A Survey of Mobile Support Needs in the Home Nursing Care

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Abstract

This paper describes the results of a survey performed in the home nursing care at different municipalities and health regions in Norway. The purpose of the survey was to map which kind of technical or informational mobile support the personnel reckoned as important when visiting patients at their homes or elsewhere when mobile. The sample was drawn based on an index that groups the regions based on the size of the population. The people in the home nursing care are familiar with the use of mobile phones and computers. They also demands access to certain type of information when mobile to support their daily work.

Keywords:

Mobile work, Mobile Nursing Informatics, Survey

Introduction

The home nursing care is an important part of the public primary health care in Norway. More than 30% of the expenses in the municipalities are used in services related to health and elderly care. More than 43% of these expenses are used in the home nursing care. About 90000 people are employed within the nursing care in Norway. These serve around 180000 patients [3].

The population in Norway is spread over relatively large distances, requiring the nurses to travel correspondingly. The home nurses have thus nomadic working conditions, and are often alone when decisions regarding a patient have to be taken. They serve a heterogeneous group of patients including physically and mentally disabled people, mental patients, convalescents, and elderly people with different demands.

In this survey we have focused on revealing the communication and information needs in the home nursing care. The home nursing care covers the demands of home care and medical treatment. The home nursing care services also include coordination and communication of other services like hospitals, nursing homes and similar.

Patient information is spread across both digital and manual archives. Both kind of archives are used within the home nursing care, and information is often duplicated. This situation may lead to incomplete and obsolete information in the patient medical records. Reporting is handled through meetings in addition to adding information to the different archives. Informal communication between nurses is frequent and is usually not documented. In a few years it is expected that the health care personnel will be able to access all patient records electronically. This will greatly improve the information flow between the different instances that a patient directly or indirectly is cared by. A further improvement would be to access the information also when mobile..

Description of the Survey

The survey is based on the current information flow and demands in the home nursing care, and measures relatively few variables in a large sample to make it representative for the whole population. The questions were given as closed alternatives in a Likert-type scale. The respondents were selected by probability sampling. The population was divided into subgroups based on KOSTRA[1] [6]. KOSTRA groups the 434 municipalities in Norway into 16 groups based on population size and their economical conditions. From these groups 39 random samples were drawn. The numbers of municipalities drawn from each group were proportional to the size of the groups. Ten questionnaires were sent by mail to the drawn municipalities. Some of the municipalities could however not answer more than 5 questionnaires because of the small size. This resulted in a quite high dropout rate. Of a total of 390 questionnaires, 175 were returned.

The questionnaire was divided into 4 parts, where parts 3 and 4 have sub parts. Part 1 contains questions related to demographical data. Part 2 contains general questions related to the normal working day. Part 3 contains questions related to the nursing care, and for demands for administrative and professional information and services. Finally, part 4 describes a technological scenario and asks questions related to experiences and expectations to new technologies, and questions of which kind of functionality a mobile device should offer.

Results from the Survey

Part 1: Demographical Data

The age distribution of the respondents was: 16.0% in the group 20-29 years, 24.0% - 30-39, 39.4% - 40-49, 20.0% - 50-59, and 0.6% above 60. This gives an average age around 40 years. The respondents have in average worked 15.9 years in the health care, and 85.5% have permanent employment. The educational level of the respondents is distributed evenly between college and university. Six of the 175 respondents did not have higher education. 86% of the respondents were women. This confirms that the nursing care traditionally is dominated by women. 81.7% had beside their occupation as a home nurse, additional responsibility related to administration, specific patient care, and other kind of leader roles.

[1] KOSTRA is an abbreviation for "Municipality-State-Reporting"

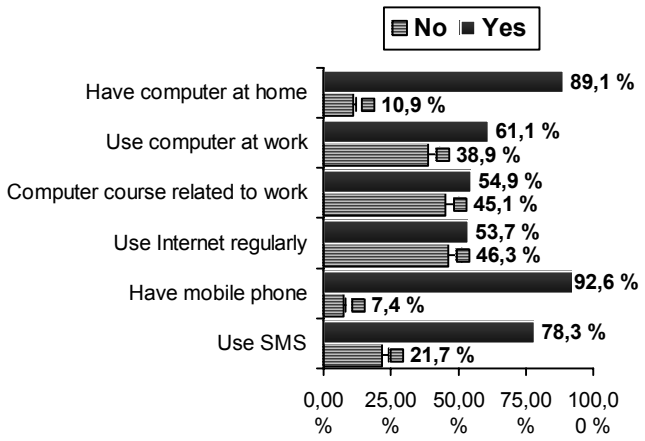

Figure 1: Use of Information Technology

Figure *1* shows the use of information technology -- both professionally and privately. A surprising large amount of the home nursing care personnel are users of different kind of computing and communication technology.

