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Mobile and Wearable Technology Needs for Aging in Place: Perspectives from Older Adults and Their Caregivers and Providers

Jing WANG, PhD, MPH,RN [a, b,1] , Deidra CARROLL, MPH [a], Michelle PECK, MSN, MPH, RN [a], Sahiti MYNENI, PhD [b], Yang GONG PhD, MD [b]
[a] *School of Nursing, University of Texas Health Science Center at Houston, Houston, TX, USA* [b] *School of Biomedical Informatics, University of Texas Health Science Center at Houston, Houston, TX, USA*

Abstract. There is an increasing number of wearable trackers and mobile devices in the burgeoning world of digital health, the purpose of the study is to explore the role of these mobile and wearable tools among older adults aging in place. We conducted a cross sectional study using individual interviews with older adults and surveys with their caregivers or providers. We interviewed 29 residents living in a retirement community, and surveyed 6 caregivers or providers. The older adults had an average age of 88 years, most did not express interests on technology and heavily relied on providers for health tracking, while their professional caregivers or providers saw a great need to access older adults' health information collected from these mobile and wearable tools. Educating the older old on the benefits of mobile and wearable tools may address such discrepancy on needs of adopting mobile and wearable tools for aging in place.

Keywords. Aging in place, mobile health, wearable devices, older adults, needs analysis, patient engagement

1. Introduction

According to recent reports from the US Census Bureau, the number of people age 65 years or older in the U.S. grew from 44.7 million in 2013 to 46.2 million in 2014. With Americans living longer than they have at any point in history, one of the new Healthy People 2020 goals is to improve the health, function, and quality of life of older adults, many of whom want to age in place.

Aging in place can be defined as living in the community, with some level of independence, rather than living in residential care. Aging in place is beneficial because it enables older people to maintain independence, autonomy, and connection to social support [1]. Aging in place involves a variety of considerations including: finances, built environment, community services, informal caregivers, and professional caregivers. Ideally, the goal of aging in place is to strike a balance between the physical, mental, emotional, and social needs of the person.

[1] Jing Wang, PhD, MPH, RN, Associate Professor of Nursing and Biomedical Informatics, Nursing Systems Department, 6901 Bertner Avenue, SON 614, Houston, TX, USA 77030; Email: jing.wang@uth.tmc.edu.

With the progressive growth of the elderly population aging in place, there are growing interests in how technology may enhance the aging in place experience, including the new area on "gerontechnology" [2]. While technological innovations seem promising, there is a number of challenges for implementing technology amongst older adults including economic barriers and challenges unique to the aging population such as familiarity with and access to novel technology [3]. Researchers noted the importance of strengthening the evidence base for these technologies and assessing the efficacy of technology for older adults as it relates to the end goal of aging in place and not merely focusing on the effectiveness of the device in and of itself. In short, it is essential to understand the impact that gerontechnology is having on older adults.

There are increasing numbers of personal health devices including wearable trackers, mobile devices, and remote monitoring devices in the market for individuals at all ages including older adults, however, it is unclear how these technology options can facilitate older adults aging in place and how older adults and their caregivers and providers view these new technology options. The purpose of this study was to explore the perspectives from older adults and their caregivers or providers on the role of these mobile and wearable technology tools for older adults aging in place.

2. Methods

Using a cross sectional study design, we developed needs analysis interview questions for older adults aging in place and surveys for their caregivers or providers. The study was conducted at a retirement community with assisted living, independent living, and healthcare/nursing facility sections. Per aging in place definition, only residents at the assisted living and independent living sections were interviewed for the purpose of the study focusing on aging in place. After completing a community assessment which included conducting a windshield survey, interviewing stakeholders within the retirement community, and interviewing older adult residents, along with a systematic review of currently available mobile apps, wearable trackers, and personal health devices, we developed an interview guide to determine if residents would be interested in mobile and wearable health devices as a means of tracking their health. We also developed a companion survey for their caregivers or health care providers who regularly interact with residents to assess their perspectives on the use of mobile and wearable tools in the retirement community. This study was approved by the Committee for the Protection of Human Subjects, at the University of Texas Health Science Center at Houston.

A structured interview guide was designed to gather information on older adults' perspectives toward technology for aging in place. Residents were asked questions about aging in place, for example, Do you feel home here? Do you feel safe here? Are you familiar with the place here? Do you feel you have independence here? Do you feel you have autonomy here? And, do you feel you are connected to social support here? As it relates to technology, residents were asked about their experience using computers, mobile devices and applications as well as how often such devices are used. In addition, they were asked about their interest in learning how to use and wear personal health devices, types of information they would be interested in tracking and sharing, concerns about using wearable health devices.

Providers or caregivers were asked to report their interest in having older adults use a device for tracking a variety of health data including daily steps, calories burned,

sleep quality, heart rate, breathing, blood pressure, blood glucose, etc. Those who were interested in having older adults use wearable devices were asked follow-up questions regarding how they would like to access this data (i.e., via electronic health records, a website connected to the personal health device, downloadable files from the devices, smartphone applications, etc.), the format in which they would like to see the health data presented, how often they would be interested in viewing this data, and ways in which they would use the data to provide feedback to the elderly. Additionally, they were asked to select the strategies they believed would help them learn to use wearable devices and explain those devices to the older adults they care for, and their perspectives on the barriers and benefits of mobile and wearable health devices.

3. Results

Twenty-nine residents at Holly Hall Continuing Care Retirement Community Center participated in the study: 17 from the Assisted Living section of the retirement community and 12 from the Independent Living section. The activity coordinator at the retirement community placed study flyers and recruitment letters in residents' mail boxes and those who showed interest in the study were interviewed by study personnel. Demographic characteristics of the older adult sample were presented in Table 1.

