

**The impact of electronic prescriptions on medication safety in Finnish community pharmacies  
– a survey of pharmacists**

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## Abstract

### Objectives

The purpose was to explore pharmacists' opinions regarding the impacts of electronic prescriptions (ePrescriptions) on medication safety in Finnish community pharmacies. Further objectives were to explore how often and what kinds of ambiguities or errors pharmacists have perceived in ePrescriptions.

### Method

A survey of randomly selected dispensers (n = 1004) and pharmacists (n = 228) was conducted in 2014.

### Results

Altogether 778 questionnaires were returned, yielding response rates of 64% (n = 635) for dispensers and 65% (n = 143) for pharmacists. The respondents felt that ePrescriptions improve medication safety in many areas: they lower the number of prescription forgeries, reduce the risk of dispensing errors, promote better management of the patient's overall medication, facilitate monitoring of duplicative therapy and drug interactions, and lessen the risk of incorrect interpretation of prescriptions. Many respondents (32%) reported that they had weekly found ambiguities or errors in ePrescriptions that required clarification during the dispensing process. Of the respondents, 18.6% had found such ambiguities or errors daily or almost daily. The three most common ambiguities or errors in ePrescriptions were incorrect total amount of medication (79.0%), missing notation of exceptional dosage instructions or exceptional purpose of use (SIC!) (69.0%), and unclear or incorrect dosage instructions (65.4%). Incorrect strength (14.9%) and incorrect pharmaceutical form (14.2%) were also commonly experienced problems.

### Conclusions

According to Finnish community pharmacists, the introduction of ePrescriptions has promoted medication safety in many areas. However, ambiguities and errors are common in ePrescriptions. Some of these can delay dispensing of the medicine, whereas others can cause serious risks to medication safety.

Key words: electronic prescription; medication safety; community pharmacy; survey; Finland

## **1. Introduction**

Improvement of patient safety, including medication safety, has been viewed as one of the most important objectives in global health policy [1, 2]. It is widely recognized that the majority of adverse events in healthcare are related to medicines [3, 4]. A prescription is an essential means of communication between physicians, pharmacists and patients. However, it is also one potential source of errors that could endanger medication safety [3, 5-9]. Conventional prescriptions (paper, telephone, fax) have several well-known problems such as legibility or interpretation problems due to physicians' poor handwriting, leading to dispensing errors at pharmacies [8]. There is also the risk of prescription forgeries. In addition, the management of patients' overall medication has been difficult because the necessary information has been scattered rather than collected in one particular place [10, 11]. During the past few decades an electronic prescription (ePrescription) system has been promoted and adopted as one potential tool for improving medication safety by eliminating the problems related to conventional prescriptions [12, 13].

In the European Union, ePrescribing is interpreted as “the process of electronic transfer of a prescription by a healthcare provider to a pharmacy for retrieval of the medicine by the patient” [14]. Dispensing information is also recorded electronically. However, the term ePrescription may have different meanings and the systems may vary between countries [12, 15, 16]. For example, in some countries ePrescribing comprises only electronic issuing and data transmission. A fully operational and nationwide ePrescription system has been implemented in only a few European countries, among them Denmark, Sweden, Estonia, Iceland, and Finland [12, 14]. ePrescriptions are also widely used in the United States [15] and Canada [17], and pilots employing them have been planned or carried out in many countries across Europe [12, 14].

Studies concerning the impacts of electronic prescribing systems on medication safety have been conducted in various settings, primarily in hospitals [18-20]. From the pharmacy perspective, previous studies have shown that ePrescribing improves the quality and safety of prescriptions and

hence improves patient safety [21-23]. It has been proposed that improvements in quality and safety result from fewer prescription errors [23-25], less misinterpretation of, or ambiguity in, prescriptions [21, 23-27], and fewer prescription forgeries [26]. In addition, an ePrescription can support the management of the patient's medication treatment because it allows pharmacies to view all the patient's prescription information [24, 26]. Despite the several positive effects of ePrescriptions, many studies have also reported that they are a potential source of medication errors [21, 23, 26-31]. These studies have highlighted the possibility that ePrescriptions might increase the risk of incorrect or ambiguous prescribing: for example, incorrect medication, incorrect dosage instructions, or incorrect medicine quantity.

