Digital Users in Pre-Digital Hospital Organisations?

An Analysis on the Readiness for Electronic Communication

Between a Hospital and Surgical Patients

Kari Dyb

Norwegian Centre for eHealth Research
University Hospital of North Norway
Tromsø, Norway
kari.dyb@telemed.no

Conceição Granja

Norwegian Centre for eHealth Research
University Hospital of North Norway
Tromsø, Norway
conceicao.granja@telemed.no

Stein Roald Bolle

Norwegian Centre for eHealth Research
University Hospital of North Norway
Tromsø, Norway
stein.roald.bolle@telemed.no

Gunnar Hartvigsen

Norwegian Centre for eHealth Research
University Hospital of North Norway
Tromsø, Norway
Department of Computer Science
UIT – The Arctic University of Norway
Tromsø, Norway
gunnar.hartvigsen@telemed.no

Abstract—**Are hospitals and surgical patients ready for electronic communication prior to surgery? This paper discusses the readiness for electronic communication between surgical patients and a university hospital in Norway. The first step in our study approach was to map the main actors involved in pre-operative planning and electronic communication. This work mapped six diverse main actors and revealed the need for multiple approaches to address the e-readiness of the different actors. The study approach consists of the following: (1) a study of the most recent health reforms in Norway, focusing on e-readiness from political and policy perspectives; (2) an in-depth empirical observation and interview study of the pre-operative planning process at a university hospital, focusing on the readiness for two-way electronic communication prior to surgery; (3) a qualitative interview study of patients' experiences with surgical cancellations, focusing on the patients' readiness for electronic communication; (4) an inquiry into the readiness of the hospitals' electronic health record to integrate two-way communication and (5) a study of the readiness for electronic patient–hospital communication from the perspective of the regional health authority's ICT operational unit. The results are reported in six analytical categories based on the identification of the main actors in the field. The authors' conclusion is that Norwegian health policy strongly promotes electronic collaboration and that patients and healthcare workers are ready to use new electronic tools. However, the hospital as an entity, together with the electronic health record system and the authority's ICT operational unit—all of which are important actors in the field—are currently not ready for electronic communication between patients and the hospital.**

I. INTRODUCTION

The aim of this paper is to discuss the readiness for electronic communication between surgical patients and a university hospital in Norway. The interest in the subject, e-readiness, stems from recent work in a research and development project, 'eTeam-surgery' [1]. The overarching goal of the eTeam-surgery project was to develop a tool for electronic communication between surgical patients and the University Hospital of North Norway (UNN). The idea of the project was to actively involve the patient in the pre-operative planning process prior to hospitalisation in order to reduce the number of surgery cancellations at the hospital.

For many patients, undergoing surgery is a major life event which involves a high level of anxiety before admission to the hospital [2][3][4][5]. In most hospitals, surgical departments are both a major area of investment and the greatest source of revenue [1][6][7]. Nonetheless, elective surgeries are regularly cancelled, and cancellation rates of 10–40 % have been reported [7][8][9]. In Western countries, up to 20 % of elective surgeries are cancelled on the day of the surgery, and this percentage increases if cancellations within the week of the scheduled surgery are included. Despite the waste of hospital resources, the anxiety and emotional stress placed on patients and the frustrations among healthcare workers, surgical cancellations seem to be commonplace in public hospitals.

The reasons for elective surgery cancellations vary. In the literature, the causes of cancellation are often divided into the

following two major categories: (a) hospital-related and (b) patient-related. Hospital-related reasons encompass such issues as the unavailability of the surgical team [10][11][12], incomplete pre-operative study/preparation [13][14], lack of surgical/anaesthetic readiness [11][13] and lack of theatre time due to the extended duration of scheduled surgeries [13]. On the other hand, patient-related causes are mostly due to patient no-shows or to a patient's need to reschedule the assigned surgical date [11][13].

At our research site, 50 % of all surgery cancellations were identified as avoidable [15], which corresponds with the literature [7][8][9]. Avoidable cancellations refer to, among other things, those involving a lack of information; hence, these are cancellations where information existed prior to surgery, but was not available when required [9][15][16][17][18][19]. For further information on the rate of elective surgery cancellations at the research site and the reasons reported for these cancellations, refer to [20].

