Electronic Patient Communication in Norwegian Municipal Health Institutions

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Abstract— **During 2017, the Norwegian center for e-health research (NSE) conducted a national survey of the extra labor generated by incompatible Information and Communication Technology (ICT) systems in municipal health institutions. We sent out an electronic questionnaire to 283 Norwegian municipalities and addressed 5 types of health service in each community during the spring of 2017. In this paper, we describe and analyze parts of our national survey, focusing on the answers given to questions concerning direct electronic communication between the different health services and their clients. We focus on the part of the investigation concerning the municipal health services' and GPs' electronic communication with their target populations. We are primarily interested in mapping to which extent the municipalities at present use electronic means for communicating with their health service clients, and which ICT systems are applied to facilitate such communication. In our material, we are able to distinguish between 5 main municipal health services, staff work roles, and size of municipalities in terms of population. Our results suggest that around one third of the Norwegian health institutions in primary care apply electronic equipment for some of their communication with the patients. SMS for reminders has the highest score, but also appointment and prescription reservations are in common use.**

Keywords-Telemedicine; Primary care; Electronic communication.

I. INTRODUCTION

It is a national ambition in Norway to build a new common electronic communication infrastructure [1][2], which can ease the information exchange between hospitals, GPs, municipal health institutions and the public. The objective is to secure a smooth electronic dialogue between all the involved parties throughout entire patient pathways [3]. Guaranteed access to relevant and updated patient information to health professionals involved in treatment and rehabilitation is a central concern. At the patient's side of the table, access to own health information will be facilitated, at the same time as the patient is given a say in own treatment and being provided opportunities for an electronic dialogue with the professional caregivers [4]. Also, the new infrastructure is hoped to facilitate automatic extraction of data into central registers which will allow for quality surveillance, enable new research strategies, and promote health care innovations [1]. However, national ambitions are one thing, and on the ground, reality usually takes on a different complexion [5]. At present, a variety of ICT systems are in use at different levels of health care and in different institutions and geographic locations. These systems sometimes form information silos [6][7], which in turn produces extra work since the same information has to be entered into different ICT systems several times. During 2017, NSE conducted a national survey of the extra labor caused by incompatible ICT systems in municipal health institutions. We sent out an electronic questionnaire to 283 municipalities and addressed 5 types of health services in each community. During the spring of 2017, we also carried out in-depth interviews with health professionals working in Trondheim.

In this paper, we describe and analyze parts of our national survey, focusing on the answers given to questions concerning direct electronic communication between the different health services and their clients. Qualitative data from Trondheim tend to support our main conclusions from the quantitative survey. We were primarily interested in mapping to which extent Norwegian primary care services currently apply electronic tools to communicate with their clients and their families. The patients are at present provided access to own health data primarily through a central portal (helsenorge.no). However, only hospital records are accessible through helsenorge.no, while primary care health information is maintained locally. The patient centric care [8] model is still in its infancy in Norway, and our results shows that the patients' opportunities for an electronic dialogue with the health professionals are still limited.

In the introduction of this paper, we cite the relevant policy documents describing a new electronic infrastructure for primary care in Norway. In these policy documents the patients' access to own health data is emphasized. We have investigated quantitatively as well as qualitatively how health information at present is exchanged between health professionals of primary care and their clients. Our main methods as well as the materials are described in the section methods and materials.

Our main findings as described in the result section are that SMS for reminders has the highest score, but also appointment and prescription reservations are in common use. However, of the more than 1000 service institutions in Norwegian municipalities investigated in our study, only 30 % apply direct electronic communication with their clients.

II. METHODS AND MATERIALS

NSE has during 2017 together with the Norwegian directorate for e-health conducted a survey of electronic communication between municipal health institutions, GPs, and their clients. The aim of the project was to study the electronic communication flow within and between municipal health institutions, and to estimate the time spent on double work generated by information silos. In this paper, we primarily focus on two objectives of the investigation:

1. To which extent do the health professionals provide updated health information to their clients by electronic means?
2. Brief mapping of ICT systems for communication with the patients currently in use in Norwegian primary care.