Part 2: The Perceived Normal Working day

The questions in this part are related to the perceived normal working day in the home nursing care. The questions in this part appealed to the feelings of the respondents. The questions were given with closed answer alternatives (1-Strongly Disagree, 2-Disagree, 3-Uncertain, 4-Agree, and 5-Strongly Agree). The results indicate that meetings are necessary to get the required information for the working day (94% agree or strongly agree with Q2-3: μ=4.37/σ=0.688), and they are social important (79% agree or strongly agree with Q2-2: μ=3.83/σ=0.898). 78% of the respondents mean that the allocated tasks take longer than estimated (Q2-12: μ=3.79/σ=0.747), and 70% find it important/nice to know were the colleagues are (Q2-11: μ=3.66/σ=0.815).

Part 3: Demands for information and services

Part 3 in the survey asked for information and services that a health care worker demands during a working day. The respondents were asked to consider a situation when mobile, either on the move or visiting the patient. Part 3 is divided into three parts where 3a considers the treatment work, 3b considers issues with respect to administration of the working day and other administration tasks, and 3c looks at demands for different types of professional health-related information. The questions in part 3 and 4 were given with closed alternatives (1-Not at all, 2-Little, 3-Some, 4-Much, and 5-Very much). The respondents answer generally quite high in this part. There are differences between the parts as will be presented below. Professional information, and information and services related to the patient treatment, are valued as more important than administrative information and services.

Part 3a: Patient Treatment

Table 1 shows the results of some of questions related to information in the patient treatment. The respondents value access to this kind of information as quite important when mobile.

Table 1: Patient treatment (N=170)

No.	Question	μ	σ
Q3a-4	General information about the patient (like closest relatives, family circumstances, living situation, professional career etc.)	4.15	.940
Q3a-5	Access to the patient epicrisis/medical records/case history (previous and current clinical picture and treatment, allergies etc.)	4.23	.917
Q3a-6	Information about the patient task, the care study, and what needs to be brought to the patient	4.49	.800
Q3a-8	Be able to make requisitions of services from others (e.g. food transport, occupational therapy)	4.07	.955
Q3a-9	Information about medical tests and the results from these	3.94	1.174
Q3a-11	Information about which kind of patient support equipment a patient possesses	3.90	1.050
Q3a-12	Possibility to record needs for patient support equipment	4.08	.946
Q3a-13	Be able to report the need for additional help when visiting a patient	4.34	.940
Q3a-15	Be able to record start and end of patient visits	3.11	1.276

It is a trend in this part that people without any specific responsibilities in the whole answer lower to every question. The mean value of this group is 3.64 compared to 4.01 in the total mean. People with a specific patient responsibility have a mean value of 4.18 for all questions. Zone leaders have a higher score to Q3a-15 than the rest. It is not clear from the survey whether the zone leaders want to follow up the personnel for security reasons, or if they in a higher degree want to monitor them.

Part 3b: Administration of the working day

Table 2 shows the average score and standard deviation of questions related to administration of the working day and other kind of administrative tasks.

Table 2: Administration of the working day (N=167)

No.	Question	μ	σ
Q3b-1	Be able to apply for, or record need for a place at an institution	3.71	1.219
Q3b-3	Get information about what are in stock (e.g. the medicine stock or the supporting equipment stock)	3.24	1.104
Q3b-4	Access to personal hour lists and information about the salary	3.12	1.543
Q3b-5	Possibility to look at your own or others‘ rotation scheme	3.37	1.535
Q3b-6	Be able to find who is having duty after yourself to be able to inform the patient about it	3.39	1.266
Q3b-7	Be able to find mileage use e.g. last week, month, or year	2.42	1.429
Q3b-8	Access to address and phone number to the personnel (both fixed and temporary staff)	3.75	1.317
Q3b-9	Be able to report the need for additional help when visiting a patient	4.13	1.033
Q3b-10	Overview of responsible professional health persons for the different patients	3.79	1.111

