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Methodological Review

Older adults and mobile phones for health: A review

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ABSTRACT

Objective: To report on the results of a review concerning the use of mobile phones for health with older adults.
Methods: PubMed and CINAHL were searched for articles using "older adults" and "mobile phones" along with related terms and synonyms between 1965 and June 2012. Identified articles were filtered by the following inclusion criteria: original research project utilizing a mobile phone as an intervention, involve/target adults 60 years of age or older, and have an aim emphasizing the mobile phone's use in health.
Results: Twenty-one different articles were found and categorized into ten different clinical domains, including diabetes, activities of daily life, and dementia care, among others. The largest group of articles focused on diabetes care (4 articles), followed by COPD (3 articles), Alzheimer's/dementia Care (3 articles) and osteoarthritis (3 articles). Areas of interest studied included feasibility, acceptability, and effectiveness. While there were many different clinical domains, the majority of studies were pilot studies that needed more work to establish a stronger base of evidence.
Conclusions: Current work in using mobile phones for older adult use are spread across a variety of clinical domains. While this work is promising, current studies are generally smaller feasibility studies, and thus future work is needed to establish more generalizable, stronger base of evidence for effectiveness of these interventions.

Contents

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1. Introduction

New technologies and innovations have promised to make tasks faster, safer, and more efficient and effective. Technological innovations have already been used to bridge health disparities and meet unmet needs of populations [1]. While many previous systems were constructed with clinical professionals and healthcare administration in mind, there has recently been an increasing interest in applying these new technologies to consumer health, empowering patients to take control and play an active role in managing their health. Consumer health technology interventions have been used, for example, to help individuals monitor their own health [2], to provide information and social support [3,4] and for remote home monitoring [5].

One example of a technology that can potentially support a consumer health focus includes mobile phones. Within the United States, an increasing number of people are subscribing to mobile telephony services, rising from 44.2% penetration in 2001 [6] to 83% penetration in 2011 [7] in American adults. The growth of mobile phones has led to a scenario where mobile phones are considered ubiquitous among the population. In fact, even older adults, who as a subpopulation may be viewed generally as technological laggards, have also been obtaining mobile phones at increased rates. As of 2012, 69% of older adults aged 65 or older owned a cell phone [8]. Consequently, older adults are more likely to own a mobile phone than a desktop (48%) or laptop computer (32%) [8]. This suggests that if system designers were to select a technology platform that would reach the majority of older adults, mobile phones would be ideal due to their high penetrance rate.

Over the next 20 years, the number of adults aged 65 years or older in the United States is projected to grow briskly, rising from 40 million in 2010 to 72 million in 2030 [9]. As an individual ages, there is an increased likelihood of having a multiple health problems or comorbidities [10], which leads to an increasing need for health and/or disease management interventions. While medications may be part of the intervention, they cannot help with other activities, such as lifestyle changes and health monitoring. For example, previous interventions include smart homes for health monitoring [11,12], videophones for telehealth applications [13], and sensors for fall detection and mobility [14,15]. These demographic trends, combined with the growth of mobile phone telephony among the older adult population, suggest that using the mobile phone as a platform for interventions in health may be a viable way forward.

Given the rapid growth of mobile phones, and its potential as a platform for improving the health of older adults, along with the projected growth of population, it is important to examine current evidence of use of mobile phones by older adults for health purposes (including communication, education, and health monitoring), and understand gaps and challenges in order to inform the design of future systems given the ubiquity of mobile phones. The purpose of this literature review was to examine the current state of mobile phone use for health related interventions targeting older adults.

2. Methods

2.1. Literature search

The literature search was informed by the following research questions:

1. How have mobile phones been used for health interventions that target older adults?
2. What is the level of evidence for the effectiveness of mobile phone based health interventions with older adults?

Relevant literature was identified via searching PubMed and CINAHL. We searched PubMed with combinations of MeSH terms "Cellular Phone" and "Aged" as well as keyword terms, such as "Mobile devices" and "Older adults." Within CINAHL, we utilized the subject heading of "Aged" with other keywords of "elderly," "older adult," with keywords for mobile phones, including "mobile phone," "cell phone," "cellular phone," "cellular telephone," and "mobile telephone". Articles were included if they were published between 1965 and June 2012.

2.2. Inclusion/exclusion criteria

The aim of this review was to survey the current state of the field, where mobile phone interventions were explored for the purposes of improving or managing the health of older adults. Consequently, in order to be eligible for the review, the projects needed to utilize a mobile phone as an intervention, involve or explicitly target adults that are 60 years of age or older, and have an aim that emphasizes the mobile phone's use in health or health issues. Within the initial search, abstracts were reviewed by the first author (JJ) to determine if they matched the aforementioned criteria. Once these articles were filtered, the remaining full text articles were analyzed by both authors for a more detailed review. Articles were eliminated if the focus of the project was on unrelated non-health aspects of a device or intervention, focused solely on the technology, or was not published in English. We also excluded reviews and other articles that did not contribute original research. Articles that were unclear on how they fit into the scope of the criteria were resolved via discussion. For each study included, we scored the level of evidence based on the Oxford Centre for evidence based medicine framework by both authors [16]. This framework introduces levels to help assess the strength of evidence of study findings. The framework includes 5 levels (Level 1: Meta analyses, Level 2: Randomized Trials, Level 3: Non-Randomized Studies, Level 4: Case studies, Level 5: Mechanism based reasoning). For our purposes, studies that included observations within a laboratory were classified as level 4. Per the framework, cohort studies of poor quality prognostic studies were classified as level 4.

3. Results

The initial searches on PubMed and CINAHL yielded 310 articles, and 200 articles, respectively, for a total of 510 articles, before removing duplicates or filtering. Articles were eliminated based upon review of titles and abstracts, yielding 85 articles, 73 from PubMed and 12 from CINAHL. The 85 remaining articles underwent full review and 63 articles were eliminated, leaving 21 articles were included in the final set. The 21 resulting articles from the filtered searches were categorized into 10 major clinical domains, which are discussed in more detail below. Table 1 summarizes the articles included in the review.

3.1. Activities of daily life

New mobile technologies, such as the mobile phone have opened new opportunities in rural homecare. Kotani et al. recruited 19 elderly participants in a rural area under home care for chronic disease and requested that they use a mobile phone camera to log activities of daily life, rather than writing it down on paper to demonstrate the practicality of the technology for elderly home care (Level of Evidence: 4) [17]. The trial was successful due to the technology's acceptance by older adults, including those who refused traditional instant cameras, with 16 out of 19 (84%) subjects agreeing to take photos with the mobile cameras. The study also suggests that using mobile phone cameras is a promis-

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