The aim of this study was to explore pharmacists' opinions regarding the impacts of ePrescriptions on medication safety in Finnish community pharmacies. Further objectives were to explore how often pharmacists have perceived ambiguities or errors in ePrescriptions, and what kinds of ambiguities or errors have appeared.

## **2. Materials and Methods**

### **2.1 Study context**

In Finland (excluding the Åland Islands, which constitute an autonomous and monolingual Swedish region of Finland), a fully operational and nationwide ePrescription system has been mandated by law to be implemented in steps in all community pharmacies in 2012, in public healthcare in 2013, and in private healthcare in 2015 [32]. All healthcare providers will be obliged to implement the system by 2017, and thereafter conventional prescriptions will be allowed only in special cases, such as technical system failures. Finnish community pharmacies dispensed nearly 39 million ePrescriptions in 2014, which was approximately 75% of all prescriptions dispensed [33, 34]. In 2015, pharmacies dispensed over 49 million ePrescriptions, which is over 90% of all prescriptions dispensed [34].

In Finland, an ePrescription is signed and transferred electronically by a physician and entered into a centralized database called the Prescription Centre [32]. The Prescription Centre contains all electronic prescriptions and the dispensing records entered on them by pharmacies. ePrescriptions can be dispensed in any Finnish pharmacy. At the pharmacy, ePrescriptions are processed in the pharmacy system, which searches for ePrescriptions in the Prescription Centre. At the pharmacy and in the physician's practice, the patient's consent must always be obtained to access the patient's information held in the Prescription Centre. Only pharmacy staff with a pharmaceutical education are permitted to use the Prescription Centre. These are pharmacists (M.Sc. in pharmacy) and dispensers (B.Sc. in pharmacy). A pharmacist has a five-year and a dispenser a three-year university education. Both are licensed pharmacy practitioners who dispense medicines independently and ensure the safe and proper use of medicines by the public.

ePrescriptions are part of the national data system service for healthcare, pharmacies, and citizens called the National Archive of Health Information (Kanta) ([www.kanta.fi/en/](http://www.kanta.fi/en/)). In addition to ePrescriptions, Kanta services include a Pharmaceutical Database, My Kanta website, and a Patient Data Repository. The Pharmaceutical Database contains information necessary for prescribing and dispensing (e.g. prices of medicines and their reimbursement status). The My Kanta website allows patients to check their own ePrescription information. The Patient Data Repository contains patient health records from all healthcare units.

The aims of ePrescriptions were to make the prescribing and dispensing processes easier and more efficient and to improve medication safety in Finnish healthcare [32, 35]. Improvements in medication safety were expected to be achieved through the enhanced management of patients' overall medication because prescriptions are visible in the Prescription Centre, thus making it easier to detect drug-related problems (e.g. drug interactions, duplicative therapy, or adverse drug reactions), and also by reducing dispensing errors thanks to less ambiguity of ePrescriptions in community pharmacies [35]. ePrescribing has also been expected to reduce prescription forgeries.

## 2.2 Data collection

A cross-sectional postal survey was conducted in the autumn of 2014. The questionnaire was sent to a random sample (to one-third) of dispensers (n = 1004) and pharmacists (n = 228) working in community pharmacies. The sample was collated from the registers of The Finnish Pharmacists' Association and The Finnish Pharmacists' Society. The Åland Islands were excluded from the study because ePrescriptions have not been implemented there. A total of 1232 questionnaires were mailed. One reminder was sent to each recipient. The response period was two weeks in both mailing rounds. The questionnaire was available in Finnish and Swedish, both of which are official languages in Finland.