The eTeam-surgery project group consists of an interdisciplinary research team which is studying if and how electronic communication, prior to hospitalisation, can actively involve the patient in the pre-operative planning process, provide the missing information and thereby reduce cancellations (Figure 1). For further information on the eTeam-surgery project, refer to [21]. A central goal for the eTeam-surgery project was to develop and test a two-way communication tool that would enable patients to communicate with the surgical department by storing the patient's input in the UNN hospital electronic health record (EHR). In this way, patients could inform the surgical department about changes in their health status or other factors that could potentially affect their forthcoming surgery. The eTeam-surgery intervention can be seen as part of what Gale and Sultan [22] label 'a wider trend to move medical technologies from the hospital to home'.
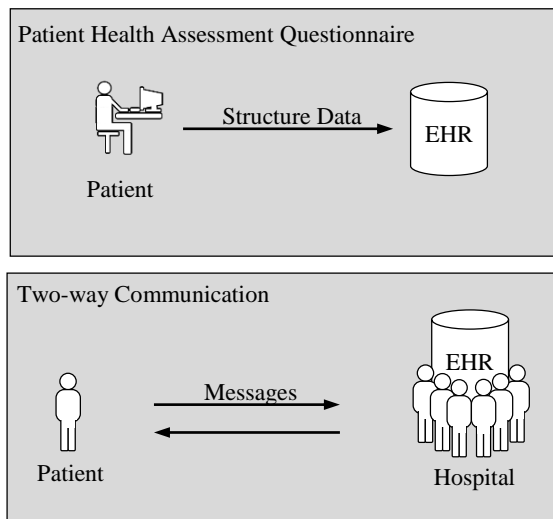

Figure 1.   Illustration of the eTeam-Surgery architecture.

Developing a tool for electronic collaboration between the patient and the hospital is not straightforward. Several health information and communication technology (ICT) projects have failed to fulfil their expected outcomes. A substantial amount of the literature in the field of health ICT, particularly from the social sciences, covers unsuccessful implementation projects, challenges and unforeseen consequences[23][24][25][26][27][28][29][30][31][32][33][34][35][36][37][38].

In an attempt to avoid adding to the list of health ICT developments that are either not used or used differently than expected, the eTeam-surgery project addressed the readiness for electronic communication between surgical patients and UNN prior to developing and testing the tool. In this paper, we address the readiness for electronic communication as a means to improve the quality and effectiveness of the pre-operative process.

The paper is divided into five sections. In the first section, the problem of surgical cancellations is introduced and the aim of the study is described. In the second section, the background of the study is presented. It briefly introduces the existing knowledge on e-readiness and the challenges of ICT in healthcare. As will be evident in section three, Materials and Methods, our approach to the study of e-readiness consists of a broad spectrum of qualitative methods. In this section, a brief introduction to the methodology (actor-network theory [ANT]) used to map the main actors regarding electronic patient–hospital communication in pre-operative planning is described. The diverse methods of data collection used to study e-readiness among the identified actors are also presented and explained in the third section. The results are disclosed and interpreted in the fourth section. In the last section, Discussion and Conclusions, the authors elaborate on the readiness to use electronic communication among the different actors involved in pre-operative planning, and in healthcare more generally.

II.   BACKGROUND

Telecare technologies are advocated by European governments and industries as innovations of great promise for improving care [39]. In the last decade, the healthcare sector has witnessed the introduction of an increased number of telemedicine applications, i.e., devices that can monitor, diagnose or treat people at a distance from the clinicians through the use of ICT [40]. Regardless of whether it is labelled 'telemedicine', 'telecare' or 'tele-monitoring', it has been reported that Norwegian patients are well prepared and able to use ICT for health purposes [41]. Patients, including the elderly and less educated [41][42], are using electronic healthcare services [43][44]. In addition to the patients' readiness for electronic communication, a tendency among healthcare workers to use personal electronic devices to support their clinical work [31][45][46] and communicate with patients [44][47][48] has also been reported.

At the same time, substantial evidence exists in the field of health ICT of less successful project implementations

[23][24][25][26][27][28][29][30][31][33][34][36][37][38]. Challenges with implementation, slow diffusion and unforeseen consequences of ICT in healthcare, particularly in hospitals, have been extensively described. This knowledge, or what we have called the 'e-readiness paradox' in the field of health informatics, shaped the research question of this paper: If patients and healthcare workers are ready for ICT in healthcare, but yet at the same time the new digital technologies are not used as expected, are Norwegian hospitals ready for electronic communication during pre-operative planning?

III. MATERIALS AND METHODS

The e-readiness paradox—which refers to the reported e-readiness among patients and healthcare workers related to studies of slow diffusion and unforeseen consequences of health ICT—illustrates the complexity in the field. It also points to the need for a broad approach to the research question, 'Are Norwegian hospitals ready for electronic communication during pre-operative planning?'

Knowledge from the field of qualitative research on health ICT, notably ANT [49] and science technology studies (STS) [50], was used as a first step in our study. The methodology employed an open, empirical approach to determine the actors in technology development, and was also used as a first step in our study to map the different actors involved in electronic communication in relation to pre-operative planning.

ANT is also called a material-semiotic method, where the concept of 'actor' is used similarly to the semiotic concept of 'actant', which means that materiality, i.e., hospitals and EHR systems, are seen as non-human actors and treated equally as human actors. An actor can be any entity that holds a position in a discourse [51]. Thus, the methodology is associated with the equal treatment of human and non-human actors, and assumes that all entities in a network can and should be described in the same terms. This is called the 'principle of generalised symmetry'.

