EMPIRICAL STUDIES

Nursing staff's assessments of medication management process in the psychiatric and operative domains: A cross-sectional study after introduction of an electronic medication chart

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Abstract

Aims and objectives: To describe nursing staff's assessments of medication management process in the psychiatric and operative domains after introduction of an electronic medication chart.

Background: The medication management process includes all structures and practices within the organisation that guide and support medication administration and related procedures.

Design: A cross-sectional survey.

Methods: A Finnish version of the Medication Administration System – Nurses Assessment of Satisfaction (modified MAS-NAS) paper-based questionnaire was sent to all nursing staff ($N = 855$) working in operative ($n = 498$) and psychiatric ($n = 357$) domains in one central hospital. Data were analysed using statistical methods.

Results: In total, 324 nursing staff members participated. More than half agreed that medication management is efficient (64%), safe for patients (76%), and that the current medication administration system provides the necessary medical treatment information (e.g. prescriptions by physicians, medication data) (64%). Respondents' overall satisfaction with medication management process was slightly above average on a scale from 1 to 10 (mean = 6.2; SD = 1.8; median = 7, range 2–9). Respondents who used electronic medication chart reported higher overall satisfaction with medication management process (median = 7, mean = 6.1, SD = 1.8 and range 2–9) than those not using it (median = 6.5, mean = 6.3, SD = 1.6 and range 2–9). No statistically significant difference was found (U = 8552.000, $p = 0.33$).

Conclusions: This study revealed several problems in the medication management process. The results can be used in developing the medication management process.

Relevance to clinical practice: Electronic medication chart should be used and developed further in terms of efficacy, safety and access. One year after the electronic medication chart was introduced, only half of the respondents had used it. That is why

implementation of electronic systems or technological applications should be carefully considered as a whole.

INTRODUCTION

Medication management is a complex process covering all the structures and practices within the organisation that guide and support medication administration and the procedures related to it. It involves not only product selection, but also careful monitoring of side effects [1] and documentation that are required in the process of getting medications to patients [2-4]. Electronic medication charts can support the delivery of appropriate care for patients [5]. Nurses' satisfaction with medication administration point-of-care technology (barcode) [6, 7] and nurse workload, teamwork and overall satisfaction with electronic medication administration record [2] have been studied. To our knowledge, nursing staff's assessments of the medication management process have not been studied previously after the introduction of an electronic medication chart. The present study was undertaken to address this knowledge gap by describing nursing staff's assessments of the medication management process in the psychiatric and operative domains after introduction of an electronic medication chart.

BACKGROUND

Central activities in the medication management process in nursing in acute hospital settings include preparing medications, checking and administering medications to patients, patient education, performing dose calculation and observing patients consume the medications [8]. The use of new technology such as national Kanta services is increasing in delivery of tasks. Kanta produces digital services for the healthcare and social welfare sector, partly internationally as well. With Kanta services, information, including electronic medication information, is shared between various healthcare units. Patients can browse their own data such as prescriptions in the My Kanta pages [9]. Technology can be used as an aid, but it must be highly usable; this helps to ensure that care delivery is safe and of high quality, without causing any unnecessary increases to the workload [10]. Technology that is poorly designed can lead to errors, weaker productivity or even abolishment of the system [11]. On the other hand, factors unrelated to the actual software have been important determinants of users' satisfaction [12]. The introduction of the electronic health record (EHR) has been associated with more positive usability ratings [13] and medication administration processes [14].

Electronic medication administration systems (eMAS) have been associated with perceived improvement in overall nurse satisfaction, workload associated with medication administration, ease of documentation, medication information accuracy, time spent on overall medication processes, time savings in copying paperwork, administering medications in a timely manner, patient safety and teamwork [2]. Vicente Oliveros et al[15] evaluated the usability of an eMAS and noticed that the tasks with more usability problems were administering, ordering and modifying medication and generating reports. Schrenk et al[16] found that each measured aspect of medication administration took more time after the adoption of the EHR. However, the results also indicate an increase in efficiency over time. Nurses performed more nursing interventions, with more time spent on medication administration and documentation. Culler et al[12] studied nurses' perceptions and experiences with the implementation of the eMAS. Adjustments to workflow in medication administration resulted in streamlined nurse work processes with increased productivity and enhanced patient safety. Increasing patient safety by reducing transcription errors was the most significant facilitator that contributed to the successful adoption and implementation. Other key facilitators were improved interdepartmental communication, easy to locate chart information and accessible patient information. Most significant barriers to adoption were excessive time for logging into the system, cumbersome process for cosigning medications, generation of new kinds of practice-related medication errors and poorly functioning proximity badges.

