesting it for my best interest.” |
| **Replacing Inconvenient Health Devices** | When asked about use of health monitoring devices other than smartwatches (i.e., cuff for checking blood pressure, glucose monitoring device) some participants explained not wanting to use these devices because they were not convenient. Some participants explained that they would be more willing to use smartwatches if they could provide a more convenient way to monitor heart rate, blood pressure, glucose levels, etc. | “Well, it's easier access. The technology, if it's helpful, and it's easier to get to have access to it, then I think that's definitely plus.”

“…embarrassing to have to plug those [nebulizers] up and catching that attention because they are so noisy.” |

**Barriers to Use**

**Cost**

Any comments about cost as a deterrent and the role that cost plays in the participant’s discussion about whether he/she would consider owning a smartwatch. | “It has been in the news a lot that these devices are really great, but pricing is a little bit hard to swallow right now.” |

**Wearability**

Discussion about comfort of wearing a | “The comfort and the flexibility and just |
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<th>Watch, fashion/design of smartwatches, ability to do everyday duties while wearing the watch, etc. Any expression of concern about the comfort and style of smartwatches.</th>
<th>making sure that it felt comfortable and not that it was just ... Oh, and if it was waterproof.”</th>
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<td>User-Friendly</td>
<td>Interviewee said that it would be important that it’s user-friendly, important that there is a book/instructions that he/she can follow, or asked if the watch is easy to use/user-friendly.</td>
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References