The four-page questionnaire contained 23 questions, both structured and open-ended and also Likert scale questions. The main themes of the questions concerned the usability of the ePrescription system, the impacts of ePrescriptions on the dispensing process and medication safety, and the main benefits and problems of ePrescriptions. The questions were designed on the basis of the objectives of ePrescriptions as set by law [32], the anticipated impacts of ePrescriptions [35], and some previous studies [26, 36]. The questionnaire was piloted with some pharmacist colleagues with experience in processing ePrescriptions and in two local pharmacies in the spring of 2014. Minor modifications were made to the questionnaire on the basis of the pilot. This paper examines the responses to questions concerning the impacts of ePrescriptions on medication safety and perceived ambiguities or errors in ePrescriptions.

The respondents' opinions on medication safety were measured with eight statements covering medication safety issues. The statements were designed on the basis of the Government proposal concerning the anticipated impacts on medication safety of ePrescriptions before they were introduced (see Study context) [35]. The respondents were instructed to answer using a five-point Likert scale for their degree of agreement, defined as 1 = I fully agree, 2 = I agree somewhat, 3 = I

disagree somewhat, 4 = I fully disagree, and 5 = I don't know. Dispensers' and pharmacists' experiences regarding perceived ambiguities or errors in ePrescriptions were measured with the structured question: "Of the ePrescriptions you have dispensed, how often have there been ambiguities or errors that have required clarification during the process?" The question had six possible answers: 1. Daily or almost daily, 2. About once a week, 3. A few times a month, 4. About once a month, 5. Less than once a month, and 6. Never. The respondents were also asked to specify what kinds of ambiguities or errors have been found in ePrescriptions, with a list of several fixed response answers to choose from and also space for an open answer. In that question, the respondents were required to choose the three most common ambiguities or errors that have emerged. Background information (gender, age, how often (s)he processes ePrescriptions, the proportion of ePrescriptions out of the prescriptions (s)he processes daily, the location of the pharmacy, and the number of prescriptions per year in the pharmacy) was obtained using structured questions. The respondents were asked to state their current job at the pharmacy at the beginning of the questionnaire. Respondents who reported they did not work in a pharmacy at that particular time were asked to return the questionnaire uncompleted. A translated version of the questionnaire is available as supplementary material.

### **2.3 Data analysis**

In the analyses, pharmacists and dispensers were combined (except for the results concerning background characteristics) because of their similar job descriptions regarding medicine dispensing (see Study context). There were no statistically significant differences between respondents with these two academic degrees in the study questions discussed in this paper. Thus, in the results, the term 'pharmacists' refers to both pharmacists and dispensers. In addition, some of the answers in Likert scale were combined: I fully agree and I agree somewhat, and I disagree somewhat and I fully disagree. The data were analyzed with SPSS Statistics for Windows, Version 21.0 (SPSS Inc., Chicago, IL, USA) using frequencies, percentages, and cross-tabulation for descriptive analysis.

Differences between groups were tested using the  $\chi^2$  test and Fisher's test. The level of statistical significance was defined as p-values < 0.05.

## **2.4 Ethical statement**

The study setting and research process were in accordance with the local and national ethical instructions for research (Finnish Advisory Board on Research Integrity: <http://www.tenk.fi/en/ethical-review-human-sciences>). According to the instructions, this study did not require ethical approval.

## **3. Results**

Out of the 1232 questionnaires mailed, a total of 800 were returned after one reminder. However, 22 (15 dispensers and 7 pharmacists) of the questionnaires returned were excluded from the study because the respondents reported that they currently did not work in a community pharmacy, and hence 778 questionnaires were included in the study. Thus, the final study sample was 1210 (989 dispensers and 221 pharmacists). A total of 635 (64%) dispensers and 143 (65%) pharmacists returned the completed questionnaire.

The representativeness of the study population compared with the target population was analyzed with respect to age and gender (Table 1). This showed the study population to be representative of the target population in terms of age and gender with the exception of dispensers aged 30–39, who were under-represented ( $p = 0.001$ ). Almost all of the respondents processed ePrescriptions daily (Table 1). Most of the respondents reported that ePrescriptions represented over 75% of all prescriptions processed daily.

