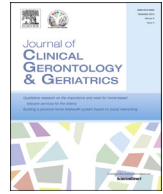




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Original article

## Social networking-based personal home telehealth system: A pilot study

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## ABSTRACT

**Background/Purpose:** Although useful vital sign monitoring equipment and information communication technologies are readily available, many researchers and businesses are still attempting to expand coverage, yet expectations for the widespread adoption of home telehealth services have not been realized in Taiwan. The practical application of such systems are often found to be too complicated, too costly, and users, both older adults and professional caregivers, lack adequate motivation or experience to use the systems effectively.

**Methods:** This paper describes a personal home telehealth system—Care Deliver Frame (CDF)—for older adults based on social networking, which transforms the home telehealth system into a platform for communication and care between older adults and their family members. The system is linked to existing social networking sites such as Facebook to encourage interpersonal communication between older adults and younger family members. The home telehealth system is implemented on personal mobile devices in the form of Apps. The scale and cost required for implementing the personal home telehealth system are greatly reduced.

**Results:** From the pilot study of user evaluation, CDF was well accepted by the older participants and their children. Even though this evaluation is based upon a small sample size, it provides a good insight into participants' behaviors, preferences, and expectations, which helps to determine the future development of CDF.

**Conclusion:** CDF presented in this paper extends the value of a home telehealth system from the provision of health care to enhancing older adults' interpersonal communication and social participation.

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## 1. Introduction

## 1.1. Typical home telehealth systems

Telehomecare, or home telehealth, can be defined as “the use of information and communication technologies to enable effective delivery and management of health services at a patient's residence”.<sup>1</sup> Having a home telehealth system allows information and communication technologies (ICT) to assist in caring for older adults and allows them the dignity of remaining in their own home for as long as possible, which is an important health management trend in an aging society.

The current market provides a variety of products and services designed and launched with different needs and application scenarios in mind for the care of older adults. For example, the Personal Emergency Response System (PERS) enables the user to call for help in an emergency by pushing a button. The Lifeline System (<http://www.lifelinesys.com>; Philips Lifeline, Massachusetts, USA) founded in 1974 is one of the earliest examples of PERS. Activities of daily living (ADLs) refer to the daily tasks that are required for personal self-care and independent living, such as eating, dressing, or bathing.<sup>2</sup> The ageing process is an expected cause of limiting ADL performance that changes from advanced or moderate ADLs to a lower, basic ADL level.<sup>3</sup> Traditional ADL assessments for older adults usually rely on subjective judgments by clinical or specialized personnel. The Lifeline Vi System, developed by Tunstall Healthcare (UK) Ltd. (<http://www.tunstall.com>, Whitley, Yorkshire, UK), provides a hub for telecare in the home and is compatible with

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a wide range of sensors for monitoring the daily living of older adults in a nonintrusive way.

Long-term wellness monitoring provides services that are designed for older adults who have chronic diseases such as diabetes. For example, the Health Buddy System (<http://www.bosch-telehealth.com>) collects and transmits vital signs data, such as blood pressure, blood glucose, weight, etc., to a secure data center. Caregivers and family members have instant access to patient data on computers or mobile devices. The medical community (doctors, nurses, emergency response workers) also shares the long-term monitoring data.

Telerehabilitation or e-rehabilitation involves the delivery of therapeutic rehabilitation interventions using telecommunication technologies.<sup>4,5</sup> Telerehabilitation programs offer more convenient and efficient service choices for patients or older adults undergoing rehabilitation.<sup>6</sup> Using advanced technologies such as motion tracking, motion detecting, computer graphics, and visual technologies, a patient can be treated at home and learn the proper corrective movements without the need to go to hospital, thus saving time, cost, and manpower.<sup>7,8</sup>

As described in the above-mentioned cases, home telehealth systems generally focus on building connections between home environments and home telehealth service providers. The technical emphasis is often on establishing an information channel for health-related data transmission between homes and home telehealth service providers, and a variety of health-related data are stored in a centralized database for further analysis and processing.