Although it is called a 'theory', ANT does not usually explain 'why' or 'how' a network takes the form that it does [50]. ANT is a way of thoroughly exploring the relational ties within a network. The methodology is empirical and descriptive, rather than theoretical and explanatory in its approach. It consists of following the actors and mapping their actions [50]. In practical terms, this means that the first step of our study of e-readiness was to map the main actors involved in electronic communication during pre-operative planning.
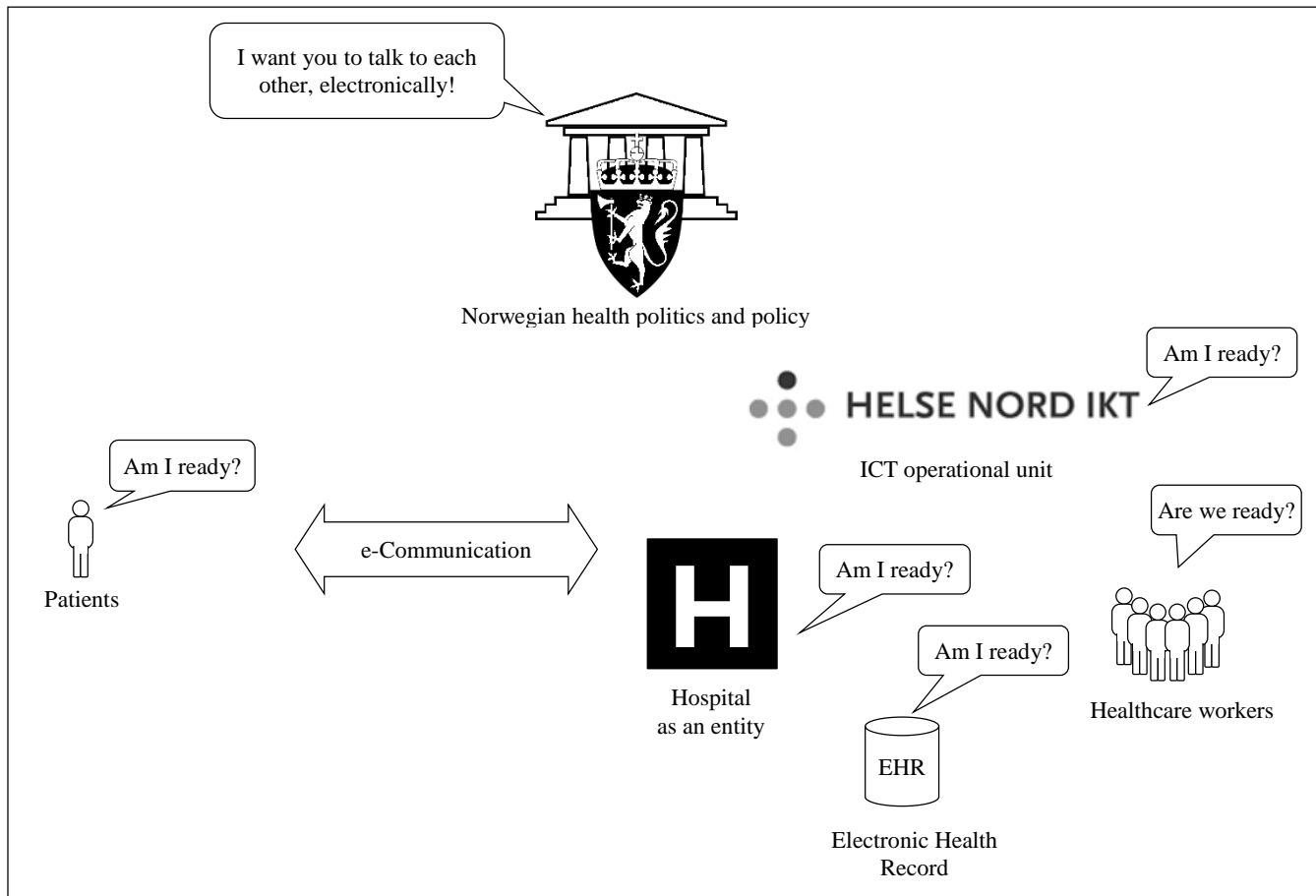

Figure 2. Actors involved in the electronic hospital–patient communication during pre-operative planning at UNN.

The process of mapping the actors identified six main human and non-human actors in need of further inquiry. The main actors, as illustrated in Figure 2, were as follows: a) Norwegian health politics and policy; b) healthcare workers; c) the hospital as an entity; d) patients; e) the EHR system and f) the ICT operational unit. Mapping actors is an extensive exercise. This paper does not reflect the entire nuanced process of mapping; however, it emphasises the need to carefully consider who the actors are in the field, as it can be much more complex than originally anticipated. For analytical reasons, the rest of the paper is organised according to the main actors.

The process of mapping the main actors created a picture of the broad network of actors involved in electronic communication in pre-operative planning. Hence, the second step of our research approach consists of five different study designs for approaching the e-readiness of the six main actors. The five study designs in step two are described below.