(Table 1)



### **3.1 Respondents' opinions on the impact of ePrescriptions on medication safety**

The majority of the respondents felt that ePrescriptions improve medication safety in many areas: they lower the number of prescription forgeries, reduce the risk of dispensing errors, promote better management of the patient's overall medication, facilitate monitoring of drug interactions and duplicative therapy, and lower the risk of incorrect interpretation of a prescription (Figure 1). However, the respondents' opinions were divided as regards the statements "ePrescriptions contain fewer ambiguities than paper prescriptions", and "ePrescription does not promote monitoring of adverse drug reactions".

(Figure 1)

### **3.2 Respondents' perceived ambiguities and errors in ePrescriptions**

Many respondents (32%) reported that they had weekly perceived ambiguities or errors in ePrescriptions that had required clarification during the dispensing process (Figure 2). Almost one-fifth (18.6%) of the respondents had perceived such ambiguities or errors daily or almost daily. Some statistically significant differences were found in perceived ambiguities or errors between age, the proportion of ePrescriptions out of the prescriptions processed daily, and the number of prescriptions dispensed per year at the pharmacy (Table 2).

(Figure 2)

(Table 2)

The three most common ambiguities or errors that pharmacists perceived in ePrescriptions were incorrect total amount of medication, missing notification of exceptional dosage instructions or exceptional purpose of use (SIC!), and unclear or incorrect dosage instructions (Table 3). Incorrect strength and incorrect pharmaceutical form were also quite commonly experienced problems in ePrescriptions.

(Table 3)

#### **4. Discussion**

According to this study, pharmacists considered that ePrescriptions improve medication safety in Finnish community pharmacies in many areas. Most pharmacists thought that ePrescriptions reduce prescription forgeries, misinterpretation of prescriptions and dispensing errors, and facilitate the management of patients' overall medication. These were also the main impacts of ePrescriptions on medication safety anticipated before they were introduced in Finland [35]. Many previous studies have reported similar findings concerning improved medication safety in community pharmacies [21, 23-26].

However, the findings of this study indicate that ePrescriptions have not succeeded in eliminating all types of ambiguities and errors in prescriptions in Finland. Quite a number of pharmacists in our study reported errors or ambiguities such as misplaced, missing or unclear prescription information. In addition, inaccuracies in our study were also attributed to physicians. Our study findings are in line with previous studies [21, 26, 30, 31].

The ambiguities and errors found in this study can be divided into two types. First, inexact prescription information (e.g. misplaced or missing information) and second, incorrect prescription information (e.g. unclear/incorrect dosage instructions or incorrect strength or pharmaceutical form). Misplaced or missing prescription information can delay the dispensing process at the pharmacy and might cause patient dissatisfaction toward customer service. In the worst case, delays can prevent patients from starting their medication on time. In addition, unclear or incorrect prescription information can cause serious harm to patients and jeopardize favorable medication therapy outcomes.

A novel technology seems to generate new kinds of problems in prescribing. Inexactly or incorrectly entered prescription information probably results from the physician's failure to complete the

prescription correctly: for example, entering prescription information in the wrong data fields or incorrectly selecting information from the system. Previous reports have shown that one reason for lack of clarity in dosage instructions is that physicians use abbreviations that may lead to the misinterpretation of instructions in pharmacies [26, 37, 38]. Moreover, some errors or ambiguities required clarifications from a physician, which delayed dispensing.

It has been proposed that poor design of prescribing systems (e.g. poorly designed drop-down menus or data fields) is one factor that can cause the physician to select prescription information incorrectly, resulting in the risk of prescription errors [30, 31, 39-42]. In addition, one previous study has found that physicians' heavy workloads, carelessness and the lack of professional skills contribute to the occurrence of medication errors [43]. On the other hand, the easy use and consistency of prescribing systems have been reported to help reduce medication errors [44, 45]. Nevertheless, electronic prescribing systems should be developed that enable physicians to write more complete, accurate, and unambiguous ePrescriptions. For example, the system should direct the user to make prescription entries in the correct fields and, where necessary, physicians should be trained in the use of the ePrescription system.