Almost half of all medication errors (38%) occur during the medication administration process. In that process, nurses play a critical role, which ranges from being involved in the communication of medication orders to administering medications. This can be a process that is both labour-intensive and prone to errors [17]. A key element of nurses' medication administration safety strategies is that they know and involve the patients [8]. Nursing staff's acceptance of health IT is facilitated if the system is able to improve patient safety and the accessibility of patient information [12]. Nurses' satisfaction with the EHR can increase as the system improves patient safety [18]. Multiple and recurring usability issues in the electronic MAS can affect nurses' effectiveness, efficiency and satisfaction with medication management. This, in turn, may have a negative effect on patient safety [19].

Medicine errors can occur if members of different disciplines lack understanding of each other's roles and routines

[20]. The eMAS should serve to facilitate communication between nurses, physicians and pharmacists; however, nurses' perceptions of communication with the pharmacy remained unchanged after the implementation of eMAS [2]. In their intervention study, Alex et al[21] found that team-based approach and collaboration with a pharmacist reduced discharge-related medication errors. Nurses' medication administration and workflow using Computerised Physician Order Entry has been studied. Nurses noted frequent barriers to the workflow across settings, including the system, greater use of informal communication models and less frequent interaction within the healthcare team [22].

Nurses are creative and frequently come up with design workarounds which allow them to bypass troublesome technology [23]. The use of eMAS has reduced the incidence of medication entry errors [24], but may lead to so-called workarounds [4, 25]; for example, medication can be recorded prior to administration [4]. It has been found that if no predefined procedures are followed, drug management entry errors may occur [25]. When nurses are satisfied with the technology, they may be less likely to spend time focusing on medication administration [6]. According to Robinson et al.[3] eMAS has been found to be able to improve efficiency and reduce labour hours and costs.

AIM

The purpose of this study is to describe nursing staff's assessments of the medication management process in the psychiatric and operative domains after introduction of the electronic medication chart. The research questions are:

1. How do nursing staff assess the current medication management process?
   1.1. What is the efficacy of the current medication management process?
   1.2. What is the safety of the current medication management process?
   1.3. What is the accessibility of the current medication management process?
2. How satisfied are nursing staff after the implementation of electronic medication chart compared to staff not using it?

METHODS

Description of the setting, target group and data collection

This study was conducted in one of the twenty hospital districts in Finland. It offers public specialised medical care, including outpatient treatment, for about 223,000 inhabitants.

There was a phased-in EHR renewal project in 2013–2016. In that system, patient medication could be recorded in outpatient (i.e. medication chart) and hospitalisation (medication during hospitalisation) applications of the EHR. In spring 2013, during the first phase of the project, the electronic patient record including electronic medication chart had been taken into use in accordance with the requirements of the national Kanta services [9]. An evaluation study of the implementation of the EHR project was carried out in the area in parallel with the introduction of EHR. This study is one part of that study.

The target group of this cross-sectional survey were nursing staff working in the psychiatric and operative domains, because the psychiatric domain was one of the first and the operative domain one of the last where the implementation of the electronic medication chart was started. The study comprised a total sample of nursing staff in the psychiatric and operative domains, because larger samples have less sampling errors than smaller samples [26].

The data for the study was collected about a year after the implementation of the electronic medication chart. All nursing and medical staff in the hospital district have been instructed to update the electronic medication chart both when the patient enters the hospital and at discharge. The assumption before the study was that all nursing staff use it. At the same time, medication during patient's hospitalisation was still on paper, but the implementation project of the hospitalisation application was ongoing. The survey period ranged from 29 December 2014 to 23 January 2015 and was conducted with a paper questionnaire which included a cover letter and instructions on responding. The unit managers were informed about the study. Based on listings received from management assistants, the researcher (AK) sent a questionnaire and a sealable return envelope by the organisation's internal mail to all the nursing staff [unit managers ($n = 41$), nurses ($n = 670$), midwives ($n = 62$), practice nurses ($n = 19$), mental health nurses ($n = 63$)] ($N = 855$) working in the operative ($n = 498$) and psychiatric ($n = 357$) domains. Before the actual study, the clarity and readability of the responses were assessed by four nursing staff members nominated by unit managers. Their responses were included in the study.