The respondent should imagine to be working on a mobile

task. A little bit surprising for us was that this kind of information was less demanded. Examples of tasks were e.g. to read hour lists or edit recent mileage use. The respondents did however value information like name of patient responsible, address information of the personnel, and being able to record needs for a place at institutions.
The standard deviation is somewhat higher in this part, but we have not been able to find any particular reason for this. It is however a tendency that the zone leaders and personnel with specific patient responsibility is more positive than the rest of the respondents.

Part 3c: Professional health information

Table 3 shows the results of questions related to what kind of professional health information the home nurse needs during a working day (working mobile). Generally, the respondents mean that they have "much" need for access to professional information. The most important information is related to medicine effect and by-effects.

Table 3: Professional information (N=166)

No.	Question	μ	σ
Q3c-1	Information about medicine effects and by-effects	4.23	1.048
Q3c-2	Access to information about concrete diagnoses (pathology)	4.09	1.049
Q3c-3	Information about diets for different diagnoses/diseases	3.81	1.122
Q3c-4	Information about practical procedures that are used in your job	4.05	1.046

It is interesting to observe the difference in responses between the zone leaders and the others in which questions that are regarded as most important. Zone leaders value Q3c-4 highest, where the others value Q3c-1 highest. This difference is important to be aware of when developing support systems in the home nursing care. Zone leaders are probably the group that is most natural to use when specifying requirements for support systems. The results show that it is important to also include other stakeholders when prioritising requirements.

Part 4: Requirements to a Handheld Device

Part 4 in the survey focused on technology. The first part asked for experiences and expectations related to new technology. We also presented a futuristic scenario for the respondents where they have access to a multi-function, multimedia handheld computer without any technical limitations.

Table 4: Technological attitude (N=170)

No.	Question	μ	σ
Q4a-1	I believe introduction of new computer systems will make my working day simpler	3.82	.964
Q4a-2	Use of new technologies is time-consuming and ineffective	3.49	.908
Q4a-3	I feel comfortable using computers	3.42	1.110
Q4a-4	Use of technology leads to increased employee surveillance at the workplace	3.74	0.952
Q4a-5	My impression is that computers create a larger distance between people	3.18	1.063
Q4a-6	I think the technological development is exciting	3.75	.978

Part 4a: Technological Attitude

Table 4 shows the results of questions related to experiences and expectations to new technology. Some of the questions were negative formulated, and the scores were therefore adjusted. Most of the respondents have positive experiences and expectations to use of new technology.

Part 4b: Functionality a mobile device should offer

Table 5 shows the results of questions related to what kind of functionality a mobile device should offer the user. The respondents are valuing different kind of information and services as quite important, but the answers have a larger variation than in part 3. In this part, *being able to record and update patient information* is judged as *the most important*. Access to professional documentation and medical test results is also judged as quite important. The respondents did not wish to record information and statistics to non-health organisations using mobile devices. They are also less positive to record time coming to or leaving the patient, or to update the hour lists.

Table 5: Questions of which kind of functionality a mobile device should offer (N=158)

No.	Question	μ	σ
Q4b-1	Be able to record and update patient information, if possible directly into the computer system	4.24	1.020
Q4b-2	Be able to show medical test results to the patient	3.99	1.121
Q4b-3	Give me access to professional documentation like procedures or corresponding	4.12	.989
Q4b-4	Let me consult with a physician or other kind of professional health personnel when in demand for assistance concerning the patient (using e.g. sound or video)	3.89	1.158
Q4b-5	Let me write and send a message to set up an appointment with other health	3.93	1.084
Q4b-6	Let me write and send messages to order new medicines	3.58	1.291
Q4b-7	Have the possibility to record information when coming to or leaving a patient to make other aware of your tasks to ensure your own safety	3.17	1.375
Q4b-8	Give me an overview of patient relatives/contacts, and eventually let me call or send messages to these	3.90	1.123
Q4b-10	Be able to let me give messages (e.g. in text or voice messages) to my colleagues	3.93	1.188
Q4b-12	Be able to anytime read and update the hour list	2.60	1.380
Q4b-13	Be able to access your own or others rotation scheme, and eventually record wishes in the rotation scheme	2.76	1.448
Q4b-14	Let me record and get informal information concerning my work tasks	3.34	1.207
Q4b-15	Be able to record and update information about the task itself (when, where, who etc.)	3.79	1.159
Q4b-17	Be able to give general information about diets	3.41	1.162
Q4b-18	Be able to record refunding of expenses (mileage coverage, patient shopping list etc.)	2.84	1.399
Q4b-19	Be able to record or give statistical information non-health databases	2.22	1.332

