

# Effectiveness of Telehealth Incorporating Health Coaching for the Elderly: A Scoping Literature Review

Telehealth combined with health coaching may be an effective solution for allowing the elderly to safely age in place while addressing the rising costs of health care. The objectives of this literature review are to understand what is known about telehealth interventions which incorporate health coaching and the effectiveness of this method in delivering health care to the elderly. Telehealth plus coaching has been implemented in elderly populations as a viable intervention method for managing chronic diseases with generally favorable results. However, neither the cost effectiveness of telehealth programs nor the sustainability of health-related benefits after formal program termination have been adequately demonstrated.

## INTRODUCTION

The aging of the world's population and the associated prevalence of chronic diseases within this population are creating a burden on available health care resources (Centers for Disease Control and Prevention, 2013). Chronic conditions such as heart disease and cancer were the leading causes of death in 2016 for people ages 65 and over (Heron, 2018). In 2010, average medical expenditures in the United States (U.S.) for people ages 65 or older were 2.6 times the national average and accounted for over one third of U.S. medical spending (De Nardi, French, Jones, & McCauley, 2015).

Many older people prefer to live at home as it allows them to better maintain contact with friends and family and potentially reduces the cost of long-term health care. This preference presents a challenge for determining what technology is needed to meet their desire to "age in place" while also ensuring their safety, independence, and comfort. (Satariano, Scharlach, & Lindeman, 2014).

The goal of this review is to investigate the effectiveness of telehealth when combined with health coaching in delivering health care to the elderly.

## Telehealth

*Telehealth* is defined by the U.S. Department of Health and Human Services as the "use of electronic information and telecommunication technologies to support and promote long-distance clinical health care, patient and professional health-related education, public health and health administration" (United States Health Resources & Services Administration, 2019). For the purpose of this scoping review, telehealth includes telemedicine, remote patient monitoring, and remote activity monitoring.

While telehealth is an all-encompassing term for clinical and non-clinical remote health care services, *telemedicine* is the use of telecommunication technology to allow health care workers to provide clinical services (e.g., medical therapy) to patients remotely (Hall, 2012). Telemedicine is useful for providing clinical services to patients in sparsely populated areas or places remotely located from a health care facility (Weinstein et al., 2014).

*Remote patient monitoring* (RPM) is the use of electronic devices and telecommunication technology to monitor and transmit patient physiological and/or metabolic parameters to a remote monitoring facility (Bratan & Clarke, 2005). RPM

usually involves Bluetooth-enabled or internet-connected devices that automatically transmit parameters of interest to a remote monitoring facility. RPM can also include electronic questionnaires that elicit information relating to patient health status.

*Remote activity monitoring* is the use of electronic devices to provide remote monitoring of a person's mobility or activities of daily life at their home (Mahoney, 2010). Daily activities can be remotely monitored using motion detection devices installed in a person's residence or a wearable device, such as a smart watch, that detects, records, and transmits movement activity. Medication adherence can also be monitored remotely via electronic pillboxes.

Some telehealth systems include a *decision support system*, which evaluates data collected via remote monitoring, to assist in the diagnosis of health-related conditions and to provide insights regarding the patient's health status.

Telehealth systems that include *health coaching* provide health-related information, recommendations, and/or encouragement to the patient on a routine or as needed basis to help drive behavior changes. Forms of health coaching include periodic health tips, short educational presentations, or health care suggestions based on an analysis of the remotely monitored data and the patient's responses to queries. The health coaching system can be manual, partially automated, or fully automated.

Figure 1 illustrates an approach to providing telehealth services that incorporates health coaching (Pavel, Jimison, Korhonen, Gordon, & Saranummi, 2015). A person's health and wellness are monitored by electronic sensors (portable or installed in their home) that measure physiological parameters, metabolic parameters, and/or activities of daily life. An electronic diary that queries individuals regarding their health status is also employed. This information is then securely transmitted to a remote monitoring facility for processing and forwarding to the health coaching system.

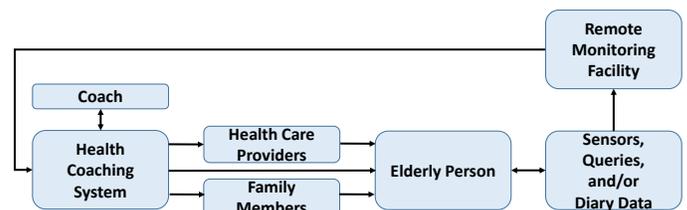


Figure 1. Telehealth system incorporating health coaching (adapted from Pavel et al., 2015)

The health coaching system plays a key role in promoting health-related behavioral changes. A health coach, trained in health behavioral change, manages the health coaching messages sent to a monitored person. These messages include periodic health and dietary advice or targeted advice based on an analysis of the monitored data. An example of a coaching message is sleep management advice if the system detects the individual is not sleeping well. This system also provides information and recommendations relative to the health status of the monitored person to family members.

The system described in Figure 1 is a work in progress, but Pavel et al. (2015) believe such a system is an important tool for helping elderly people learn and adhere to better health behaviors through the use of health coaching. This telehealth solution could meet the goal of enabling elderly people to safely, independently, and comfortably age in place.