The investigation was divided into three phases:

1. An observational/interview phase in Trondheim to get an overview of work routines in the municipality and to learn the language by which the professionals described their own work.
2. Development and distribution of a questionnaire in accordance with the objectives of the study. The questionnaire was tested against an expert panel of five health professionals at NSE prior to distribution. We used a Questback form of around 100 questions, which was sent to key health personnel within NSE's network in each municipality. These key persons in turn distributed the questionnaire to subordinate personnel in their own community. Five municipal service areas were targeted, including nursing homes, in home care services, maternity and child services, municipal IT departments and GPs. The questions regarding direct communication between health services and clients were divided into two parts:

a) Has your institution established routines for direct electronic communication with the patients/close persons in your municipality? If so, who is involved in the electronic communication (clients, close persons or both parties)?

b) If you don't apply electronic tools for direct communication with the patients, do you have plans about implementing such services? What are the most important obstacles on the way to establishing communication with patients in your institution/municipality (lack of resources, lack of priority, legislation barriers)? The second project phase was primarily conducted during the fall of 2017.

3. Analysis and reporting of results. The work was carried out during the spring of 2018.

Trondheim is a municipality of about 220.000 inhabitants, one of the largest in Norway. We regard this fact as important, since health information handling may vary according to community size. In small municipalities (less than 5000 inhabitants), different health services are often localized within the same building. Personnel of different services often meet, and they know each other personally. In larger communities (more than 20.000 inhabitants), different services are usually located in different buildings, and personnel of different services meet less frequently face-to-face.

The transcriptions were encoded according to our checklist by several members of the staff, and the coding discussed and refined in a cyclic process during several project meetings in early 2018.

Obviously, a handful of informants cannot yield quantifiable results valid for all Norwegian municipalities. However, during our field investigation, we engaged in lengthy discussions with health personnel of all types working in our targeted institutions. All in all, we talked with around 15 people during our study, and we find it plausible that the suggestions given by them point to important aspects of the workings of electronic communication in Norwegian health care in general.

The net questionnaire of the quantitative investigation was distributed to all Norwegian municipalities (283 entities), except for municipalities in Trøndelag and Møre- and Romsdal counties. The investigation was closed on October 20, 2017, and we received 1245 answers. After cleaning of the resulting forms, a total of 1022 responses were kept for further analysis.

The compiled material about direct communication between health professionals and their clients collected for the first part of the investigation 324 responses (698 nan-values), while the second part yielded 614 (408 nan-values) and 127 (895 nan-values) responses for the last question block. In our total material 431 responses come from the larger municipalities, and 335 and 291 from medium-sized and small communities respectively (n = 1015, indicating that 7 respondents failed to fill in information about the size of their municipality). In this paper, we focus on the part of the investigation concerning the municipal health services' and GPs' electronic communication with their target populations. We are primarily interested in mapping to which extent the municipalities at present use electronic means for communicating with their health service clients, and which ICT systems are applied to facilitate such communication. In our material, we are able to distinguish between 5 main municipal health services, staff work roles, and size of municipalities in terms of population. A summary of the incoming responses showed that municipalities of different sizes are well covered, and that all health service types are represented in the materials (Table 1).

The Number of responses regarding use of electronic tools for direct communication with the clients are more frequent from large and medium size communities as compared with the small ones. The number of responses from small municipalities is only half of what we got from large and medium sized municipalities in our material (table 2). This of course has consequences when we compare number of answers to the specific questions in our Questback [10] form.

The second part of our question concerning direct communication between the municipal health services and their patients regarding who the partner in the communication with the professionals is, gave no responses. Question about plans for further implementation, and which barriers hamper such implementations, yielded 614 and 127 answers respectively. Of the 614 answers, 46 are positive responses (1-values). Hence, our material is missing or

sparse for two of the questions for the rest of the material the responses are distributed as shown in table 3. Roman number I is the numbers from the first question block of the investigation, while II and III are the numbers given in the second block.

Table 1 TOTAL NUMBER OF RESPONSES IN ABSOLUTE FIGURES WITH REFERENCE TO SERVICE

Health services	Large communities	Medium-sized communities	Small communities	Total
In home service	107	72	58	237
Maternity and child service	89	69	54	212
Nursing homes	85	56	60	201
GP	73	57	47	177
IT department	55	60	21	136
Administrative	14	17	9	40
Emergency room	8	4	0	12
Total	431	335	249	1015

TABLE 2 NUMBER OF RESPONSES REGARDING USE OF ELECTRONIC TOOLS WITH RESPECT TO COMMUNITY SIZE

Electronic tools	Large communities	Medium sized communities	Small communities
SMS	144	111	69
Online booking of appointments	144	112	68
Online prescription order	144	111	68

TABLE 3 NUMBER OF RESPONSES IN TOTAL NUMBERS WITH RESPECT TO HEALTH SERVICE CATEGORY.