This study had some strengths and some limitations. One strength is that the findings are based on a fully operational ePrescription system that is in nationwide use. In addition, the respondents' experiences were based on their daily use of ePrescriptions. The study sample was randomly selected from registers that cover most Finnish dispensers and pharmacists. Moreover, the response rates (64% and 65%) were similar to or higher than for some earlier surveys sent to pharmaceutical staff [26, 46, 47]. The respondents also represented the target population quite well, with the exception of dispensers aged 30–39. The response rate for each question was also high (97–99%) and there was only very little missing information, making the results more reliable. We therefore suggest that our study results can be generalized to apply to all Finnish community pharmacists. However, it should be noted that the results of this study are based on self-reports from community pharmacists. Thus,

there is the possibility of over- or underestimation in study questions related to perceived ambiguities and errors in ePrescriptions. In the future therefore, the actual incidence of ePrescription errors in community pharmacies should be investigated using different methods, for example observational research. In addition, this study was conducted in Finland and there are differences in ePrescription systems, its definitions, and stages of implementation between countries [12, 15, 16].

The present study adds new information in this study field [25, 26, 31, 48]. First, our study was quantitative and included large amounts of data, while previous studies have been qualitative and thus used only small amounts of data [23, 24, 31]. Second, the present study focused more precisely on medication safety and how it has been affected by the introduction of ePrescriptions. In some previous studies, ‘safety’ has only been one part of the study and has not been studied in depth, or the term ‘safety’ has been defined imprecisely [23, 25, 26]. Moreover, our study findings shed more light on the different aspects of medication safety, something that the law also seeks to achieve in Finland [32].

## **5. Conclusions**

According to Finnish community pharmacists, the introduction of ePrescriptions has promoted medication safety in many areas, as anticipated. However, ambiguities or errors are common in ePrescriptions. Furthermore, some of these ambiguities or errors can delay dispensing, whereas others can cause serious risks to the patient. The ePrescription system needs further development so that it better supports correct prescribing and hence smooth and safe dispensing.

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## Summary table

### What is already known on the topic

- A fully operational and nationwide electronic prescription (ePrescription) system has been implemented in only a few European countries, one being Finland.
- The use of ePrescriptions have the potential to improve the quality of patient care at the pharmacy.
- Only a limited number of studies focus on the impacts of ePrescriptions on medication safety from the pharmacists' point of view.

### What this study has added to our knowledge

- ePrescriptions have improved medication safety in many areas, particularly by reducing prescription forgeries, the misinterpretation of prescriptions, and the risk of dispensing errors, and facilitated better management of the patient's overall medication.
- Ambiguities and errors are still common in ePrescriptions.
- Ambiguities and errors can be divided into two types; those which can delay dispensing at the pharmacy, and those which pose a risk to medication safety.

