



Specific technological communication skills and functional health literacy have no influence on self-reported benefits from enrollment in the TeleCare North trial



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ABSTRACT

Purpose: The Danish TeleCare North trial has developed a telehealth system, Telekit, which is used for self-management by patients diagnosed with chronic obstructive pulmonary disease (COPD). Self-management is the engagement in one's own illness and health by monitoring and managing one's symptoms and signs of illness. The study examines the association between COPD patients' use of Telekit and their functional health literacy and the association between their use of Telekit and their specific technological communication skills.

Methods: A consecutive sample of participants ($n=60$) from the TeleCare North trial were recruited. Face-to-face interviews were conducted with each participant to collect demographic data. Functional health literacy was measured with the Danish TOFHLA test. Participants completed a non-standardised questionnaire about their health status, their use of the Telekit system, and their specific technological communication skills. Binary logistic regressions were performed to examine how functional health literacy and specific technological communication skills influenced the use of Telekit by giving users an enhanced sense of freedom, security, control, and a greater awareness of COPD symptoms.

Results: Participants (27 women, 33 men) had a mean age of 70 (SD: 8.37) years. Functional health literacy levels were classified as inadequate in 14 (23%) participants, as marginal in 12 (20%), and as adequate in 34 (57%). Participants self-reported a feeling of increased security (72%), greater freedom (27%), more control (62%), and greater awareness of symptoms (50%) when using Telekit. The use of Telekit was not significantly associated with levels of functional health literacy or with the number of specific technological communication skills ($p > 0.05$) based on the binary logistic regressions.

Conclusion: The enhanced sense of security, freedom, control, and the greater awareness of COPD symptoms achieved by using Telekit were unassociated both with the patients' score of functional health literacy and with their specific technological communication skills. On the basis of our results it seems that the specific technological communication skills and functional health literacy are not a prerequisite for the use of the Telekit system.

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1. Introduction

Chronic obstructive pulmonary disease (COPD) places a huge economic burden on healthcare systems and patients' health. Because of its chronic and progressive nature, COPD represents a

significant challenge, and it is a growing problem that demands continuous, coordinated and integrated treatment involving relatives, general practitioners, hospitals and in some countries, like Denmark, also municipal caregivers [1–3].

Telehealth may deliver a broad range of benefits to society and patients alike. These benefits include reduced costs; improved, continuous and more personalised care; prevention of unnecessary hospital admissions or readmissions; reduced mortality from chronic diseases through better self-care; and continuous monitoring and communication of critical vital signs to healthcare providers

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[4–7]. Evidence suggests that patients are positive towards telehealth technologies, but it can be a challenge for patients with chronic conditions to operate these tools [7–15]. Thus, it is important to examine the patients' use of and experiences with such technologies. This may be particularly important in elderly and chronically ill patients whose physical and cognitive skills are generally limited compared to younger adults and who may therefore find it more difficult to use telehealth technologies [16].

The use of telehealth calls for patient empowerment. Patient empowerment includes the ability to perform health related actions – something that should be founded on a sufficient level of health literacy, as these actions should be based on a solid knowledge and expertise. In this regard, health literacy can be considered a prerequisite in the use of telehealth [17]. Health literacy can be defined as: “*the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand, and use information in ways which promote and maintain good health*” [18]. The ability to promote and maintain one's health is shaped by many factors, both somatic and demographic. Patients with chronic somatic conditions and poor/low health literacy face unique challenges and may be unable to understand health information and to fully exploit available care services, which may ultimately lead to more hospitalisations and reduced quality of life [19]. A low level of health literacy seems to be particularly predominant among the elderly, citizens with low education and low income levels, and citizens with a poor health status, e.g. COPD patients [20,21].

The present study is a part of a large-scale, pragmatic, cluster-randomised trial, named TeleCare North, the purpose of which is to build an educational environment that will empower patients to take responsibility for their own health [22]. For this purpose, TeleCare North has developed a telehealth system (Telekit) which is available for all COPD patients in the North Denmark Region. Approximately 1200 patients are enrolled in the trial.

