

# The Technology Use and Information Flow at a Municipal Telemedicine Service

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**Abstract.** Health care services face challenges with providing individualised treatment to an ageing population prone to chronic conditions and multi-morbidities. The research project *Patients and Professionals in Productive Teams* aims to study patient-centred teamwork service models. This paper presents an evaluation of a telemedicine service for chronic obstructive pulmonary disease patients integrated with municipal health care services. Qualitative methods were used to study the technology use and information flow. The results showed that the telemedicine technology was a standalone system, not integrated with the electronic health record of the municipality. A benefit of the system was a function to provide the patient with written instructions on agreements and advices. As a constraint for the patient-centred team approach, the information in the telemedicine system was available only for the telemedicine nurses and not to other health care professionals.

**Keywords.** Health technology assessment, telemedicine, patient-centred care

## 1. Introduction

Demographic changes with a growing ageing population are threatening the sustainability of the health and care services [1] as the prevalence of chronic diseases is increasing [2]. Patients with long-term chronic conditions and multi-morbidities dominate the specialised health care budget, through complex care processes over longer periods [3]. The World Health Organization (WHO) has emphasised the need to focus on patient-centred health care service models [4] and different approaches have been developed such as the Chronic Care Model [5][6] with the aim of operationalising patient-centred care and focusing on quality of care and patient outcomes. Information and communication technology (ICT) has an important role for supporting efficient team collaboration. In this context, the research project *Patients and Professionals in Productive Teams* (3P) has the aim to study health care services models run with a patient-centred teamwork approach [7]. 3P is a 4-year long project (2015-2019) funded through Helseforsk, a cross-regional health research fund owned by the four Norwegian Regional Hospital Trusts. The 3P project involves four innovation arenas utilising patient-centred teamwork service models, located in different health regions of Norway and Denmark. This paper presents a study on the technology support and information flow made in one of the innovation arenas, Risør

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municipality in Norway, where a telemedicine service for chronic obstructive pulmonary disease (COPD) patients was integrated with the municipal health and care services [8]. The research questions (RQs) stated for the study were:

RQ1: *How does the technology support the communication and information flow at a municipal telemedicine service?*

RQ2: *What are the benefits and constraints of telemedicine technology in municipal patient-centred care?*

## **2. Methods**

Qualitative research methods were applied to study the technology use and information flow at the telemedicine service [9][10]. A total of 7 informants contributed to the study, including health care professionals, technicians and administrators. 5 semi-structured interviews were made with key informants, having an average duration of 63 minutes. A 2-hour long focus group interview was made with 7 participants addressing the topic telemedicine technology, telemedicine follow-up, and the information flow in a future perspective- what is needed to support patient-centred team collaboration? In addition, a demonstration of the telemedicine technology was made to show the practical use in the preparation and performance of a consultation. The data were collected at the end of year 2017 and beginning of 2018, consisting of audio-video recordings and annotations from the interviews and demonstration, that were categorised into thematic groups. The Norwegian Centre for Research Data (NSD) approved the study with project number 53771. The participation in the study was voluntary and the informants signed a consent form.

## **3. Results**

The telemedicine service was organised as a unit integrated with the municipal health care service. Two nurses were responsible for running the daily operations during weekdays. The service was open for all inhabitants of the municipality needing medical follow up of COPD and that could benefit from remote monitoring. Patients could be referred from home nursing services, General Practitioner (GP) or hospital. As the telemedicine service was integrated with the other municipal services, there was a close collaboration with physiotherapist and occupational therapist. In addition, the telemedicine nurses had regular meetings with the GPs in the area. The patient's GP was responsible for medical treatment and advises during the telemedicine follow-up. In addition, there was collaboration with pulmonary specialists at the hospital.

When enrolling a new patient into telemedicine, the patient received a home visit from a telemedicine nurse for connecting the equipment and to provide user training. In addition, there was a research protocol to follow with registrations and a patient questionnaire on eHealth literacy and patient safety [8][11]. An electronic notification was sent to the patient's GP to inform about the inclusion to telemedicine monitoring. During the period when a patient was enrolled in the telemedicine service, the telemedicine nurses could assist with contacting or sending referrals to other health care providers and related services when needed due to medical circumstances.