### 1.2. Challenges to home telehealth systems

In addition to health problems, the greatest risks for older adults are isolation and loneliness. Isolation refers to a person being physically separated from others, such as living alone; loneliness, in contrast, refers to a person who mentally feels lonely.<sup>9</sup> In Stockholm, a survey among older adults shows that 35% of 1725 people over the age of 75 years had experienced loneliness. Loneliness easily causes disorders in an older adult's life such as depression and insomnia.<sup>10</sup> Steptoe et al<sup>11</sup> also assessed social isolation in 6500 men and women aged 52 years and older who had participated in civic organizations from 2004 to 2005. After conducting interviews and statistical analysis for 8 years, the results showed that both isolation and loneliness were significantly associated with mortality. Some studies also showed that social interactions are essential especially for older adults, to reduce social isolation, loneliness, and improve psychological well-being.<sup>12–14</sup>

Most home telehealth systems focus on health management and health care for older adults. However, from a psychological perspective, more attention should be paid to communication and emotional needs of older adults as a central facet of elder care. Older adults are more likely to make contact and share their life experiences or emotions with family members and relatives rather than with professional caregivers.

### 1.3. New frontiers of ICT and the concept of Web 2.0 in home telehealth

Mobile devices such as smartphones and tablets have become popular in the past few years. Compared with dedicated home telehealth devices, such as home gateways, mobile devices are easily available, portable, and relatively inexpensive for both caregivers and older adults. A home telehealth system can be in the form of an App on a mobile device, which can be downloaded from a digital application distribution platform such as Google Play and Apple App Store.

From a usability point of view, the availability of 7–10.5 inch touch screens is the key reason why tablets are more popular among older adults. It can accommodate for some age-related limitations and provide better image resolution and multimedia experience than a smartphone. Caprani et al<sup>15</sup> pointed out that touch screens with virtual buttons provide easier hand–eye coordination for older adults than mice and keyboards. It is easier for older adults to learn to use tablets because of this direct manipulation.

The use of a cloud service in a home telehealth system can enable dynamic scaling to meet the needs of the user. Caregivers do not need to build a server or allocate IT staff to manage it. The concept of Web 2.0, first raised by O'Reilly in 2004, has been described as a “web as a platform” for delivering services. Beyond the static pages of earlier websites, Web 2.0 sites may allow users to interact and collaborate with each other in a social media dialogue as creators of user-generated content in a virtual community, such as blogs and video-sharing sites. Today, in the era of Web 2.0, the focus is switched to connecting online activities with associated friends in the real or virtual world. Social networking has the potential to become a key driver of home telehealth systems.

### 1.4. Social networking and older adults

An online social networking site is a web-based service that allows users to construct a public or semi-public profile, connect with other associated users, as well as view and traverse connections that were made by others within the system.<sup>16</sup> In many peoples' daily lives, online social networking sites such as Facebook have become an integral interpersonal communication channel. Facebook officially reached one billion active users in September 2012, which means that one out of every seven people on planet earth has an active Facebook account. In Taiwan, with 13 million active users in March 2013, more than half of the population in Taiwan (23 million) is using Facebook, spending an average of 317 minutes per month on Facebook and browsing 468 pages.<sup>17</sup> However, in April 2014, only 6.7% of Facebook users were over 55 years old, which indicates that Taiwan's older adults are less involved in participating in social networking sites.<sup>18</sup>

Many specialized sites have been established for older adults with a specific user interface design, such as the Genkvetch social network site (<http://www.genkvetch.com>) and ThirdAge (<http://www.thirdage.com>). These sites usually use large fonts, simple color schemes, and receive high marks for readability. However, the user interfaces of most social networking sites are still too complicated for many older adults, especially for those who are not familiar with using a computer and surfing the internet. A barrier still exists for older adults who wish to join social networking sites.

Linking with social networking sites can extend the value of a home telehealth system from the provision of health care to enhancing older adults' interpersonal communication and social participation. Social networking sites such as Twitter, Google+, and Facebook often provide application programming interfaces (APIs), which can be used to link home telehealth systems with social networking sites. A few telehealth systems already provide social networking functions. Healthcare4Life is a novel web-based telehealth system that combines the social networking API to enable older adults to take charge of their own health.<sup>19</sup> GrandCare System (<http://www.grandcare.com>) provided by TellaBoomer TeleCare Services is an all-in-one telehealth device that combines ADL sensors, blood pressure/blood glucose meters, and social networking. Family and friends can send pictures, messages, set up calendar events, and even upload family videos to the social networking site specifically set up for the users.<sup>20</sup>

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