Service name	I	II	III
GP	152	22	4
Maternity and child service	118	88	12
In home services	30	201	36
Nursing homes	15	180	42
IT department	9	123	33
Total	324	614	127

The results were exported from Questback to excel in a full text version, but also a numeric excel report was generated. We primarily used Python 3.6 with NumPy and Pandas [11] for the numeric analysis. Python was installed by applying Anaconda 5.0.1 from Anaconda Inc. [12], on an arch Linux desktop computer, and the software read the original excel files out of the box. Python's scientific stack [13][14] represents an easy applicable and free tool for the analysis we are carrying out here. We provided access to the data for the research team via Jupyter hub. A preliminary description of the overall material is provided on the basis of the xlsx-files by Eli Kristiansen (E. Kristiansen 2018, oral communication, 5th January, NSE).

III. RESULTS

Our qualitative data suggest that direct communication with the patients by electronic means is still in its infancy in Norway. 31 per cent of our respondents to our net-form said they were currently applying electronic routines for direct communication with their clients. Of the tools in use, SMS has the highest score, followed by appointment reservation and prescription reservation on the net (table 4).

The centralized electronic services, such as helsepost.no and consultations via helsenorge.no are currently little used. Only 13% and 10% respectively of the informants saying they applied direct communication with their patients (n = 324) using these services. Looking closer at the responses explicatively saying they are applying SMS as a communication tool, the GPs and the maternity and child services use this routine most frequently (table 5). The other health services to some extent apply SMS to communicate with their clients. The figures of table 5 show that when adjusting for sample size there is no difference in the application of SMS in large versus medium-sized/ small communities.

Also, GPs apply online booking most frequently, again municipal size does not seem to influence on these work routines (table 6). The other municipal health services do not apply online booking to any extent. During our fieldwork, the GPs stated that as private enterprises GP offices often have a home site for their private enterprise up and running. Hence, online booking routines are fairly easy to implement. On the other hand, municipal health services have to work via their communities' common net pages, which might make it more difficult to implement service- specific routines for direct communication with the clients.

The numbers for online prescription order show that this routine is little used by municipal health services (table 7). Only GPs use online prescription order as a routine. The figures for the GPs' application of online prescription order is evenly distributed regarding community size, taking into account that the sample size in small communities is half of the sample sizes in large and medium sized communities.

TABLE 4 NUMBER OF RESPONDENTS (IN ABSOLUTE NUMBERS AND PERCENT) APPLYING ELECTRONIC ROUTINES FOR DIRECT COMMUNICATION WITH THEIR CLIENTS (N = 324).

Service name	Total number	Percent
SMS	266	82%
Online prescription order	122	37%
Online booking of appointments	116	35%
Other communication channels	53	16%
E-consultation	43	13%
Patientpost.no	34	10%

TABLE 5 USE OF SMS COMMUNICATION IN MUNICIPAL HEALTH SERVICES WITH RESPECT TO COMMUNITY SIZE

Health Services	Large community	Medium sized community	Small community	Total
GP	49 (42%)	44 (37%)	25 (21%)	118 (100%)
Maternity and Child services	51 (45%)	42 (37%)	21 (18%)	114 (100%)
In home Services	13 (59%)	7 (32%)	2(9%)	22 (100%)
Nursing home	4 (67%)	1 (16,67%)	1 (16,67%)	6 (100%)
IT department	3 (50%)	2 (33,33%)	1 (16,67%)	6 (100%)

TABLE 6 USE OF ONLINE BOOKING OF APPOINTMENTS IN MUNICIPAL HEALTH SERVICES WITH RESPECT TO COMMUNITY SIZE

Health Services	Large community	Medium sized community	Small community	Total
GP	46 (43%)	38 (35%)	24 (22%)	108 (100%)
Maternity and Child services	1 (25%)	2 (50%)	1(25%)	4 (100%)
In home Services	1 (33%)	1(33%)	1(33%)	3 (100%)
Nursing home	1(100%)	0 (0%)	0 (0%)	1 (100%)

TABLE 7 USE OF ONLINE PRESCRIPTION ORDER IN MUNICIPAL HEALTH SERVICES WITH RESPECT TO COMMUNITY SIZE

Health Services	Large community	Medium sized community	Small community	Total
GP	46 (43%)	38 (35%)	24 (22%)	108 (100%)
Maternity and Child services	1 (25%)	2 (50%)	1(25%)	4 (100%)
In home Services	1 (33%)	1(33%)	1(33%)	3 (100%)
Nursing home	1(100%)	0 (0%)	0 (0%)	1 (100%)

The general practitioners are the pivot of Norwegian primary health care, and to some extent they use electronic tools for direct communication with their patients. Working as emergency room or nurse home staff, direct communication with external clients is handled by other personnel. The same is true when the doctor work in maternity and child services. The in-home care services stated during our field investigation that one of their primary goals when rebuilding their ICT systems is to stablish direct contact with the patients' EPR when being out of office.