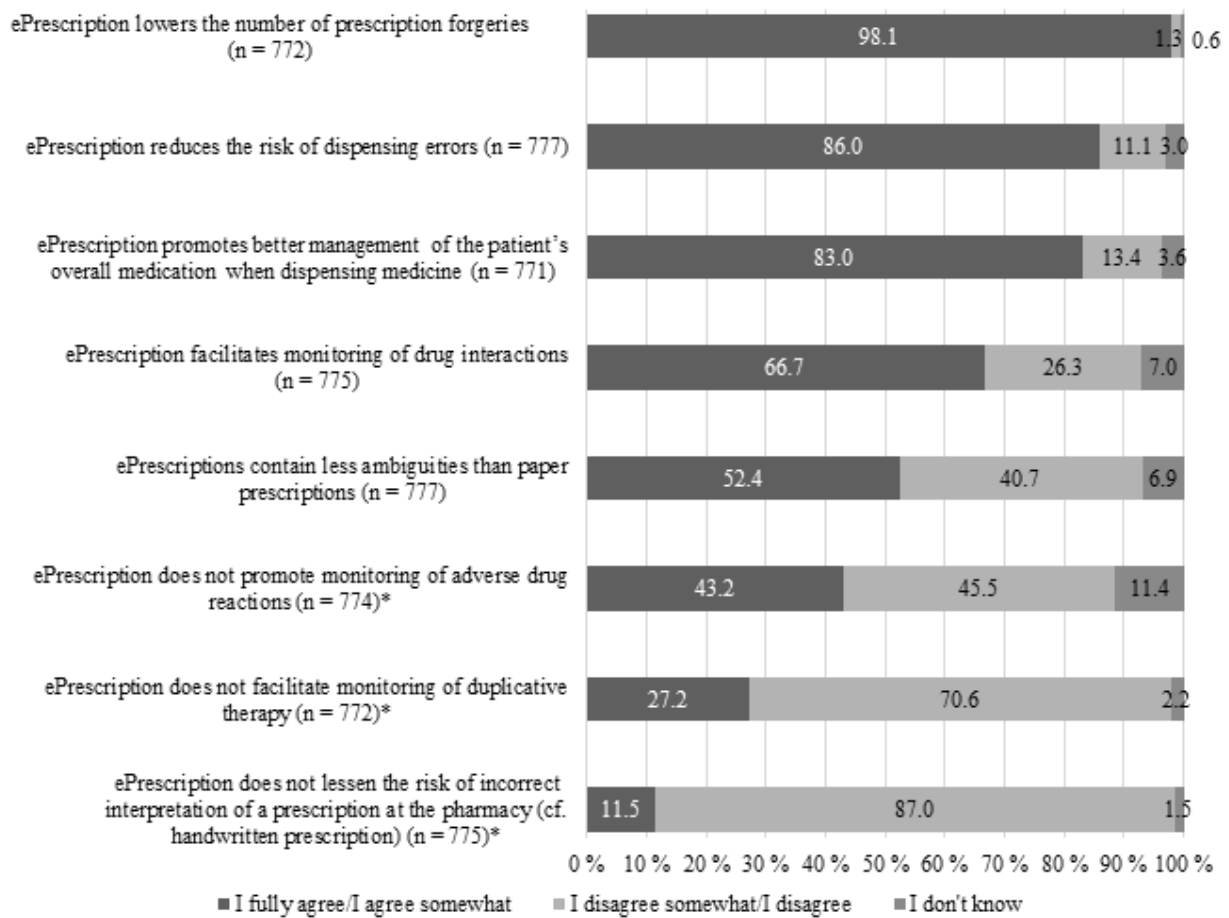


Figure 1 Pharmacists' opinions on the statements regarding medication safety (%).

\*The last three statements were posed as negative statements, and hence disagreements in the last two statements are interpreted as positive opinions.