A. Health politics and policy

Norwegian health and social care are based on the classical Scandinavian welfare model, which combines financing and the provision of universally accessible services mainly within the public sector [52]. An important political goal in Norway is to provide healthcare on equal terms for all citizens, meaning that local healthcare services should be easily accessible, meet clients' needs and be provided in accordance with political priorities. The Norwegian health and social care sectors are mainly run by public institutions, which accounted for more than 95 % of the health expenses paid by governmental institutions in 1996 [53]. Despite a minor increase in private health services during the last two decades, governmental ICT strategies for the future are an important actor when studying e-readiness.

In order to gain knowledge on the governmental readiness for digitised patient–hospital communication, we conducted a study of one of the largest public sector reforms in Norway, the Coordination Reform [54]. Enhancing coordination between primary and secondary healthcare has been central in Norwegian healthcare policymaking in the last decade. In 2008, a new Minister of Health and Care worked out plans under the key term 'Coordination Reform', and the government has been implementing these administrative, structural and economic reforms since 2012 [52]. The Coordination Reform was identified as an important actor regarding e-readiness in Norwegian healthcare.

In Norway, the healthcare services are divided into four health regions, each with their own authorities aimed at planning, organising and promoting patient care [55]. One way to approach the policy implementation of the Coordination reform is to look into the regional health authority's recent strategies and investments in ICT. This study focuses on the northern region, represented by the Northern Norway Regional Health Authority (Helse-Nord RHF). In order to gain knowledge on the northern health regional ICT policy, we studied their website [56]. The ICT strategy of the northern health region was identified as one important actor in our study of e-readiness.

Since the national vision and the regional health authority's strategy for ICT in healthcare correspond, in this paper they are considered as one actor in the study of e-readiness.

B. Healthcare workers and the Hospital as an organisation

The UNN hospital and the healthcare workers involved in pre-operative planning are main actors in relation to e-readiness. A new communication tool must be implemented in the daily practices at the hospital and taken into use by health professionals during the pre-operative planning process. To study readiness for electronic communication between surgery patients and the hospital, we conducted an in-depth empirical observation and interview study of the pre-operative planning process at UNN. This approach consists of three phases. The empirical methodology will be described briefly; for further information, refer to [57].

Stage 1: Gather data on the hospital's representation of the elective surgery cancellation problem. Inspired by Bacchi [58], the aim was to gather knowledge on how the hospital represented the elective surgical cancellation problem. One internal report from 2008, which contained information on the use of resources involved in surgery at the hospital, was identified and studied [15]. In addition to the report, in 2012, the hospital had initiated a Lean Project (which was established by the management at UNN as an internal project to reduce the cancellation rate) to optimise the elective surgical process. Two researchers from the eTeam-surgery group followed this project. For further reference on the Lean Project, see [57].

Stage 2: Gather data on the pre-operative planning process at the hospital. In Stage 2, the pre-operative planning process in different departments at UNN was investigated. This comprised three weeks of fieldwork and interviews at the surgery and intensive care clinic while following an anaesthesiologist and an anaesthetic nurse. In addition, 13 interviews with physicians, nurses and administrative personnel were conducted in six different departments. The interviews were semi-structured, done at the workplace and lasted from 30 minutes to two hours. During the first two stages, two departments were described as more efficient. However, these departments still had a number of cancellations. One of the departments was chosen for an in-depth study in Stage 3.

Stage 3. Individual, in-depth interviews with professionals from all groups involved in pre-operative planning in a specific department. The chosen department is not revealed due to ethical reasons. In Stage 3, representatives from all the professional groups involved in the pre-operative planning process at UNN were addressed. In this specific department, extensive knowledge on the pre-operative planning process was collected. The department-specific interviews were semi-structured, done at the workplace and lasted between one to two hours.

The ANT-inspired approach helped us to map the main actors and their network of relationships. Not unexpectedly, the hospital and the involved healthcare workers were identified as main actors. Nonetheless, the approach exposed the need to treat and describe the hospital as an institution, or as an organisational entity, and the healthcare workers involved in pre-operative planning at UNN as two separate, equally important

actors in the field of e-readiness. Hospital and health personnel will from now on be considered two important actors in this study of e-readiness.

C. *Patiens*

Patients are, of course, important actors in patient–hospital communication. To investigate the patients' readiness for electronic communication, we interviewed patients who had recently cancelled an elective surgery. The category was strategically chosen due to the patients' recent experience with surgical cancellations and their current incentive to communicate with the hospital on the issue. The relevant patients were identified from the hospital's EHR system. The study of the patients' readiness is part of a larger qualitative phone inquiry where a researcher from the eTeam-surgery project interviewed 16 patients who had recently cancelled elective surgery. The interviews were semi-structured, and patients were asked about their experiences with elective surgery at the hospital, patient–hospital communication and cancellations of surgery. The 16 phone interviews lasted between 15 to 60 minutes and were recorded and transcribed. In this paper, we report on one question from the phone interviews. As a follow-up to the main questions related to how the patients experienced the communication with the hospital regarding their surgical cancellations, the patients were asked, 'Do you have any thoughts on how it [the communication] could be done differently?'

