Evaluation of Technology Use in an Inter-Disciplinary Patient-Centered Health Care Team

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Abstract. Health care services are facing challenges with carrying out 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 different patient-centered teamwork service models. This paper presents an evaluation on the technology support in a patient-centered health care team providing services to elderly people with chronic conditions and multi-morbidities in the transition from hospital to a home setting. The team had employees both from a university hospital and municipal health services. Qualitative research methods were applied in the evaluation of the technology use and information flow. The results showed that two information systems were used, that were not integrated and caused double manual work and registrations by the health care professionals. A benefit was that information sharing was improved between the hospital and municipal health care services, but the constraint was added workload.

Keywords. health technology assessment, patient-centered care, information systems, electronic health record

1. Introduction

Health care organizations are facing challenges due to demographic changes in an ageing population, with growing numbers of individuals prone to long-term conditions and multi-morbidities [1]. One of the challenges is the organization of hospital services, that tends to have a focus on specialization and less patient focus around care needs [2]. This brings to light a need for understanding how to operationalize patient-centered, integrated and pro-active care. In this context, the research project *Patients and Professionals in Productive Teams* (3P) aims to study and share knowledge on health care services models run with different inter-disciplinary patient-centered teamwork approaches, also focusing on efficient technology support for collaborative work across health care organizations [3] The 3P-project started in 2015 and runs in a 4-year long period until the end of 2019. It is funded through Helseforsk, a cross-regional health research fund owned by the four Norwegian Regional Hospital Trusts [4]. The project is

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divided into 10 work packages targeting the different aspects of patient-centered teamwork service models, such as models for implementation, digitalized individual care plan, patient experiences and patient safety. Four innovation arenas utilizing patient-centered team models, located in different health regions of Denmark and Norway are included in the project [5][6][7][8]. This paper presents a study of the technology support and information flow in one of the innovation arenas, the University Hospital of North Norway, where a patient-centered health care team service was run as a collaboration between the hospital and surrounding municipalities providing community health care services to the citizens. The service model had the aim to support the independent life and self-management of elderly patients with a complex disease history and multi-morbidities in the transition from a hospital stay to a home situation, influenced by the Chronic Care Model [9][10]. This patient group is prone to frequent hospital admissions and re-admissions [11], and in this context, the service model aims to provide individualized care to patients with multi-morbidity after a hospital stay. The research questions (RQs) stated for the study were:

RQ1: *How does technology support the communication and information flow in an inter-disciplinary patient-centered health care team working in multiple locations?*
RQ2: *What are the benefits and constraints of the technology use in the inter-disciplinary team from a patient-centered care perspective?*

2. Methodology

A qualitative research approach was applied in the study, with the methods observations and semi-structured interviews [12][13]. Two visits were made to the innovation arena, the first one for three days and the second for five days. A total of 23 informants contributed to the study, with the professions nurse, physiotherapist, occupational therapist, physician and technician. Also, one patient and one family member contributed. The selection of the informants was made in collaboration with the leader of the patient-centered health care team. During the first visit in June 2017, individual interviews were made with a physician, patient and family member. Two paired interviews were made with two technicians and with a nurse and a physiotherapist to dynamically focus on technology and how telemedicine had been used in the team. A one-hour focus group interview was made with five nurses. In addition, a two-hour long workshop was organized with 14 participants having health professional background targeting the technology use and information flow in their collaborative work. The aim was to map out the experienced obstacles in the information flow within and between the involved services, and to outline optimal and technology support for the future.

During the second visit in November 2017, a field study was made with observations of communication processes and technology use in the staff room. Individual interviews were made with two nurses, specially targeting the user interfaces and functionalities of two separate information systems. In addition, they both made a thorough demonstration of the systems. A focus group interview with four nurses working in municipal home services was made. The data collection consisted of audio- and video recordings and annotations, that were thematically analyzed and categorized into three main groups. The Norwegian Centre for Research Data approved the study, with project number 53771 [14]. All informants participated voluntary and signed a consent form.

3. Results

The results are presented divided into three main topics: 1) the organization and workflow and 2) the technology and 3) the patient's access to information.