## METHODS

A literature review was conducted to determine what is known about telehealth combined with health coaching, including the effectiveness of using this intervention method to deliver health care to the elderly. This study was conducted based on the scoping review process guidelines outlined by (Arksey & O'Malley, 2005). Medline OVID and CINAHL databases were searched for relevant studies performed in the last 10 years. The search criteria included the key words: *remote*, *wearable*, and *aged*.

This combination of search terms retrieved 700 papers relevant to telehealth for aging populations. After deleting duplicates, 677 papers were included for an abstract review and screening. After reviewing the abstracts for applicability of telehealth for the elderly, 313 articles were included for full-text review, of which 19 articles were identified that evaluated the effectiveness of telehealth combined with health coaching.

The 19 articles assessed in this scoping study included only those that provided evidence of the effectiveness of telehealth combined with health coaching. Effectiveness measures included clinical effectiveness, cost effectiveness, and quality of life effectiveness. Clinical effectiveness measures included: (1) management of the illness/symptoms, (2) emergency room visits, (3) hospital admissions and/or readmissions, (4) hospital length of stay, (5) mortality or time to death, and (6) exercise tolerance. Cost effectiveness measurement techniques varied across studies, so no additional breakdown was attempted. Health-related quality of life effectiveness measurement tools included: (1) short form 36 (SF-36) questionnaire, (2) Minnesota Living with Heart Failure Questionnaire, (3) chronic obstructive pulmonary disease (COPD) Assessment Test, and (4) subjective assessments.

## RESULTS AND DISCUSSION

Telehealth has been implemented in elderly populations as a viable intervention method for managing chronic diseases with generally favorable results. Studies that evaluated the effectiveness of telehealth combined with health coaching in older populations were evaluated in this scoping review.

Table 1 summarizes the results and includes the reference article, the type of study, the sample size (number of articles reviewed or number of study participants as applicable), the disease(s) studied, the type of remote monitoring, the type of health coaching, and the results of the effectiveness review.

### Clinical Effectiveness

Management of the illness or symptoms was the most common clinical effectiveness measure assessed, and telehealth with coaching was found to be effective in all 12 of the studies using this metric. Exercise tolerance was evaluated in only three of the studies (Bernocchi et al., 2017; Giordano et al., 2013; Stuckey et al., 2011), and exercise tolerance was found to be improved in these studies.

There is a recognized positive relationship between physical activity and health status (United States Department of Health & Human Services, 1996). Future studies have an opportunity to expand physical wellness measures such as exercise tolerance to try to correlate telehealth interventions with overall health and wellness.

### Cost Effectiveness

Cost effectiveness was evaluated in only two studies reviewed, and neither found telehealth plus coaching to be cost effective (Hofmann et al., 2015; Pekmezaris et al., 2012). Additional cost studies are necessary to provide a solid basis for implementing telehealth on a larger scale.

### Quality of Life (QOL) Effectiveness

Health-related QOL considers state of mind (how someone perceives their health status) and not merely the absence of diseases (Moriarty, Zack, & Kobau, 2003). Nine studies evaluated QOL, of which eight found that telehealth was effective at improving overall QOL.

The studies reviewed did not adequately evaluate how the various aspects of a telehealth program contribute to an improved QOL. For example, there is insufficient evidence to conclude if the improvement is due to the psychological benefit of knowing that one's health is being monitored or due to the periodic feedback provided by the telehealth system. Additional studies are needed to evaluate the psychological benefit of remote monitoring on QOL for elderly people and whether there is a relationship between the psychological benefit and one's overall health and wellness.

Table 1. Effectiveness review results for telehealth combined with health coaching

