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# Scaling Digital Technologies to Improve Patient-Clinician Interactions: A Comparative Case Study

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**Abstract.** This position paper reports from ongoing research on the implementation and scaling of digital technologies for remote care. The primary objective of the project is to investigate how digital technologies can be scaled, adapted, and evaluated to ensure high-quality remote care for patients with chronic illness in both Norway and China. The comparative study is based on longitudinal case studies in different geographical and institutional contexts that provide insights into how digital technologies can influence, support, and improve patient-clinician interactions.

## Introduction

Digital solutions are considered as a key enabler to promote health, prevent diseases, and provide patient-centered care that meet citizens' needs (European Commission, 2018). International strategies have called for a paradigm shift in the way healthcare is organized (World Health Organization, 2015). The need for

new models that enable patient-centered services and a shift from hospital-centered systems to more integrated care structures is highlighted (European Commission, 2018). The increasing use of digital technologies have changed how and where care is delivered, e.g., remote care, telecare, telehealth (Bardhan et al., 2020). The terms telecare, telemedicine and telehealth are often used interchangeably, however, we use the term remote care which “involves the delivery of health and social care to individuals within the home or wider community with the support of ICT enabled systems” (Barlow, Hendy, & Chrysanthaki. 2012, p.2). Recent studies in the CSCW field have emphasized how remote care technologies have changed the traditional interactions between patients and health professionals (Andersen et al., 2018; Bardram et al., 2005) and how the role of patients has transformed from care receivers to active data generators (Cerna et al., 2020). Most of the CSCW literature on remote care technologies has studied the design and use of these technologies on relatively small scales for specific group of patients with specific health conditions. However, we still have limited insights into how these technologies can be scaled and what the implications of scaling for patients, health professionals and their collaborative interactions are.

## Research setting and method

This position paper reports preliminary findings from a research project called “DigiRemote”, which aims to identify infrastructural and institutional challenges to scale up digital technologies for remote care in Norway and China. We investigate a digital health care system which is developed by a Norwegian IT company. The technological solution is proposed as an integrated collaborative solution that consists of a web-based patient monitoring portal and a patient mobile application, as well as a set of integrated measuring devices. The web-based patient monitoring portal is developed for health professionals to handle digital home follow-up, which integrates a range of patient-driven medical devices that support home-based care, such as medical measurements, symptom reporting and rehabilitation. In addition, a mobile application is designed for patients’ end. It is used in combination with relevant measuring equipment, which automatically transmits the measurement results via Bluetooth to the patient’s tablet or smartphone. The measurement results are immediately visible to the patient application where they can also answer clinical questions and register symptoms and side effects. The results are simultaneously transferred to web-based portal so that health personnel can follow up the values that come in and provide individual follow-up. The solution is integrated with a number of wearable measuring devices to support their patients to perform measuring at home, for example, for measuring blood pressure, weight, temperature, pulse, etc.

The study is designed as a longitudinal case study in Norway and China, respectively. Data collection involves semi-structured interviews, observation, and archival document (Walsham, 1995). The same solution has been implemented in both cases; however, the cases represent different cultural, organizational, and clinical settings. For instance, the Chinese side has a particular focus on post-operative thoracic and cardiac surgery patients. On the other hand, the Norwegian side has a broader scope and includes chronic patients who need follow-up by the health professionals. Several pilots with chronic illness patients have been taken place in Norway, using the solution for remote care in Norwegian primary healthcare services. Experience and evaluations will be shared and used as inputs to the clinical studies that have been carried out in two Chinese hospitals.

## The Norwegian case studies

The use of digital remote care in Norway has mainly been driven by national strategies and six municipalities in Norway have participated in the national program for the use of digital remote care that lasted from 2018 to 2021. The overall goal of the national program was to gain knowledge about the use of digital remote care to provide national recommendations for further implementation and scaling of the service. Thus, the experiences from the national program have been continued in new projects and scaled to new users and care settings.

The results of the national program have recently been published and showed promising results such as increased safety and quality of life for patients as well as improved interaction between health professionals (The Norwegian Directorate of Health, 2022). However, challenges were also identified during the pilot period, such as the need to improve the interaction between the home care service, GP's and hospitals. The digital solution has so far mainly been offered to patients suffering from chronic diseases that are followed up by municipal home services. However, these patient groups usually have frequent contact with the hospital service and a challenge has been to integrate patient-generated information with electronic patient records used at the hospital. For example, patient generated information can be valuable to clinicians in the hospital; however, they do not have the ability to follow up daily measurements for all patients. There is thus ongoing work to adapt the digital solution to different needs, roles, and responsibilities in a new integrated solution.

Digital remote care technologies have also been scaled to new care settings such as digital outpatient clinics. Ongoing activities involve digital follow-up of patients who need long-term follow-up, such as patients with diabetes, lung diseases, epilepsy, cancer and so on. These patient groups need regular follow-up by health professionals and are traditionally performed by physical attendance at

the nearest hospital. Digital remote care is considered an opportunity for more person-centered follow-up for these patients, and it is expected that self-monitoring of vital sign and symptoms will provide more continuity in the follow-up of the patients. Digital follow-up entails change of patient-clinician interactions and ongoing activities include designing a new service that is adapted to the needs of different patient groups.

## The Chinese case studies

The integrated collaborative solution has been implemented in two hospitals in Shanghai, China since 2021, respectively. One hospital is specialised in thoracic surgery and the other is specialised in cardiac surgery. The goal is to enrol 1,000 patients who are undergoing thoracic and cardiac surgery rehabilitation and establish a corresponding database for patient follow-up. At present, the two hospitals are still in the process of patient enrolment, which has been experiencing disruption due to COVID-19. The enrolled patients have completed the informed consent before discharge, and completed the filing, registration, and management of the case report form.

The two hospitals had different strategies in terms of personnel who participated in the study. One hospital invested twelve doctors, while the other invested five doctors and seven nurses. We observed that their strategies of personnel arrangement had an interesting impact on their respective experience of implementing and scaling the solution. The purpose of enabling the solution for remote care is to bring patients and clinicians closer together. Nevertheless, the digital technology itself is merely a tool to support and enhance the two hospitals' existing healthcare services. What is ultimately provided to their patients is health care service per se, which needs their own clinical teams to deliver. Therefore, it was important for the hospitals to equip themselves with the competencies needed for delivering high-quality health care services to their patients, and act proactively in investing time and effort to learn, use, and implement the proposed solution. This identified factor can be associated with the organisational and leadership level which has been reported in the previous studies (Aaen, 2021; Barlow, Curry, et al., 2012; Barlow, Hendy, et al., 2012).

## Conclusion

We have briefly introduced the comparative case studies that are currently in progress in Norway and China. Scaling is the process of extending the scope of digital systems by adding new users and/or functionalities (Sahay & Walsham, 2006). We have illustrated the need to reconfigure the interaction between patients and clinicians. However, DigiRemote project is still at its early stage, we

will continue investigating how needs, responsibilities, and concerns are aligned in the new digital service.

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