Data collection scale

The back-translated Finnish version of Medication Administration System – Nurses Assessment of Satisfaction (modified MAS-NAS) was the scale used to collect data. An authorised translator translated the questionnaire from English to Finnish. The MAS-NAS scale is about satisfaction of an electronic system and has previously been used in surveys targeting barcode technology, for example [6, 7].

The original scale consists of 18 statements charting satisfaction in different areas of the MAS-NAS: efficacy ($n = 5$), safety ($n = 7$) and accessibility ($n = 6$) [27]. Later, Hurley et al[6] supplemented the scale with seven separate statements, which two researchers (AK, JS) placed in the original scale [27] areas: efficacy ($n = 4$), safety ($n = 2$) and accessibility (n = 1). Correlations between the statements were assessed using Spearman's correlation coefficient and Cronbach's alpha [26]. In addition, in Hurley's instrument, the respondents were asked to evaluate their overall satisfaction with medication management on a visual analogue scale (VAS) from 1 to 10, where indicated 1 indicated 'completely dissatisfied', 4.5–6.5 indicated 'neither satisfied nor dissatisfied' (neutral) and 10 indicated 'completely satisfied'.

In this study, the modified MAS-NAS is a 25-item scale covering the topics efficacy ($n = 9$), safety ($n = 9$) and access ($n = 7$) using a Likert scale (1 = completely agree, 2 = agree, 3 = somewhat agree, 4 = somewhat disagree, 5 = disagree and 6 = completely disagree). In addition, the original scale included the option 'not applicable' [6, 27]. The modified MAS-NAS scale used in this study can be considered internally consistent as the Cronbach alpha coefficient between all the Likert scale variables in the scale was very high (0.96). The Cronbach alphas in different domains of the scale were also found to be good (0.81–0.93) if the target value was set at 0.8 or higher [26]. The reliability of the original scale (18 items) has been shown to be good for internal consistency ($\alpha = 0.86$) in earlier study as well [27].

Background questions were name, age, sex, domain, work unit, job title, use of electronic medication chart, hospitalisation application and Prescription Centre and department pharmacy in unit. The responses were entered into SPSS as whole numbers. If the response was between two whole numbers, the smaller whole number was entered.

Data analysis

The data were analysed with IBM SPSS Statistics 25 using descriptive statistics in accordance with the purpose of the study. The original variables were adjusted. The response alternatives completely agree–slightly disagree [1-3] were combined to form one class, 'agree' and the alternatives slightly disagree–completely disagree [4-6] were combined into 'disagree'. Those respondents who had selected the alternative 'not applicable' were excluded at the analysis stage. The association of electronic medication chart use with efficacy, safety and access was studied with cross-tabulation. The statistical significance of the differences observed was tested with chi-square test. Median, mean and range of overall satisfaction with the medication management process

were calculated. Statistical significance was $p < 0.05$ [28]. In the tables (Tables 2, 4, 6), figures are rounded to the closest whole number, which is why total percentage may differ from 100%.

Ethical considerations

The study was conducted in compliance with the ethical principles of science. In the study, ethical decisions followed general ethical guidelines and the legislation on health care research.[29] According to the ethics committee statement, based on Finnish guidelines and laws, there was no need for an ethical review (Consortium of Universities Ethics committee 2/2020). Permission for the study was obtained from the target organisation, and permission to translate, modify, use and publish parts of the original MAS-NAS scale was granted by its developer. Responding was voluntary, and participation in the study was considered informed consent. The questionnaires were returned in sealed envelopes, and they were only used by the researchers and kept in a locked facility.