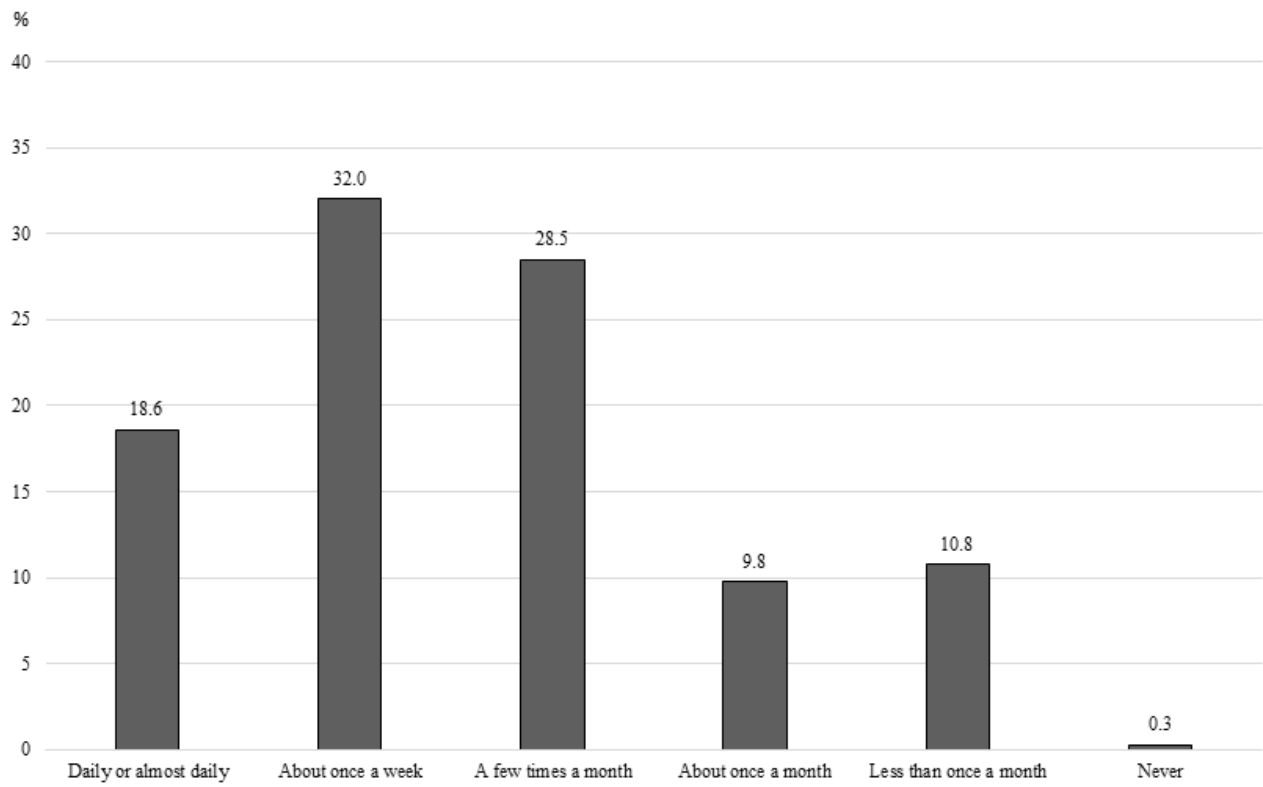


Figure 2 Pharmacists' (n = 775) perceived ambiguities or errors in the ePrescriptions that have required clarifications during the dispensing process (%).

Table 1 Characteristics of the study population<sup>a</sup>.

	Respondent dispensers %(n)	Respondent pharmacists %(n)
<i>Gender</i>		
	n = 632 <sup>b</sup>	n = 142 <sup>b</sup>
Female	96.5 (610)	85.9 (122)
Male	3.5 (22)	14.1 (20)
<i>Age, years</i>		
	n = 632 <sup>b</sup>	n = 142 <sup>b</sup>
≤ 29	17.1 (108)	19.0 (27)
30–39	23.4 (148)	39.4 (56)
40–49	33.7 (213)	28.2 (40)
50–59	21.0 (133)	10.6 (15)
≥ 60	4.8 (30)	2.8 (4)
<i>Processing ePrescriptions</i>		
	n = 635	n = 143
Daily	97.6 (620)	96.5 (138)
Weekly	2.2 (14)	2.8 (4)
Less than weekly	0.2 (1)	0.7 (1)
<i>Proportion (%) of prescriptions processed daily are ePrescriptions</i>		
	n = 632 <sup>b</sup>	n = 143
≤ 75	36.9 (233)	35.7 (51)
> 75	63.1 (399)	64.3 (92)
<i>Location of the pharmacy</i>		
	n = 633 <sup>b</sup>	n = 143
Southern Finland	35.2 (223)	33.5 (48)
Western Finland	30.0 (190)	27.3 (39)
Eastern Finland	13.9 (88)	21.7 (31)
Northern Finland	9.2 (58)	7.0 (10)
Southwestern Finland	8.9 (56)	5.6 (8)
Lapland	2.8 (18)	4.9 (7)
<i>Number of prescriptions per year at the pharmacy</i>		
	n = 625 <sup>b</sup>	n = 142 <sup>b</sup>
≤ 30 000	10.2 (64)	4.2 (6)
30 001–60 000	21.6 (135)	22.5 (32)
60 001–100 000	31.4 (196)	42.3 (60)
≥ 100 001	36.8 (230)	31.0 (44)

<sup>a</sup>Representativeness was observed in terms of the respondents' age and gender. Dispensers at the age of 30–39 were under-represented ( $p = 0.001$ ) in the study population.