3.1. The Organization and Workflow

The patient-centered health care team was physically placed at a university hospital that was divided into two locations and financed by both municipalities and the hospital trust fund. The employees had the professions: nurse, physiotherapist, occupational therapist, physician and pharmacist. In addition, there were administrative and research staff. The team was established to support elderly people with chronic conditions and multi-morbidities in the transition from hospital to a home setting, also including other patient groups that could benefit from the services. The patients could be referred from hospital departments, municipal services or General Practitioners (GPs) for an evaluation of services from the patient-centered health care team. Each referral was evaluated by the inter-disciplinary team. When including a new patient, a meeting was usually organized with key people from the involved hospital ward, the patient-centered health care team and municipal services. In addition, relevant family members could be invited. The physician in the patient-centered health care team could be consulted. The patient-centered health care team made a personalized plan for the patient to support him/her in the transition period from the planning of the discharge and during the first weeks at home, in close collaboration with the municipal health services. The patient's contact person in the patient-centered health care team could consult the team's physician, the GP of the patient or other related health service providers such as the pharmacy or home nursing services when needed due to medical circumstances. The patient-centered health care team was available at day-time during weekdays and they could attend patients at home. The patients were enrolled to the services for a limited time.

3.2. The Technology

Two information systems were used in the patient-centered health care team to support the clinical workflow: 1) the hospital electronic health record (EHR) from the vendor Dips and 2) the municipal EHR Visma Profil. Both systems had to be used separately to carry out the team services and there was no system integration. All statutory medical documentation had to be made in both systems for permanent storage and the patient information was manually registered in both systems. In case of time constraint, the documentation could be made in one of the systems, printed out and scanned into the other system. All patient consultations were documented in both systems. Data storage was ensured by the two EHR systems located in two different organizations, and personnel in the team was given separate access to both systems using two different log-on procedures in two different PC's. When it comes to usability, Profil was described as a system designed for billing purposes of performed services, lacking a status overview of clinically complex patients. The documentation was differentiated by keyword banners in a menu, and there was no view to show content of "all banners" from a particular shift or day. Each banner had to be clicked on to show the content. Dips was described as a system with acceptable usability, but there was some information overload in the user interface. Quite many notes that had to be clicked on to read key information about the patient.

Figure 1. Using two information systems simultaneously, one in each screen.

3.3. The Patient's Access to Information

The patients in the health region had access to read their own EHR at the hospital through the National Health Portal (helsenorge.no). There was a secure log in procedure and access to all notes made by different professions. The patients did not have access to the information registered in the municipal EHR. Regarding physiotherapy, exercise and training at patient's home, there was a solution to support this with a tablet application. But it was experienced that this elderly patient group had limited digital literacy to be able to use such technology, and also regarding how to access their own hospital EHR information through the secured National Health Portal.

4. Discussion

This paper has presented a study of the technology use and information flow at a patient-centered health care team. The research questions (RQs) are answered based on the results.

Regarding RQ1, that asked about how technology supported the communication and information flow in the team. The study showed that to be able to support the information flow in the team providing services across different organizations, the professionals had to use two separate information systems with manual transfer of information between the systems. There was electronic communication with other health care providers such a GP or municipal services, but the telephone had a quite important function due to frequent lack of response to electronic messages.

RQ2 asked about benefits and constraints of the technology from a patient-centered care perspective. The study identified both strengths and weaknesses with the technology support. Addressing patient-centered care, it was beneficial that the service was run as a mobile service being able to attend patients at home. Due to limited resources in the team, a few visits regarding exercise and training could have been replaced with guidance through a tablet-PC. But most patients had limited digital literacy and could not use such technology. The individualized plan was beneficial for the patients, but one of the constraints was "Who owns the plan?". A plan made by hospital staff is not always followed by municipal health care services, because they have other ways of prioritizing

services. Another constraint in the daily operation, was the lack of response to electronic messages sent to other services, causing that the most reliable communication method was the telephone with verbal communication. The technical solutions used in the team were mainly designed for the information needs of health care professionals and not for involving patients. When patients are provided with a Tablet-PC solution to follow up own actions in their care plan, the user interface needs to include all actual functionalities and data access for the patient. It is not advisable to use general health portals and separate log-in procedures to have access to relevant data for daily treatment and follow-up.

This study had some limitations, such as using one research method and studying one patient-centered health care team within one health region. However, the respectable number of study participants with different professions and backgrounds meaningfully represented the group and contributed in multiple settings. Lessons learned from this study, indicate that EHR systems to a larger extent should support functionality for information flow within teams to avoid manual double work and verbal transfer of information by telephone. The main contribution lies on the evaluation of benefits and constraints that are applicable and transferable to other health care contexts. Future research agenda targets a further evaluation of the innovation arena evaluating possible new features of the systems and making a comparison with the results from the other three innovation arenas in the project.

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