Analysis of the Survey

The questions in part 4a were aggregated to get an impression of the technological attitudes of the respondents. The result of the aggregation was divided into 4 subgroups where each group represents a different attitude to technology. The respondents had generally a positive attitude to technology. Table 6 shows which factors that

have the highest correlation to technological attitude.

Table 6: Factors that correlate with technological attitude (p<0.01, N=165)

Attitude to technology (categorised)	Correlation
Q1-13: Do you use the Internet regularly?	-0.461
Q4b-1	0.369
Q4b-5	0.293
Q1-3: Formal education	0.278
Q1-15: Do you use SMS?	-0.245[2]
Q4b-15	0.235
Q4b-8	0.232
Q4b-2	0.228
Q1-11: Do you use computer at work?	-0.217
Q3b-4	-0.211
Q4b-6	0.211
Q4b-10	0.208
Q4b-7	0.204

Regular Internet usage and technological attitude has a strong correlation. Use of SMS also correlates significantly with technological attitude. This can either be interpreted as that use of Internet and SMS gives better attitudes to technology; or that people with a good attitude to technology in a larger degree will be a user of that kind of services.

It is a quite strong correlation between Q4b-1 and the technical attitude. Table 7 shows the distribution of answers to this question and technological attitude in general.

Table 7: Cross-tabulation of Q4b-1 and technological attitude categories (part 4a) (N=161)

		Attitude to technology (categorised)				Total
		1	2	3	4	
Q4b-1: Be able to record and update patient information	1	12.5%	5.9%		2.3%	4.9%
	2	2.5%	2.9%			1.2%
	3	20.0%	8.8%	4.5%	4.5%	9.3%
	4	35%	50.0%	31.8%	22.7%	34.0%
	5	30.0%	32.4%	63.6%	70.5%	50.6%
Total		100%	100%	100%	100%	100%

The rows show the answer alternatives in Q4b-1, and the columns in the distribution show the subgroups in the aggregated variable; technological attitude. Only 1/3 of the respondents in the group with lowest technological attitude strongly agree that they should be able to record and update patient information. In the group with the strongest technological attitude, close to 70% wish this functionality (strongly agree). This functionality is recognised to be the most central in all kind of health applications, and is also most valued in part 4b (μ=4.24). Formal education correlates with technological attitude. People with lower education have generally less expectations to and experiences from the use of technology.

We asked the respondents how much they valued the possibility to report needs for additional medicine (Q3a-2: μ=4.35/σ=0.969). They are less positive to be able to order new medicines by sending electronic messages (Q4b-6). We found a significant positive correlation (ρ=0.205/p<0.01) between the technological attitude and this question. People already using SMS valued, not surprisingly, this functionality higher than the rest (Using SMS μ=3.70, not using SMS have μ=3.15).

We found significant correlation (ρ<=0.01) between technological attitude and only one of the questions from part 3. This was Q3b-4, access to personal hour lists and information about the salary. The other questions from part 3 have not significant correlation. This observation is positive for the validity of the survey since part 3 should be answered independent of technology. We did not find any significant correlations (ρ<=0.01) between technological attitude and any of the questions in part 3.

Informal Communication

Ellingsen [2] and conversations with home nurses indicated use of informal communication channels like message books or post-it notes. KITH[3] [1] means that informal information is important. The results of our survey, however, show that this communication has a lower score than the other questions (Q3a-16: μ=3.49/σ=1.050). This can be interpreted in different ways; the question may be vaguely formulated, or that this kind of functionality is lower prioritised or that they want to keep the informal communication as-is. It is however interesting that those personnel with less experience (students or trainees) have a mean of 4.75 to this question. The number of respondents in this group (4) is however to low to draw any conclusion, but we find informal communication to be especially interesting for qualitative studies.