Despite variations and differences among patients, the exercise of mapping actors showed that the surgery patient can be considered a main actor in our study field of e-readiness.

D. *EHR system*

The hospitals' ICT systems are obvious actors in patient–hospital communication. This paper focuses on the EHR system since it is the system that healthcare workers mainly interact with during the pre-operative planning process.

In the northern health region, the EHR systems in use are provided by DIPS ASA [51]. DIPS ASA is the leading supplier of electronic health records in Norwegian hospitals, and is a supplier of systems for the health sector with a special focus on the Scandinavian market [51]. DIPS ASA provides EHR systems to three of the four health regions in Norway. Currently, DIPS ASA, in collaboration with FIKS, an implementation project initiated by the Northern Regional Health Authority, is developing a new EHR system for the region, including a new surgery module.

In the literature, usability, integration and interoperability are identified as key topics in the development of ICT for the healthcare environment. Usability refers to the adequacy of the system for the users' needs. This is mainly reflected by the impact that the system has on the productivity of the process, e.g., efficiency, fulfilling work content, time required for data entry and interference with the physician/patient relationship. The topics, integration and interoperability, generally go hand in hand.

It was the aim of the eTeam-surgery project to combine the eTeam system with the EHR to form one system, ensuring that they function together efficiently by fulfilling the required

integration. However, to do so, interoperability is required between both systems, meaning that they must be able to communicate with each other and exchange information. The use of data standards ensures that the collected patient health data can be integrated in the EHR system and shared among health entities.

In order to study the readiness for a two-way communication system between patients and the hospital integrated in the EHR system, the three aforementioned topics were investigated. Our approach was to study how the EHR was described by health personnel and by the EHR vendor. These groups were involved in separate interviews and meetings, as well as joint workshops focusing on the visions for the future, the limitations and the characteristics of the system.

E. *ICT operational unit*

The Northern Norway Regional Health Authority has established an operational unit (in Norwegian, Helse-Nord IKT) to manage, operate and develop ICT systems for the health region, which comprises a total of 11 hospitals [59]. Hence, all ICT projects involving any of the hospitals in the health region must be approved and accounted for by the ICT operational unit. The ICT operational unit was identified as one important actor regarding readiness for electronic patient–hospital communication.

In order to establish a secure online solution for electronic communication between surgical patients and UNN, a researcher from the eTeam-surgery project attended meetings and workshops over a two-year period from 2014 to 2015. During this period, the Norwegian Centre for Integrated Care and Telemedicine (NST), today called the Norwegian Centre for eHealth Research (NSE), i.e., the authors' research institution, coordinated the efforts to meet the needs and requirements set by the ICT operational unit for electronic communication. A researcher from the eTeam-surgery project attended between 13 meetings. Knowledge gained during the meetings was used to address the ICT operational unit's readiness for two-way electronic communication between the patient and UNN.

IV. RESULTS

Six main actors were identified in order to explore the readiness for two-way electronic communication between the patient and UNN within pre-operative planning. The main actors are categorised as follows:

a) *Norwegian health politics and policy:* National and regional health authorities' visions and strategies for the future of electronic communication within public healthcare;

b) *Healthcare workers*: Readiness among the professionals involved in pre-operative planning to use ICT to communicate with patients;

c) *Hospital as an entity*: Readiness within UNN as an organisation to use two-way electronic communication with patients;

d) *Patients:* Readiness among surgical patients to communicate electronically with the hospital;

   e)   *EHR system*: Readiness of the EHR to support two-way electronic communication with patients;

   f)   *ICT operational unit:* Ranking of priorities and allocation of resources regarding two-way electronic patient–hospital communication.

A. *Norwegian health politics and policy*

In the preface of the Coordination Reform, the Minister of Health and Care Services states, 'In public health spending per capita, Norway ranks among the highest of all OECD nations—but we have not achieved a correspondingly high level of health in return' [54]. However, 'With smart solutions, patients will receive proper treatment at the right place and right time. We will achieve this through the Coordination Reform'. [54]. A well-defined goal in the reform (p. 135) is that 'electronic communication should be the standard way of communicating' [54].

In line with the national ambition, an extensive ICT investment is currently being made in the northern health region, including at the UNN hospital, our site of research. The Northern Norway Regional Health Authority is investing €62.5 million in the FIKS project (from the Norwegian Felles innføring kliniske systemer) [60]. On their webpage, the regional health authority describes the FIKS project as the largest and most interesting ICT investment in northern Norway [56].

B. *Healthcare workers*

During our observations and interviews at the hospital, we did not experience any resistance from the healthcare workers towards electronic communication. On the contrary, aside from what can be described as mixed enthusiasm for 'quick IT-fixes' for complicated clinical issues, most healthcare workers expressed frustration over the current cancellation situation at the hospital. Several stressed the need for new communication tools.