RESULTS

Background variables

In total, 324 nursing staff members participated in the study. Hence, the response rate in the study was 38%. Most of the respondents were nurses (82%, $n = 267$), women (86%, $n = 277$) and over 40 years of age (62%, $n = 201$). They reported working in the operative (58%, $n = 189$) and psychiatric (40%, $n = 128$) domains. In addition, there were two respondents (1%) who later moved to work in gynaecology and childbirth. Nearly one half reported working in a ward (46%, $n = 150$), slightly over one fifth in a procedure unit (22%, $n = 70$), and nearly one fifth in an outpatient clinic (16%, $n = 53$) or other (15%, $n = 48$), such as reserve nursing staff. Half of the respondents (50%, $n = 163$) were electronic medication chart users, 13% ($n = 42$) had an electronic ward medication application, 16% ($n = 51$) had a Prescription Centre and 32% ($n = 105$) had a department pharmacy in use. Most of the electronic medication chart users worked in wards (52%, $n = 84$), slightly more than one fifth in outpatient clinics (22%, $n = 36$), slightly more than one in ten in a procedure unit (13%, $n = 21$), while the rest worked 'elsewhere' (14%, $n = 22$). More of the nursing staff working in the operative domain (65%, $n = 105$) reported using the electronic medication chart compared to those working in the psychiatric domain (35%, $n = 56$).

Nursing staff's assessment of the efficacy of the current medication management process

In terms of efficacy of the current medication management process, nursing staff members most often agreed with easy accessibility of equipment and/or supplies needed in medication administration (90%) and information needed in medication administration (67%) and the goodness of MAS (65%). Nursing staff most often disagreed with the ability of the current MAS to efficiently reduce medication errors (50%), reasonability of time to handle medicines of recently hospitalised patients or urgently required medicines (46%) and the availability of time to spend with patients (44%) (Table 1). The proportion of nursing staff who answered that statements about efficacy were not applicable to them varied between 13.3 and 28.8% ($n = 324$).

In the area of efficacy, electronic medication chart users agreed less often with all statements than non-users. The differences were statistically significant in two statements: 'I get time to spend with patients' ($p < 0.001$) and 'The system makes it easy to find the information needed in medication administration' ($p = 0.012$) (Table 2).

Nursing staff's assessment of the safety of the current medication management process

In terms of safety of the current medication management process, nursing staff members most often agreed with the easy implementability of the safety steps involved in medication administration (92%), the safety of MAS for patients (76%) and the sufficiency of the medication warning feature of the current MAS (64%). Nursing staff most often disagreed with information on prescription confirmed by physician and/or pharmacist concerning medication interactions (71%), confidence to administer medication regardless of having seen note about drug–drug interaction (65%), and the current MAS promotion of communication on prescriptions between professionals (50%) (Table 3). The proportion of nursing staff who answered that statements about safety were not applicable to them varied between 16.3% and 45.0% ($n = 324$).

Electronic medication chart users agreed more often with being confident that the medication can be administered regardless of having seen a note on drug–drug interaction ($p = 0.015$). In turn, non-users agreed more often with 'It is easy to implement verification steps included in medication administration' and with 'Medication administration ($p = 0.005$) allows to see prior to medication administration whether the prescription has been confirmed by the pharmacist' than did medication chart users ($p = 0.024$). With those statements, the differences between electronic medication chart users and non-users were statistically significant (Table 4).

Nursing staff's assessment of the accessibility of the current medication management process

In terms of the accessibility of the current medication management process, nursing staff members most often agreed with good accessibility of medications when the patient needs them (89%), information on all the necessary medication storage locations' (86%) and awareness of the effects

TABLE 1 Nursing staff's assessment of the efficacy of the current medication management process

Efficacy	Agree n/%	Disagree n/%
The equipment and/or supplies I need in medication administration are readily available to me	236/90.1	26/9.9
The system makes it easy to find the information needed in medication administration	166/66.7	83/33.3
The medication administration system is good	159/64.6	87/35.4
I consider medication management to be efficient	155/63.5	89/36.5
The current medication administration system supports me in efficient medication management as a whole	162/62.8	96/37.2
The current medication administration system is user-friendly	155/58.5	110/41.5
I get time to spend with patients	134/56.5	103/43.5
The time it takes to handle medicines of recently hospitalised patients or urgently required medicines is reasonable	121/53.8	104/46.2
The current medication administration system is efficient in reducing medication errors	133/49.8	134/50.2