Start the Working Day at Home

Q4b-20 asked about starting the working day at home. We wanted to investigate how the respondents felt about starting their work at home, and thereby identify needs to access required information using mobile/nomadic applications. However, the respondents were more negative than expected (μ=2.39/σ=1.471). We therefore wanted to investigate how this question correlated to type of municipality and thereby travel distance. A cross-tabulation between the municipalities and Q4b-20 shows significant differences, but it was difficult to interpret these results. We found a significant negative correlation (ρ<=0.05) between this question and the number of people working in the unit. People in smaller units prefer to start the working day at home more than people in larger units. Table 8 shows the statistical significant correlations (p<0.01) between the other questions in the survey and Q4b-20.

Table 8: Questions that significantly correlate with working at home (p<0.01, N=157)

Question	Correlation	Question	Correlation
Q4b-19	0.363	Q4b-2	0.247
Q4b-18	0.357	Q4b-4	0.247
Q4b-12	0.332	Q3b-6	0.233
Q4b-13	0.310	Q3b-3	0.226
Q4b-7	0.302	Q4b-14	0.212
Q4b-6	0.288		

[2]Negative correlation means that those who answer NO to this question, have a poorer attitude to technology

[3]The Expert Centre for Information Technology in the Health Care

An evaluation of the results lead us to the following observation: The wish to start the work from home is small among the home nurses. 42.4% did not wish to work from home at all, but there is also a large group, 27.9%, who whish to do this more than "much" (4-in the Likert scale).
In Table 8, we observe that people that want to work at home have greater need for other services than the mean. E.g. to record statistics (Q4b-19), record refund of expenses (Qb-18), and update the hour list (Q4b-12); all administrative tasks. An investigation of the type of position shows that the zone leaders want to work at home (20.0% strongly agree), while nurses with specific patient responsibility did not wish to work at home (3.3% strongly agree).

Requirements to a mobile support system

Part 3 in the survey was designed to reveal requirements of information and services. In part 4b we presented technological proposals to find whether these were interesting with respect to the needs in part 3. For all categories in part 3, we have compared the results with the corresponding technological solution in part 4b. The respondents generally answered lower to the presented solutions than to the information needs. The non-conformity between the general need and the proposed solution shows that the solutions probably do not cover the perceived need. This issue is natural for future investigation and interpretation.

Management of Medicaments

The category discussed here deals with management of medicaments, i.e. what medicaments a patient use, and be able to report of needs for additional medicaments. This category is covered by Q3a-1, Q3a-2, and Q4b-6. The questions from part 3a is quite similar and deals with getting overview of the patient medicines (Q3a-1: μ=4.442/σ=0.941), or be able to report needs for more medicines (Q3a-2: μ=4.35/σ=0.969). The correlation between Q3a-1 and Q3a-2 is of course strong (0.659, ρ<=0.01). But both questions have a lower correlation to Q4b-6 that asks whether the respondent wants the possibility to write and send messages to make requisitions of new medicines. Q4b-6 (μ=3.58) has a strong correlation with technological attitude.
The respondents reported high demands for information and service related to patient medication, but did not wish the proposed functionality by using messages to order new medicines. This picture changes as a function of technological attitude where the respondents with strong technological attitude valued this information as very important (μ=3.93). The results indicate that management of medicines is very important and probably problematic.

Task

Many of the questions in the survey cover the category task. These questions correlates internally in the different parts (3a and 4b), but have lower correlations between the parts. We cross-tabulated the parts by aggregating the questions, and found a significant correlation (0.285/ρ<=0.01) between the aggregated variables. We interpret from the results that the technological proposals partly can fulfil the needs from part 3.

Access to professional health information

Professional health information is a category that covers areas like access to health information for all kinds of health professions, information about medicaments and diets, information of laboratory results and what these imply, or access to professional information related to specific diagnoses. Part 3c mainly covers this category, and has the highest average answers in the survey. This indicates that functionality related to accessing professional information is strongly demanded in the home nursing care. This category is different from the other categories in that answers are equally or more positive to technological solutions (part 4) than in the more general parts 2 and 3. The home nurses regard access to this kind of information as an area where a handheld unit is suitable.