A theatre nurse linked the need for new ways of communication to the current 'quick in, quick out' trend in Norwegian hospitals. The nurse emphasised that this trend requires new ways of communicating with patients prior to hospital admission in order to prepare them for surgery while they are still at home. Before the quick in, quick out movement, nurses were responsible for nursing and preparing the patient for surgery after the patient arrived at the hospital. Such preparation included, for example, cleaning, shaving and nail trimming, according to the hygienic standards required for surgery. Today, many patients are responsible for doing these tasks themselves, and they must follow the hygiene instructions provided by the hospital at home. The nurse's main concern was related to infections. In this context, an electronic communication tool between the patient and the hospital was suggested to help patients prepare for surgery.

Some of the secretaries were also very much in favour of electronic communication with patients. Secretaries are on the front line in terms of everyday communication with patients. Almost all of them expressed frustration or resignation over the current cancellation situation at the hospital, and stressed the need for better tools to book, rebook or cancel scheduled appointments.

As a professional group, with some exceptions, physicians were less troubled than nurses and secretaries by the established hospital communication procedures for patients. Physicians were deeply concerned by the cancellation rate at the hospital, but did not necessarily link it to communication issues. Some emphasised that they used the phone to contact patients if they needed additional information prior to surgery.

C. *Hospital as an entity*

During the inquiry into UNN's position on the elective surgery cancellation problem, one internal report [15] was identified and studied, and the Lean project at the surgery and intensive care ward was followed and observed. The internal report [15] acknowledges the challenges with the continuity of patient care in the region, and relates them to poor interaction between the different professional groups involved in surgical practices. The aims of the internal report [15], along with those of the Lean project, were to promote the continuity of patient care and efficient use of resources in surgery and to reduce elective surgery cancellations. Regarding e-readiness at the hospital, it is important to note that electronic collaboration as a strategy to improve the continuity of care during the pre-operative planning process is not suggested in any of the hospital initiatives.

In addition, the fieldwork at the hospital revealed internal variations between the different departments in terms of how and by whom surgeries were planned and when the planning was done. At the UNN hospital, the different departments had developed their own local practices. In some departments, senior surgeons did the pre-operative planning. In other departments, this planning involved interdisciplinary teamwork between junior and senior physicians, nurses and secretaries. Based on the empirical findings, a homogeneous structure for the pre-operative planning process at UNN could not be identified, nor was it possible to describe a standard pre-operative planning structure at the selected department. It is the authors' understanding that in order to complete the daily schedule, healthcare workers depend on personal and empirical knowledge.

The main findings from the empirical inquiry into the e-readiness at the hospital were as follows: a) the two identified hospital initiatives to reduce surgery cancellations and improve the continuity of care during the pre-operative planning process did not include two-way electronic communication; and b) heterogeneity was identified in how departments and individual professionals carry out the pre-operative planning process.

D. *Patients*

The respondents to the telephone inquiries were patients scheduled for elective surgery who had taken the initiative to call the hospital to reschedule the appointed date for surgery. Some of these patients were pleased with the existing communication with the hospital (i.e., letters and phone calls) and articulated their gratitude towards UNN. It is relevant to note

that many of the grateful patients named specific health workers who had been particularly helpful during the pre-operative planning process.

A majority of the patients that participated in the telephone inquiry had experienced difficulties with patient–hospital communication and expressed readiness for new ways of communicating with the hospital. Most patients did not come up with any concrete recommendations in response to the question, 'Do you have any thoughts on how it [the communication] could be done differently?' Rather, the responses can be categorised as vague suggestions regarding the potential for online communication in modern society. One patient explicitly suggested an electronic communication system where patients could inform the hospital about specific dates when surgery was inconvenient, e.g. vacations, attending family events. It is the authors' interpretation that the patients expected some sort of interactive communication tool which they could use to participate in the planning of the surgery date. With respect to readiness for electronic communication, we did not identify any differences among patients regarding age, gender or level of education.

E. EHR system

During workshops and meetings with professionals from DIPS and FIKS, the EHR system was described as a central working tool for elective surgery planning. Nevertheless, the phrase 'poor functionally' was used to describe the current version of the surgery module in the EHR. This is in line with the findings from the observations and interviews at the hospital, which revealed that different individuals use this module differently in their workflow, and that different departments also use it in different ways to support the information flow. Nevertheless, the EHR system was often referred to as the future spine of the hospitals' ICT services, and huge investments were made in the development of the EHR system.

The next step in our study was to approach the EHR vendor in relation to the integration requirements and interoperability of the EHR system. The study revealed that, despite implementation and research initiatives, the lack of structured data within the EHR system hinders integration with other health ICT. Furthermore, the lack of structured data, combined with the non-use of communication standards, limits the availability of interoperability interfaces. This creates a barrier to achieve the degree of interoperability required to establish patient–hospital communication. The implementation of a communication tool is also restricted by either the inexistence or low maturity of the required platforms. However, tools for electronic communication within the EHR system are being tested at UNN, e.g., the Innsyn project [54]. Such a scenario demonstrates why the EHR system vendor, DIPS ASA, collaborates with the health authority's FIKS project to develop a new EHR system, including a new surgery module.