The aim of the present study was to examine the association between COPD patients' use of Telekit and their functional health literacy and the association between their use of the Telekit system and their specific technological communication skills. Use of Telekit refers to the patients' benefits of using the Telekit. Knowledge of such associations can provide an indication of whether functional health literacy or the specific technological communication skills influence the use of Telekit and provides enhanced sense of security, freedom, control, and greater awareness of symptoms.

2. Methods

2.1. The TeleCare North trial

This study was developed in collaboration with the Danish, large-scale, pragmatic, cluster-randomised trial, TeleCare North. The TeleCare North trial comprises 1225 COPD patients; 647 patients in the control group and 578 patients in the intervention group. The control group receives usual care and the intervention group receives a telehealth system, named Telekit (this intervention is described in detail below, Section 2.3).

2.2. Sample and settings

The participants in this study were recruited from the intervention group of the TeleCare North trial. The sample for this study was recruited by using the method of consecutive sampling to use of the Telekit system with instruction. Recruitment was done by phone. During the call, the participants received information about the study in general and about confidentiality. The number of participants in the study was limited to 60 patients as decided by the TeleCare North trial administration office to minimize the potential

impact on the overall TeleCare North study. When the data for this study were collected, the participants had been using the Telekit system at home for approximately two months as an aid in the monitoring and treatment of their COPD disease. We waited two months with the recruitment to ensure that the patients were familiar with the Telekit system.

2.3. The Telekit system

The Telekit system consists of a tablet (Samsung Galaxy TAB 2, 10.1, Samsung Electronics, Seoul, South Korea), a fingertip pulse oximeter (Nonin, Onyx II% SpO₂, A&D Medical, Tokyo, Japan), a blood pressure monitor (Model UA-767, plus BT-C, Nonin Medical, Minnesota, USA), and a precision health scale (UC-321PBT-C, A&D Medical, Tokyo, Japan). COPD patients use the Telekit system at home to measure vital signs and to answer questions related to their disease. The measurements are transferred through a wireless connection to health care personnel who look into the data and respond if there are any deviations from expected values.

The patients included in the sample of participants in the present study were trained in using the Telekit by healthcare personnel. The training consisted of either a 45-min appointment at home or a 75-min appointment in groups at a health centre. The healthcare personnel instructed the patients in how to use Telekit and how to take measurements, and the patients were asked to report measures daily during the first two weeks and then one to two times per week thereafter. The frequency of reporting measurements were decided by the healthcare personnel from the Danish TeleCare North trial. A 45-min follow-up visit was scheduled a month later to check if the patients were using the Telekit system appropriately, and if the threshold values of the vital signs needed to be adjusted [22].

2.4. Data collection

Data collection took place in the participants' homes in three consecutive steps during the same day: (1) Face-to-face interviews were conducted with each participant to collect the following demographic data: age, gender, and educational level. The face-to-face interviews created a comfortable atmosphere and a sense of trust. (2) Functional health literacy was measured using a Danish version of the Test of Functional Health Literacy Assessment (TOFHLA) [24]. The test has two parts: a 17-item numeracy part and a 50-item reading comprehension part. The former part assesses the participant's ability to understand financial assistance, to keep a clinical appointment and, for example, to understand instructions for taking medication [25]. In the Danish TOFHLA, the reading comprehension test is conducted as a modified cloze procedure in which random words are deleted from a reading passage [26]. The scoring makes it possible to categorise participants' functional health literacy levels as inadequate (score: 0–59), marginal (score: 60–74), and adequate (score: 75–100). The two levels inadequate and marginal are characterised as low functional health literacy and the adequate level is characterised as sufficient functional health literacy. (3) The participants completed a self-created, non-standardised questionnaire consisting of 14 questions that were developed for the purpose of the present study (this questionnaire is presented as Supplementary material). These questions were developed specifically to explore the benefits of using the Telekit system. At present, there is lack of validated instruments for assessing patient perceptions and satisfaction in the use of telehealth [11]. The MAST (Model for Assessment of Telemedicine) Manual and a current review [11] of the literature guided the development of our questionnaire. MAST includes seven domains which can be used to provide information about which telehealth systems to implement. One domain that includes the patient perspective was used

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