Discussion

The survey was pre-tested before being sent to the respondents. We had several questions related to operational sub-components to have a better overlap in the survey to increase the internal validity.

External validity

The systematic errors are mainly related to non-responses. Of the 39 municipalities contacted in the survey, 28 have responded. The average number of responses from the municipalities is 6.2. The distribution of responses was uniform in the responding municipalities.

Internal validity

The variables measured in this survey are based on earlier investigations within the health care [1] that strengthen the internal validity. The missing empirical investigations of use of mobile technologies and solutions make it difficult to estimate the internal validity. A qualitative study could raise important issues related to the internal validity of our study.

Reliability

A pre-test showed that the questionnaire was built up thoroughly, and the question formulations were clear and concise. However, one of the respondents meant that some of the questions were leading: "*I think that the whole questionnaire leads us to wish to have a handheld device. Existing systems are not covered and this makes it hard to answer many of the questions*". The results from this respondent were considerable lower with respect to part 4b (μ=1.9) than the mean (μ=3.4). We did specifically ask for opinions to specific mobile support services. The respondents should neglect the current technological constraints. They should instead be open to how technology could be used to simplify, make more effective, and improve the work. This should be possible without any prior detailed knowledge of technology. The technological attitude correlated significantly to the half of the questions in part 4b (ρ<0.05). This can be interpreted that the respondents were influenced by the technological view in part 4b, while in part

3 the respondents answered independently of technology. We therefore mean that the questionnaire was not leading with respect to technological solutions based on the statistical results. We have done an investigation of potential threats to reliability and validity, but not been able to find any factors that disqualify the design of the questionnaire. We therefore consider the survey to have a satisfactory validity and reliability. A negative aspect of the survey is the treatment of non-respondents. We have not been able to trace and explain all the missing returns of the questionnaire.

Related Work

KITH has surveyed the information flow and the information technology needs in four municipalities in Norway [1]. The survey shows that all consider IT to be absolutely necessary within the nursing care, and that it improves the efficiency considerably.
In the "Alta-project", a test of implementing IT-services in the home nursing care was carried out [2]. The purpose of the test was to investigate if it was possible to do all journaling, and to access important patient information when in the field. The test was performed using a provisional Wireless Local Area Network (WLAN), but problems with the network caused few results. The participants were, however, positive to use this kind of technological aids. The information flow was improved, and the patients could better influence decisions by participating in the journaling.
Tveito and Hasvold [5] refer to an observation of the people in the hospital ward that the work situation of the professionals is such that they are constantly interrupted. They are never able to plan their working days in detail because new situations occur all the time. The situation might be dramatic, or barely a nuisance, but during a working day there is no time to concentrate on one thing. This observation can be extended to the home nursing care where the home nurses often have tasks that are not planned for, and also have many patients during a day.

Conclusion

The survey confirms that the personnel in the home nursing care have great need to receive and exchange the kind of information presented here during a working day. Administrative functionality might be omitted when mobile, but some professions have more need for this kind of functionality than others. The home nurses have in average a positive technological attitude. Some of the groups have less positive experiences, and it is therefore important to be observant of these when introducing new technology.
The respondents recognise the need for functionality related to the treatment and access to professional health information as very important. The survey shows that applications to support their work routines and methods might make the working day easier. We observe that the home nurses recognise the need for ad-hoc information and services when mobile. This kind of functionality is probably hard to implement in practice because of the hardware limitations on many digital devices. Offline information access requires storage space as well as pre-emptive caching of the required information. The digitalisation of the health care information will further make requirements for services to update central patient information when visiting patient at their homes. We therefore believe that mobile workers in after a while will become regular users of mobile information systems and services. A qualitative survey can elaborate more on what functionality a mobile support system should offer the home nursing care. It is also of interest to observe the home nurses to further capture processes and requirements not covered in this survey.

Acknowledgements

This paper is a result of work in the MObile Work Across Heterogeneous Systems (MOWAHS) project [4]. MOWAHS is sponsored by the Norwegian Research Council's IKT-2010 program. The survey was performed as part of the interdisciplinary course "*Experts in Team*" at the NTNU. We want especially to thank Amar Bhargava, Rune Hansen and Karwan Rush for their participation.

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