Article Reference	Type of Study	Sample Size	Disease	Type of Coaching	Effectiveness Result			
					Clinical	Cost	Quality of Life	Article Endorses?
(Agboola, Jethwani, Khateeb, Moore, & Kvedar, 2015)	Retrospective Study	348	CHF	RM + Bi-weekly and Just-in-Time Teletraining	Yes	DNE	DNE	Yes
(Bernocchi, Scalvini, Bertacchini, Rivadossi, & Muiesan, 2014)	Non-Randomized Controlled Trial	173	HT	RM + TN	Yes	DNE	DNE	Yes
(Bernocchi et al., 2017)	Randomized Controlled Trial	112	CHF COPD	RM + TN + Physical Therapist	Yes	DNE	Yes	Yes
(Davis, Bender, Smith, & Broad, 2015)	Matched Cohort Study	118 232	CHF COPD	RM + Teletraining + Nurse Home Visits	Yes	DNE	DNE	Yes
(Delaney & Apostolidis, 2010)	Pilot Study	24	CHF	RM + Nurse-Led Training + Nurse Home Visits	No	DNE	Yes	Yes
(Delaney, Apostolidis, Bartos, Robbins, & Young, 2014)	Quasi-Experiment	46	CHF	RM + Nurse-Led Training + Nurse Home Visits	Yes-NS	DNE	Yes-NS	INC
(Domingo et al., 2011)	Prospective Study	92	CHF	RM + Teletraining	Yes-NS	DNE	Yes	Yes
(Giordano et al., 2013)	Retrospective Study	602	CHF	Telemonitoring of vital signs + TN	Yes	DNE	Yes	Yes
(Hofmann et al., 2015)	Randomized Controlled Trial	621	CHF	RM + Teletraining	No-NS	No	Yes	DNE
(Nicolucci, Cercone, Chiriatti, Muscas, & Gensini, 2015)	Randomized Controlled Trial	302	DIAB	RM + TN	Yes	DNE	Yes	Yes
(Ong et al., 2016)	Randomized Controlled Trial	1437	CHF	RM + TN	No	DNE	Yes	No
(Pekmezaris et al., 2012)	Matched Cohort Study and Randomized Controlled Trial	160	CHF	RM + TN + Nurse Home Visits	No	No	DNE	No
(Prescher et al., 2013)	Randomized Controlled Trial	710	CHF	RM + TN	Yes	DNE	Yes	Yes
(Roesler, Binotto, Iochpe, Palomba, & Tizatto, 2015)	Quasi-Experiment	100	DIAB	RM + Teletraining + Social Networking	Yes	DNE	DNE	Yes
(Stuckey et al., 2011)	Feasibility Study	24	Various	RM + ADL + TN	Yes	DNE	DNE	Yes
(Van Sickle, Magzamen, Truelove, & Morrison, 2013)	Pilot Study	29	Asthma	RM + Weekly Feedback Reports with Health Tips	Yes	DNE	DNE	Yes
(Wakefield et al., 2011)	Randomized Controlled Trial	302	DIAB HT	RM + Teletraining	Yes	DNE	DNE	Yes
(Wang et al., 2017)	Randomized Controlled Trial	212	DIAB	RM + Teletraining	Yes	DNE	DNE	Yes
(Welch, Balder, & Zagarins, 2015)	Prospective Study	29	DIAB	RM + MED + TN	Yes	DNE	DNE	Yes

Abbreviations:  
ADL – activities of daily life monitoring  
CHF – chronic heart failure  
COPD – chronic obstructive pulmonary disease  
DIAB – diabetes  
DNE – did not evaluate  
HT – hypertension  
INC – results were not conclusive  
MED – medication monitoring  
NS – result not significant  
RM – remote monitoring  
TN – telenurse

### Sustainability of the Benefits of Telehealth Monitoring

This scoping review has shown that telehealth programs have clinical and QOL benefits while people are actively enrolled in the program; however, those benefits may not be sustained after disenrollment from a formal program. Only four of the studies reviewed evaluated the effectiveness of the program after disenrollment, and the post-program study period was limited. Two of the studies demonstrated the effects of a telehealth program were sustainable for two or three months (Bernocchi et al., 2017; Davis et al., 2015), but two studies showed that the effects were not sustainable after either six or eight months after termination of a telehealth program (Agboola et al., 2015; Wakefield et al., 2011).

Additional post-termination studies are needed to assess the long-term sustainability of the positive effects brought about by a telehealth program. This research can facilitate a program designed to help transition the elderly from telehealth to self-management of their health and wellness.

### Monitoring for Depression

Notably, this review observed only two studies with an assessment of depression as part of the telehealth intervention program. Findings from these studies, however, were not conclusive. While one study concluded that telehealth was effective at reducing depression (Delaney & Apostolidis, 2010), the other study did not show a reduction in depression symptoms (Delaney et al., 2014). Research has shown that depression can have an adverse effect on the health status of older people with critical heart failure (Sullivan, Newton, Hecht, Russo, & Spertus, 2004). It has also been demonstrated that depression is prevalent in individuals with chronic medical conditions and is associated with increased health care utilization, lost productivity, and functional disability (Egede, 2007).

Telehealth intervention programs should evaluate the inclusion of tools for monitoring depression and initiating intervention as applicable. Additional studies are needed to

identify tools (in telehealth programs) for detecting and treating depression and to evaluate the effectiveness of these tools.

### Acceptance of Remote Monitoring by the Elderly

A recent study of older adults with chronic heart failure found that older adults can and will use remote monitoring systems for an extended period of time (six-month study duration), and remote monitoring may enable older people with chronic diseases live an independent lifestyle longer (Evans et al., 2016). This scoping review also found that telehealth intervention programs were generally accepted by older adults in the studies that assessed this factor.

### CONCLUSIONS AND FUTURE RESEARCH

This review found that telehealth incorporating health coaching can be an effective method of delivering health care to the elderly. Specifically, it has been demonstrated to be an effective intervention method for managing chronic diseases during the duration of the formal telehealth program from both a clinical effectiveness and QOL assessment standpoint.

In addition, this review found that telehealth programs have generally been accepted by older populations, and elderly people have shown the capability and willingness to use this intervention method.

The cost effectiveness of telehealth programs has not been adequately demonstrated, nor has the successful transition from a formal telehealth monitoring program to self-management of one's health and wellness. Additional research is needed in these areas to establish a basis for expanding the use of telehealth intervention programs for the elderly.

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