TABLE 2 Cross-tabulation of the MAS-NAS scale efficacy statements and electronic medication chart use

| | Use of medication chart | | |
| | Yes | No | |
Efficacy	Disagree/Agree %	Disagree/Agree %	*p*-value
I get time to spend with patients	53/47 (n = 134)	27/70 (n = 98)	<0.001
The system makes it easy to find the information needed in medication administration	39/61 (n = 144)	23/77 (n = 100)	0.012
The time it takes to handle medicines of recently hospitalised patients or urgently required medicines is reasonable.	51/49 (n = 124)	39/62 (n = 96)	0.077
I consider medication management to be efficient	40/60 (n = 140)	29/71 (n = 99)	0.101
The medication administration system is good	39/61 (n = 144)	29/71 (n = 97)	0.130
The current medication administration system is efficient in reducing medication errors	54/47 (n = 155)	44/56 (n = 107)	0.133
The current medication administration system is user-friendly	44/57 (n = 154)	38/62 (n = 106)	0.372
The current medication administration system supports me in efficient medication management as a whole	39/61 (n = 153)	33/67 (n = 100)	0.423
The equipment and/or supplies I need in medication administration are readily available to me	11/89 (n = 139)	8/92 (n = 118)	0.519

and side effects of the administered medications (67%). Nursing staff most often disagreed with need to 'hoard' medicines (67%), easy accessibility of medication information as needed via the current MAS (40%), and information on medication obtained with the aid of the current MAS (36%) (Table 5). The proportion of nursing staff who answered that statements about accessibility were not applicable to them varied between 12.2 and 26.5% (n = 324).

Electronic medication chart users agreed less often with the statement 'with the information in the current MAS I know how to act if the medication causes problems for the patient' than did non-users (*p* = 0.013) (Table 6).

Nursing staff's overall satisfaction with the medication management process

On a scale from 1 to 10, nursing staff's (n = 261) overall satisfaction with the current medication management process on a scale from 1 to 10 was slightly above average (mean = 6.2; SD = 1.8; median = 7, range 2–9). All in all, electronic medication chart users' overall satisfaction with

the medication management process was higher (median = 7, mean = 6.1, SD = 1.8 and range 2–9) than that of non-users (median = 6.5, mean = 6.3, SD = 1.6 and range 2–9). (Figure 1). A comparison of the mean of the distribution of variable nursing staff's overall satisfaction with the medication management process was desired for electronic medication chart users' and non-users' categories but due to the non-normality of the variable a Mann Whitney test [26] was carried out. According to Mann–Whitney U test, the differences between medication chart users and non-users were not statistically significant (U = 8552.000, *p* = 0.33).

DISCUSSION

Reviewing results

The purpose of this study was to describe nursing staff's assessments of the medication management process in the psychiatric and operative domains after introduction of the electronic medication chart. More than half of the nursing staff members agreed that the medication management

TABLE 3 Nursing staff's assessment of the safety of the current medication management process

Safety	Agree n/%	Disagree n/%
The verification steps included in medication administration (correct patient, correct timing and correct medication) are easy to implement	216/91.5	20/8.5
The medication administration system is safe for patients	186/76.2	58/23.8
In my opinion, the medication warning feature in the current medication administration system (drug–drug and food–drug interactions) is sufficient	159/63.6	91/36.4
With the help of the current medication administration system it is easy to make sure that the principles of safe medication are met	157/59.9	105/40.1
With the help of the current medication administration system it is easy to check valid prescriptions before medications are administered	134/54.7	111/45.3
The current medication administration system promotes communication on prescriptions between professionals (physicians, pharmacists and nurses)	125/49.8	126/50.2
If I see a note on an identified drug–drug interaction I know that the prescription has been confirmed by a physician/pharmacist	66/29.2	160/70.8
When I see a note on drug–drug interaction I'm confident the medication can be administered regardless	50/16.0	204/65.2
The current medication administration system allows me to see prior to medication administration whether the prescription has been confirmed by a pharmacist	19/6.1	152/48.9

process was efficient, safe for patients, and that the current MAS provides the necessary medical treatment information. On a scale from 1 to 10, respondents' overall satisfaction with the medication management process was slightly above average. The overall satisfaction with the medication management process of the respondents who used the electronic chart was higher than that of those who did not use it.