Professionals working for FIKS and DIPS, including nurses, physicians and engineers, as well as health personnel in general, promoted one singular system that health personnel would learn how to operate and which would provide them with relevant information and services easily and without additional log on. Quite a few professionals expressed interest and enthusiasm for the implementation of the new and future surgery module under development. Some health personnel were enthusiastic and impatient for the new version of the EHR. Still, they questioned the possibilities for integration with other ICT systems in the region, e.g., tools for electronic patient–provider interactions. The success or failure of the huge ICT investments was tied to a functional EHR system.

F. The ICT operational unit

In meetings and workshops with the Northern Norway Regional Health Authority's ICT operational unit, electronic communication between patients and hospitals was described as an aim for future health care. A secure system for two-way communication between patients and hospitals is a clear vision for the northern health region.

However, the ICT operational unit had several unsolved tasks on their agenda due to many large ongoing ICT projects and the lack of human resources. Furthermore, they lacked a secure platform for testing new functionalities. We also found the ambition for contributing to two-way electronic communication differed at different management levels within the ICT operation unit. The policy and willingness varied between individuals and from meeting to meeting. Neither the eTeam-surgery project nor NST were successful in reaching an agreement with the ICT operational unit on one solution for solving secure two-way electronic communication.

To this day, the ICT operational unit has not implemented a platform to support secure two-way electronic communication, nor do they have a foundation for pursuing the issue. However, the unit is supporting and testing a platform to provide patients access to their own electronic health record in an ongoing project in the health region [54].

Summing up the results, see Table I, the strong governmental vision that 'Electronic communication should be the standard way of communicating' [54] is evident in our findings from the study of e-readiness among healthcare workers at the hospital. Apart from what can be described as mixed enthusiasm for quick IT-fixes for complicated clinical issues, several healthcare workers expressed frustration with the current cancellation situation at the hospital and stressed the need for new communication tools. Similarly, and in line with the governmental vision, the patients in our study requested some sort of interactive communication tool, where they had access and could participate in the planning and decision making of the date of their forthcoming elective surgery.

TABLE I.   SUMMARY OF THE TYPE OF STUDY AND RESULTS HIGHLIGHTS FOR THE IDENTIFIED ACTORS.

	Health politics and policy	Healthcare workers	Hospital as an entity	Patients	EHR system	ICT Operational unit
Type of study	Documentary study of the Coordination Reform [54]	Identification of UNN's representation of the elective surgery cancellation problem In-depth empirical observation of the pre-operative planning process at UNN Interviews with professionals from all groups involved in the pre-operative planning process	Phone interviews with patients that recently had an elective surgery cancelled	Interviews, meetings and workshops with vendors and users	Meetings with the ICT operational unit concerning two-way electronic communication
Results highlights	Electronic communication should be the standard way of communicating	Stressed the need for new communication tools	None of the identified hospital initiatives included two-way electronic communication Heterogeneity in how departments and individuals carry out the pre-operative planning process	Requested some sort of interactive communication tool	Lack of structured data within the EHR system hindered the integration with other health ICT solutions	Two-way electronic communication was not presented as a priority in their ICT strategy

Regarding e-readiness, electronic communication, as a strategy to improve the continuity of care during the pre-operative planning process, was not suggested in any of the hospital initiatives identified in this study. In addition, the main finding from the empirical inquiry at the hospital was heterogeneity in how departments and individual professionals carried out the pre-operative planning process. The study has also exposed that, despite implementation and research initiatives, the lack of structured data within the EHR system hinders the integration with other health ICT solutions. This creates a barrier to achieve the degree of interoperability required to establish two-way electronic communication. At this point, the regional health authority's ICT operational unit is not ready to open up for two-way electronic communication.

V.   DISCUSSION AND CONCLUSIONS

Are Norwegian hospitals ready for two-way electronic communication between the patient and hospital during pre-operative planning?

Six main actors were mapped and identified as requiring further investigation in order to study readiness for two-way electronic communication within pre-operative planning at UNN. The main actors were as follows: (a) Norwegian health politics and policy; (b) healthcare workers; (c) hospital as an entity; (d) patients; (e) the EHR system and (f) the ICT operational unit.

It is the authors' conclusion that the Norwegian government states a strong wish for electronic communication in the Coordination Reform. This conclusion is in line with Tjora and Melby's [61] analysis of the reform, demonstrating the government's attention to the importance of ICT in order to succeed in healthcare coordination.

The empirical study conducted at the UNN revealed that nurses and secretaries involved in the pre-operative planning are ready for electronic communication. Even though physicians, as a professional group, reported less need for an electronic communication system than nurses and secretaries, it is the authors' interpretation that they are ready for electronic communication. The relative absence of interest is most likely linked to work tasks, such as scheduling, traveling logistics, general pre-operative information and support, which are the responsibility of nurses or secretaries. These are the ones who communicate with patients prior to surgery, not the physicians. It is also important to note that some physicians were enthusiastic about the possibility of electronic communication with patients.