This way, much of the documentation required in healthcare might be down before returning to the office, i.e., the documenting tasks may be performed in the clients' home. The in-home care services, to any extent, do not communicate directly with their clients by electronic means, even if this was regarded as a constructive opportunity when rescheduling appointments. Nurse home personnel told us

during qualitative interviews they primarily use telephone for direct communication with the families of their clients. Direct electronic communication with the public is hardly used, and in our quantitative material, the nurse home constitutes 19.8 % of the answers.

Maternity and child services personnel told us during qualitative interviews that in general, they used their own log systems, often in written form. In their daily routines, they need to collect written consent forms with signatures from children, as well as from adults. Today, these tasks are performed through regular mail, and hence is time- and labor consuming. An electronic system for document exchange with the clients would be more efficient than the current procedures, according to the staff.

We finally asked our informants about possible reasons for not applying direct electronic communication with their clients. Among the suggested reasons in the questionnaire was 1) lack of priority among the leaders, 2) lack of resources/competence 3) lack of technical equipment. We got 127 answers (response rate 12%) of which 895 were nan-values. Of the answers pointing to specific reasons for not applying electronic tools for direct communication with the patients 33 per cent pointed at lack of priority and 37 % pointed to lack of economic resources.

IV. DISCUSSION

The nursing homes are marked by several professions working together to provide care to their clients. Our informants told us that much of the communication with external colleagues is carried out by telephone, and the same also goes for communication with their clients' families and close persons. Some of our informants told us about communication bottlenecks due to incompatible electronic systems in different community health care institutions, and this potentially generates a lot of double work when care is to be coordinated with external parties. The nursing homes did not communicate with their clients' families electronically and usually applied telephone for this task. Our quantitative results show that the nursing homes have a lower score for all of the communication routines investigated regardless of community size. A lack of priority among municipal leaders and lack of resources seem to be the reasons for this state of affairs. In the literature, electronic communication with patients is suggested to secure continuity in the care provided [15][16].

The in-home care services' personnel focused on the lack of integration between mobile and stationary ICT systems as a main barrier to efficient digital communication at the workplace. Updated medication lists were of central concern, and our informants did not to any extent use electronic communication with their clients in their daily work. The focus is still on enhanced information exchange with professional partners, and this has to be resolved first, our informants told us. Like in the nursing homes, the in-home care services have a low score for all of the communication routines investigated, regardless of community size [17].

The Norwegian maternity and child services serve nearly all children and mothers in the communities. They are involved in general health checkups for all of their clients,

vaccination programs and proactive medicine. The stations also collaborate closely with the schools. Hence, the staff reach patient categories which other health personnel may infrequently meet. The maternity and child services seem to apply means of electronic communication slightly more than nursing homes and in-home services [18]. The collaboration with municipal school may be the reason for high score on SMS. A considerable portion of the communication with other professionals and the clients is performed by written documents sent by post. Our informants told us that casework for schoolchildren is slowed down if written consent is required from the parents on behalf of their underaged children.

The GPs are the pivot of Norwegian health care, and any restriction of communication at this level has consequences for the entire patient pathway. GPs communicate extensively with patients, primary care institutions and hospitals [19][20]. According to our informants, much of the communication with other professionals in municipalities and in hospitals is conducted by telephone. In particular, the exchange of medication lists between GPs and the municipal home care services were considered as bottlenecks in the information exchange. Some of our informants claimed that restrictions in communication across municipality borders, and when patients consult different GPs constitute potential blocking of patient information exchange. Documents frequently have to be scanned, which results in data that are not electronically searchable. Some of the GPs requested a better national coordination of electronic health record systems. The GPs conducted the bulk of direct electronic patient communication which we observed in this investigation. Especially SMS reminders and online booking services were in frequent use, and more so than in the rest of primary care. This may be due to a smoother process of decision making within small work organizations.

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