In this study, in the area of efficacy, the use of an electronic medication chart had a negative link to getting time for the patient and finding the information needed in medication administration. Although slightly more than half (60%) of the nursing staff who stated that they were electronic medication chart users perceived medication management as efficient, electronic medication chart users' agreement level with statements of medication administration being efficient was lower than that of non-users. The finding is in line with a previous study where Schrenk et al[16] found that each measured aspect of medication administration took more time after the adoption of the EHR. However, the results also indicated an increase in efficiency over time. Our findings differ slightly from a previous study where more than half of the respondents felt that the electronic medication system increased the efficacy of their work whereas slightly fewer than half considered that it impaired their efficacy [12].

In this study, in the area of safety, the use of an electronic medication chart had a positive link to the assessments of interaction properties of the medication products provided by the electronic medication chart. This is an indication of the benefits of electronic information medication management that traditional paper-based pharmaceutical information (i.e. Pharmaca Fennica) has not been able to provide. This finding is in line with the study of Culler et al[12] who noticed that nursing staff's acceptance of health IT is facilitated if the system is able to improve patient safety and the accessibility of patient information. However, in this study, in the area of safety the use of an electronic medication chart had a negative link to easy implementation of the verification steps included in medication administration and to seeing, prior to medication administration, whether the prescription has been confirmed by a pharmacist. It is important to develop co-operation between different professional group such as nursing staff and pharmacists in medication management. In this study, about one third had a department pharmacy in their unit and only 16% had used the National Prescription Centre [9]. Previously Alex et al[21] have found that teamwork is linked to a reduction in medication errors. Nowadays, Kanta services [9] allow nursing staff to review patient prescription information and new functionality of the electronic

TABLE 4 Cross-tabulation of the MAS-NAS scale safety statements and electronic medication chart use

| | Use of medication chart | | |
	Yes Disagree/Agree %	No Disagree/Agree %	*p*-value
Safety			
The verification steps included in medication administration (correct patient, correct timing and correct medication) are easy to implement	12/89 (*n* = 130)	2/98 (*n* = 101)	0.005
When I see a note on drug–drug interaction I'm confident the medication can be administered regardless	75/25 (*n* = 143)	88/12 (*n* = 106)	0.015
The current medication administration system allows me to see prior to medication administration whether the prescription has been confirmed by a pharmacist	94/6 (*n* = 97)	82/18 (*n* = 71)	0.024
With the help of the current medication administration system it is easy to make sure that the principles of safe medication are met	44/56 (*n* = 152)	32/68 (*n* = 105)	0.069
With the help of the current medication administration system it is easy to check valid prescriptions before medications are administered	49/51 (*n* = 140)	38/62 (*n* = 101)	0.088
If I see a note on an identified drug–drug interaction I know that the prescription has been confirmed by a physician/pharmacist	74/26 (*n* = 138)	64/36 (*n* = 84)	0.133
In my opinion, the medication warning feature in the current medication administration system (drug–drug and food–drug interactions) is sufficient	32/68 (*n* = 148)	41/59 (*n* = 98)	0.221
The current medication administration system promotes communication on prescriptions between professionals (physicians. pharmacists. nurses)	53/47 (*n* = 148)	46/55 (*n* = 99)	0.300
The medication administration system is safe for patients	24/76 (*n* = 141)	21/79 (*n* = 99)	0.642

medication chart is currently under development. The information obtained from this study on the experiences of nursing staff is thus valuable, because medication development is an important target in e-services all around the world.

In this study, in the area of accessibility, the use of an electronic medication chart had a negative link to knowing, with the information in the current MAS, how to act if the medication causes problems for the patient. In another study, improved access to clinical data and reduction in the time spent on health record documentation were associated with nurses' intention to use the HER [24].

All in all, in this study, nursing staff's satisfaction with the current medication management process was not very good. However, electronic medication chart users' median satisfaction with medication management process was higher than that of non-users, although there was quite a wide range,

from 2 to 9. This suggests that development of electronic medication and especially information management can improve the efficiency, safety and availability of the medication management process in nursing.