The nurse's proposal of an electronic tool to help patients prepare for surgery at home illustrates how a nurse pictures the future of healthcare. The nurse's proposal includes the need for electronic communication and online care for patients while they are still at home. The shift from care towards telecare is also evident in the literature. Wyatt and Sullivan [62] state, 'In the future, health professionals may move towards spending some of their working lives as telecarers. A telecarer is a health professional who delivers responsive, high-quality information, services and support to remote patients or clients using the most appropriate communication, such as telephone, email or instant messaging'.

The study of patients' readiness identified that surgical patients expect some sort of interactive communication with the hospital. Today, hospital–patient communication is based on letters exchanged by post and/or telephone calls between patients and hospitals. This system does not allow patients to participate in the process of scheduling their forthcoming elective surgery. It is the authors' interpretation that there is a strong wish among surgery patients to coordinate minor surgery with their everyday lives, e.g., the ability to inform the

hospital about the dates or weeks they are unavailable to undergo surgery. This reveals their readiness for new ways to communicate with the hospital. These findings are in line with existing literature that demonstrates how patients, including the elderly or less educated, are ready for electronic communication [41][42][43].

Regarding e-readiness at the hospital, electronic communication as a strategy to reduce surgery cancellations is not suggested in any of the identified hospital initiatives to improve planning and reduce cancellations. Further, the empirical study of the pre-operative planning process at UNN demonstrates heterogeneity in how departments and individuals carried out the planning process. It is the authors' understanding that in order to complete the daily schedule, the hospital depends on the healthcare workers' personal and empirical knowledge, proactivity and workarounds. The heterogeneity and lack of standards in the pre-operative planning processes reveal that the hospital, at this stage, lacks the organisational structure required for two-way electronic communication. Hence, the hospital is not yet prepared for two-way electronic communication with patients during pre-operative planning.

The surgery module in the EHR is an unused resource at the hospital. At present, money and resources are being invested by FIKS and DIPS ASA, the EHR vendor, to develop a new surgical module. However, two-way communication with patients is not prioritised by either of them. On the other hand, the northern health region has supported initiatives to provide patient–hospital communication within the EHR; however, to date, this is limited to one project which focuses on the patients' access to their own electronic health record. Despite this initiative, it is the authors' understanding that the current EHR is a barrier for two-way electronic communication between patients and the hospital.

The governmental vision for electronic communication has not materialised in technological solutions or in the priorities of the regional authority's ICT operational unit. Despite massive ICT investments in the region, it is the authors' understanding that the ICT operational unit, at this stage, is not ready for two-way electronic communication between patients and UNN.

This analysis is based on the recognition that in order to avoid the e-readiness paradox and to develop and implement sustainable electronic communication systems, computer scientists need to identify patterns of information and work flow. The authors conclude that Norwegian health policy strongly promotes electronic communication, and that healthcare workers and patients are ready to use new electronic tools, while the hospital as an entity, the current EHR system and the ICT operational unit are not yet ready for two-way electronic communication between patients and UNN.

While the analysis, and particularly the conclusions, might be debated, they are still relevant on multiple levels. For the eTeam-surgery project, the study of e-readiness have a great impact on future work. Should resources be spent on the development and implementation of new technology or should they be spent primarily on gathering knowledge on the organ-

isation and how to prepare the hospital for electronic communication? A relevant question for future work is as follows: Is heterogeneity in pre-operative planning processes exclusive to our site of research, or are local practices and differences among individuals and between departments common in Norwegian hospitals? What about the regional ICT operational units? Are they powerful actors in all Norwegian hospitals, or are our findings related to local issues, such as lack of resources and bad timing?

In an applied context, the analysis has relevance for policy makers, managers and stakeholder in the healthcare sector, e.g., health authorities, vendors and large ICT projects. Are the findings applicable to other hospitals in Norway? What if today's hospitals, as organisational entities, are not ready for electronic communication with patients? Will a new EHR, additional resources and different priorities in the ICT operational unit solve the barriers for two-way electronic communication, or do the reported findings illustrate how work is organised and done in healthcare today?

In the scientific field of health informatics, the debate on e-readiness requires that the concepts of 'user involvement' and 'user centred', as well as the users' role, need to be revisited. As demonstrated in this paper, the health policy, the hospital and the EHR system are important non-human actors that need to be studied, analysed and accounted for in relation to the question of e-readiness. A methodology that practices the equal treatment of human and non-human actors, and assumes that all entities in a network can and should be described in the same terms, is useful to map important actors. As we have demonstrated, readiness for electronic communication is not exclusively about the interaction between patients and health personnel. This multi-method approach revealed that some actors are ready for electronic communication while others are not.

We argue that in order to avoid the e-readiness paradox and develop and implement sustainable electronic communication systems, it is not only human actors—patients and healthcare professionals—who need to be ready for electronic communication.

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