Two technical systems were used at the telemedicine service: 1) the municipal electronic health record (EHR) named Gerica from Tieto [12] and 2) a solution for the

telemedicine services developed by Open TeleHealth [13] and delivered by Siemens Healthineers [14]. Both systems had to be used separately to carry out the telemedicine services. All statutory medical documentation was made in the municipal EHR system for permanent storage.

For telemedicine follow-up, the patient at home logged on a tablet application with a username and password. The patient used a pulse oximetry device with Bluetooth transmission to the tablet and filled in a symptom self-evaluation questionnaire. The data communication from the patient's tablet to the server was encrypted by standard Hypertext Transfer Protocol Secure (HTTPS). To access the information from the patients, the nurse used a laptop to log into the telemedicine management system, connected with a network cable and secured by end-to-end VPN. The measurements sent in by the patients, were automatically colour coded as there was a triage function implemented in the system based on an algorithm. The nurse could call the patient's tablet from the telemedicine management system to perform a video consultation, but telephone was also used for the consultations. The telemedicine management system had a function to send messages and written instructions to the patient's tablet, for instance on temporary changes in medication.

The information sent from the patients was stored in the telemedicine management system, and available only for the telemedicine nurses. For permanent documentation, the nurse had to create a journal note in the patient's EHR, with manual transfer of the telemedical measurements. For registering a new patient in the telemedicine management system, all administrative information from the patient's EHR had to be manually inserted by the nurse.

#### **4. Discussion**

This paper has presented a study of the technology use and information flow at a municipal telemedicine service driven with a patient-centred service model. The research questions (RQs) are answered based on the results.

RQ1 asked about how the technology supported the communication and information flow at the telemedicine service. The study showed that the telemedicine system was a standalone technology and not integrated to the municipal EHR, which created double work with manual transfers between the two separate systems, also seen in other studies [15]. The technical solution used for the telemedicine service did not efficiently support patient-centred teamwork, as incorporated personnel at the municipality, GP or hospital could not log on to the stand-alone system for accessing information. The information was only available for telemedicine nurses. The municipal system was used for electronic communication within the municipal health care services, and for instance if a patient was categorized with a red alert based on the telemedicine measurements, the telemedicine nurse would contact the patient and send a notification on the digital working list of the home nurse that the patient is needing a prioritised home visit. The communication with the patient's GP was based on electronic messages. Regarding the videoconference function, there were technical issues with the quality that made the nurses preferring use of telephone for consultations and follow-up.

RQ2 asked about benefits and constraints of using telemedicine for carrying out patient-centred care. The aim of running the telemedicine service was to increase the quality of care, safety and outcomes for COPD patients in the municipality. When it comes to the patient-centred care approach, it was beneficial to have the telemedicine

service integrated with the municipal health services, for operating as a team for instance when the telemedicine consultations revealed a need for advices on physiotherapy or occupational therapy, but also for collaborating efficiently and closely when a telemedicine consultation had shortcomings and an urgent home visit was needed. The telemedicine service had two nurses that followed up the patients, which was beneficial for the continuity of care and communication procedures. The function of sending messages to patient's tablet was a quality feature for better adherence to oral information given by the nurses and expedient for patient safety, but a constraint was that the patient needed to be logged in to hear that a message was received. Another constraint was that to hear an incoming call on the tablet device, the patient needed to be logged in to hear the signal. Due to battery capacity and privacy reasons, the patients were instructed to log out after each use of the tablet. This was solved with an initial phone call to ask the patient to log in for an upcoming video-consultation. For privacy and security reasons, the patients were not registered with their name in the telemedicine system, instead de-identification of personal information was made with a number, as the access to medical information in Norway is restricted by the authorities [16]. This study has some limitations, such as a limited number of informants. However, the study participants had different professions and backgrounds, meaningfully representing the user group. Future research agenda targets an extension of the study, by including patients and health care professionals in a new evaluation made one year later to evaluate changes in the use of technology, and summarising the results in a recommendation to the stakeholders.

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