Methodological considerations

To our knowledge, the MAS-NAS scale has not been used in Finland before. The validity of the modified MAS-NAS questionnaire was mainly viewed as content or face validity, whereby researchers critically reviewed findings based on their own nursing professional experience. Evaluation of the construct validity would have required the questionnaire to be tested for a long time in different environments and in different populations [30].

TABLE 5 Nursing staff's assessment of the accessibility of the current medication management process

Access	Agree n/%	Disagree n/%
Medications are readily accessible when my patients need them	209/88.6	27/11.4
I know where all the medications I need are stored (within the unit or in the hospital pharmacy from where the medication must be fetched)	223/86.1	36/13.9
Thanks to information in the current medication administration system I am aware of the effects and side effects of the medications I administer	172/66.7	86/33.3
With the aid of the medication administration system I use I get the information on medication administration I need (such as prescriptions by physicians, medication data)	170/64.4	94/35.6
When necessary, medication data is readily accessible through the current medication administration system	165/60.2	109/39.8
With the information in the current medication administration system I know how to act if the medication causes problems for the patient	158/50.8	103/33.1
I must 'hoard' medicines to make sure there is enough when needed	12/3.8	218/69.6

TABLE 6 Cross-tabulation of the MAS-NAS scale access statements and electronic medication chart use

Access	Use of medication chart		p-value
	Yes Disagree/Agree %	No Disagree/Agree %	
With the information in the current medication administration system I know how to act if the medication causes problems for the patient	45/55 (n = 152)	30/70 (n = 104)	0.013
Medications are readily accessible when my patients need them	14/86 (n = 124)	8/93 (n = 107)	0.142
Thanks to information in the current medication administration system I am aware of the effects and side effects of the medications I administer	37/63 (n = 47)	28/72 (n = 107)	0.177
With the aid of the medication administration system I use I get the information on medication I need (such as prescriptions by physicians, medication data)	37/63 (n = 155)	31/69 (n = 105)	0.355
I must 'hoard' medicines to make sure there is enough when needed	96/4 (n = 120)	93/7 (n = 105)	0.554
When necessary, medication data is readily accessible through the current medication administration system	41/60 (n = 158)	38/63 (n = 112)	0.704
I know where all the medications I need are stored(within the unit or in the hospital pharmacy from where the medication must be fetched)	14/86 (n = 134)	14/86 (n = 121)	1.000

The study reported upon here had some limitations. We used a descriptive cross-sectional design; however, the results reflect nursing staff's important assessments of the medication management process at that time, and the results are currently valuable and applicable as well. Sample size calculations are important, but in practice, they serve as a general guideline when deciding on the size of the data to be collected. In addition to sample size calculations, the final data size is also affected by resources, for example. We used a total sample of nursing staff working in operative and
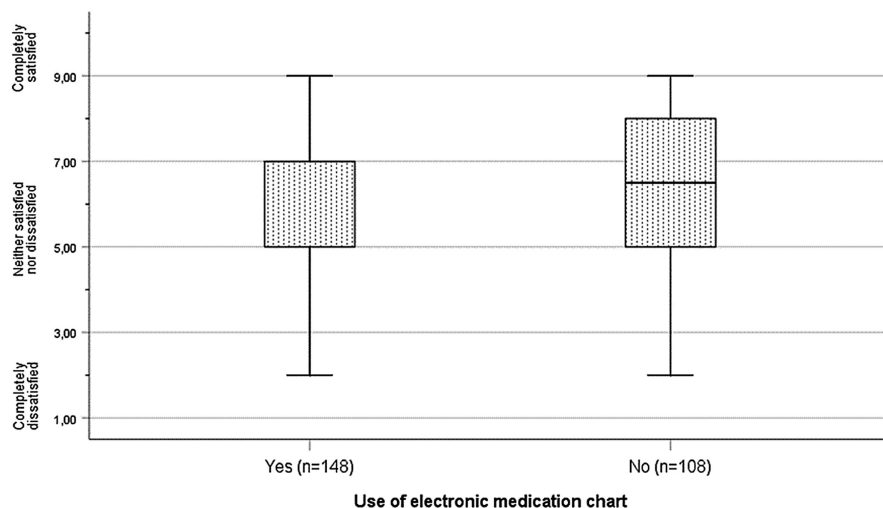
FIGURE 1 Nursing staff's ($n = 256$) overall satisfaction with the current medication management process according to the use of electronic medication chart (scale 1–10)

psychiatric domains at one central hospital because small samples are usually used in nursing studies [26].