Table 1. Demographic Characteristics of Older Adult Sample

Characteristics	Assisted Living (n=17)	Independent Living (n=12)
Gender		
Female	12 (71%)	9 (75%)
Race		
White	14 (82%)	12 (100%)
Black	2 (12%)	0
Age (in Years: Mean)	90	86
Had A Chronic Illness	14 (82.4%)	8 (66.7%)

3.1 Residents Aging in Place

Of those living in Assisted Living, over half of the residents (9 out of 17) came to this living situation as a result of their increased aging or due to a medical illness. Thirteen of the 17 residents reported feeling at least somewhat at home living at the facility, and 70% (12 out of 17) reported being happy there. In addition, 65% (11 out of 17) reported feeling like they have independence, 29% (5 of 17) feel somewhat independent and 6% (1 of 17) do not feel independent. Eleven of the residents reported feeling at least somewhat connected to social support at the facility.

As it relates to residents living in the Independent Living section of the community, similar to those in Assisted Living, half of the residents (6 out of 12) came to the facility due to their age or illness. Ten out of 12 residents report feeling at least somewhat at home there. All residents living in this section of the retirement community reported feeling as though they had independence as well as autonomy. And all but one resident reported feeling connected to social support at the facility.

3.2 Perspectives from Older Adults Aging in Place

As it relates to their perspective of using technology, 14 out of the total 29 reported having access to a computer, cell phone, or tablet. Of the 14 individuals, eight reported using apps or checking email on these devices. Five said they were introduced to these devices through family or friends, and four said they were introduced to the technology through work.

Only 4 out of the total 29 residents had ever used a wearable health device. Twenty-two reported not being interested in learning how to use or wear a personal health device after being told that these are small devices to be worn on the body and that are used to track various types of health information. Similarly, five of the residents said that they would be interested in having a device that monitors their health for them. Overall, most of the residents (24 of 29) reported a preference that someone else would manage their health for them – someone else being either their health care provider (13 of 29) or a family member (3 of 29).

Six of the total 29 individuals reported that they would be interested in tracking health information such as steps, distance, calories, hours of sleep, falls, active minutes, sleep quality, heart rate, body posture, blood glucose, and blood pressure. For those who are interested in tracking health information (6 out 29), the most common concern was the price which was reported by 4 of the 6 residents One person thought it might be burdensome to have to learn how to use it and another person was concerned about the technology getting wet and then not working. This same resident also reported that he/she would be interested in sharing health data collected from the wearable device with other people he knows only from the internet. The other 5 residents who reported being open to wearable devices said that they would not be interested in sharing such data.

3.3 Perspective from Caregivers and Health Care Providers

Six caregivers or health care providers caring for older adults at the Holly Hall Retirement Community Center completed the survey. Three described themselves as certified nursing assistants, one as a charge nurse, one as a caregiver on medication administration, and 1 as a resident life enrichment coordinator. Five of them had over 10 years of experience caring for older adults.

They reported that they would be interested in seeing data on the seniors' breathing, fall risk, walking distance, sleep quality, heart rate, blood oxygen level, body posture, blood pressure, weight, mood, fatigue, blood glucose, steps, hours of sleep, active minutes, calories burned, and location. Some would like for seniors to track this data for self-care, but reported that they would not be interested in reviewing such data.

When asked how they would like to access seniors' data, all responded that electronic health records or downloadable files from the device would be a preferred method. All reported that they would be interested in giving residents who use wearable devices feedback during a face-to-face visit with the individual, and that they believed such devices would help them to individualize care to the older adults living in the facility. Five reported that they believe the major obstacle in accessing and reusing information from wearable devices would be legal and accuracy-related.

Three providers strongly agreed that these devices would help older adults age in place for a longer period of time. Four providers strongly agreed that the devices would help them identify precipitating factors that would prevent adverse events such as heart attacks, falls, etc.

4. Discussion

Older adults living in the assisted living and independent living sections of the retirement community mostly felt like aging in place at their current apartment or cottage homes, they did not express much interests on the use of mobile and wearable healthcare technologies, nor did they understand the existence of these technology tools. However, they trusted and relied on their providers to know their health status including monitoring of blood pressure and other applicable biomarkers to keep them healthy. The professional caregivers or providers mostly expressed needs in accessing such data to facilitate their care of older adults aging in place, though not all are interested in reviewing all data.

There are several limitations to this study. First, the older adult sample had an average age at 86 or 90 years old with relatively higher socioeconomic status before retirement, this sample may have a quite different view from the younger old and those with a lower socioeconomic status. Second, the sample was also all residents at a retirement community with easy access to a nursing facility and health care providers under one roof. Aging in place older adults living in other independent communities may have different opinions. Third, the small sample size limits the study generalizability. There was a lack of family caregivers' perspective in this study. T Fourth, as the first exploration of aging in place seniors' preference toward mobile and wearable technology, a cross sectional design was used, participants did not actually try the mobile and wearable technology mentioned in the survey.

In summary, there is a discrepancy between the needs of the older adults on using mobile and wearable technology tools, and the needs of their caregivers or providers wanting to track information collected from these tools. Studies with longitudinal designs and with participants using the actual technology using a larger and more diverse sample are warranted for future investigation. Since mobile and wearable technology tools have the potential to facilitate the needs of caregivers and providers to manage aging in place seniors' health and enhance connection with them, educating the older old on the benefits of these tools may potentially address the challenge of patient adoption and engagement.

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