The response rate remained low (38%) after one reminder. The responses can be considered indicative. The interest to respond may have been affected by other surveys about the same subject that were conducted in the organisation at the same time. The fact that the data collection was performed by one of the researchers (AK) from the same organisation as the respondents and that participants' names were asked for repeat measurement may also have affected the willingness to respond. The data were collected using a paper questionnaire because response rates are known to be lower in online surveys than in paper-based surveys [31]. The sample may have included persons who were not at work at the time due to various reasons (e.g. leave of absence and annual leave). The number of unreturned questionnaires in the psychiatric domain (such as day unit, enhanced outpatient care unit and rehabilitation unit) was about one hundred. The number of respondents from operative outpatient clinics seems to have been low. However, it is assumed that the respondents represent the target population, that is the nursing staff in the hospital in question who deal with the medication management process in their work.

The questions were answered comprehensively (range 89%–98%), but the large proportion of 'not applicable' responses in the areas on efficacy, safety and access was unexpected. It may be that some of the respondents did not understand what all the aspects of medication management process meant although it was explained in the questionnaire and may therefore have thought that this research did not apply them. Most of the respondents who considered that the efficacy statement did not relate to their work worked in outpatient clinics or procedure units. The conditions for using the chi-square test of independence were met [30], although the strength of the results was not measured by multivariate methods. It is not quite certain whether all the respondents

worked in patient care, but matters related to medication management process concern all nursing staff members who take part in caring for patients.

CONCLUSIONS

More than half of the nursing staff members working in the psychiatric and operative domains agreed that the medication management process was efficient, safe for patients, and that the current MAS provides the necessary medical treatment information. Respondents' overall satisfaction with the medication management process on a scale from 1 to 10 was slightly above average. The satisfaction of the respondents who used the electronic chart was higher than that of those who did not use it. Nonetheless, this study revealed several problems related to the medication management process in the areas of efficacy, safety and accessibility from nursing staff's perspective. The results suggest that the electronic medication chart improves nursing staff's overall satisfaction with the medication management process. However, in the areas of efficacy, safety and accessibility, electronic medication chart users rated the current medication management process lower than non-user, except concerning 'note on drug–drug interaction'. The introduction of the electronic medication management system in two different parts, that is medication chart application followed by hospitalisation application, may be reflected in the results of this study.

RELEVANCE TO CLINICAL PRACTICE

The results of this study are important for clinical practice for developing the medication management process for nursing staff. We showed that electronic medication chart improves

nursing staff's overall satisfaction with the medication management process. However, its use was low. This study adds to previous evidence that medication management process should be developed especially in the psychiatric and operative domains. The management at the organisation should offer usable information tools, monitor and evaluate practices and, if necessary, provide support and training in their use. The usability of any electronic system and application needs to be developed and nursing staff's assessments should be taken into account to increase the usage of electronic medication documentation. More research is needed on medication management process which is a high priority for patient safety. As the use of mobile devices has increased it is important to find out their effect on medication management process. Next, this study should be repeated. Since this study, a comprehensive medication application (including both outpatients and hospitalised patients) and a new regional information system have been introduced in the region and more experiences with the use of Prescription Centre [9] have been obtained.

ACKNOWLEDGEMENTS

CONFLICT OF INTEREST
No conflict of interest has been declared by the authors.

AUTHOR CONTRIBUTIONS
AK, KS and PA: involved in study concept and design. AK: involved in data collection and drafting of the article. AK, JS, KS, TS and PA: involved in data analysis and interpretation. JS, KS, TS and PA: involved in critical revision of the article. All authors contributed to the final approval of the version to be submitted.

ETHICAL APPROVAL
A statement from an ethical commission was not required by the study protocol because the collection of material focused on staff (Finnish Advisory Board of Research Integrity, 2012).

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