<sup>b</sup>Some of the respondents did not report their gender or age, how often they processed ePrescriptions, the proportion (%) of prescriptions processed daily that are ePrescriptions, pharmacy location, or the number of prescriptions per year at the pharmacy.

Table 2 Perceived ambiguities or errors in ePrescriptions that have required clarification during the dispensing process (% , n). Only significant p-values (< 0.05) have been marked in the table.

Of the ePrescriptions you have dispensed, how often have there been ambiguities or errors that have required clarification during the process?												
	Daily or almost daily		About once a week		A few times a month		A once a month		Less than once a month		Never	
	%	n	%	n	%	n	%	n	%	n	%	n
<b>Gender</b>												
Female	18.0	131	32.0	233	28.8	210	9.9	72	11.1	81	0.3	2
Male	28.6	12	31.0	13	23.8	10	9.5	4	7.1	3	0.0	0
All (n = 771)		143		246		220		76		84		2
<b>Age, years</b>												
≤ 29	23.7	32	38.5	52	31.9	43	2.2**	3	3.7**	5	0.0	0
30-39	17.6	36	35.8	73	27.0	55	9.8	20	9.8	20	0.0	0
40-49	18.4	46	27.2	68	30.0	75	12.0	30	12.0	30	0.4	1
50-59	16.2	24	29.1	43	25.7	38	12.8	19	15.5*	23	0.7	1
≥60	14.7	5	29.4	10	26.5	9	11.8	4	17.6	6	0.0	0
All (n = 771)		143		246		220		76		84		2
<b>Processing ePrescriptions</b>												
Daily	18.4	139	32.1	242	29.0	219	9.8	74	10.5	79	0.3	2
Weekly	22.2	4	27.8	5	11.1	2	11.1	2	27.8	5	0.0	0
Less than weekly	50.0	1	50.0	1	0.0	0	0.0	0	0.0	0	0.0	0
All (n = 775)		144		248		221		76		84		2
<b>Proportion (%) of ePrescriptions processed daily are ePrescriptions</b>												
≤75	21.6	61	36.5	103	22.7	64	8.2	23	10.3	29	0.7	2
>75	16.9	83	29.6*	145	31.6**	155	10.8	53	11.0	54	0.0	0
All (n = 772)		144		248		219		76		83		2
<b>Number of prescriptions per year at the pharmacy</b>												
≤ 30 000	8.6*	6	21.4	15	25.7	18	17.1*	12	25.7***	18	1.4	1
30 001-60 000	10.2**	17	33.7	56	31.3	52	9.6	16	15.1	25	0.0	0
60 001-100 000	19.7	50	29.1	74	31.9	81	9.8	25	9.1	23	0.4	1
≥ 100 001	25.2***	69	35.4	97	24.8	68	8.0	22	6.6**	18	0.0	0
All (n = 764)		142		242		219		75		84		2

\*p-value 0.01 ≤ p < 0.05

\*\*p-value 0.001 ≤ p < 0.01

\*\*\*p-value < 0.001

Table 3 Ambiguities or errors in ePrescriptions reported by pharmacists (n = 754).

“What kinds of ambiguities or errors have there been in ePrescriptions?”	Percent of cases % (n) <sup>a</sup>
Incorrect total amount of medication	79.0 (596)
Missing notation of exceptional dosage instructions or exceptional purpose of use (SIC!) <sup>b</sup>	69.0 (520)
Unclear or incorrect dosage instructions	65.4 (493)
Incorrect strength	14.9 (112)
Incorrect pharmaceutical form	14.2 (107)
Unit dose distribution marking is missing or unnecessary	8.6 (65)
Incorrect pharmaceutical product	4.8 (36)
Missing dosage instructions	3.8 (29)
Child’s (under 12) weight missing	3.6 (27)
Other, please specify <sup>c</sup>	22.5 (170)
Entry on prohibition of generic substitution missing or misplaced in ePrescription	30.5 (51)
Ex tempore <sup>d</sup> prescription prescribed incorrectly or unnecessarily	28.1 (47)
Separate statement for reimbursement incorrect or misplaced	24.6 (41)
Iteration <sup>e</sup> -related entries incorrect or misplaced	16.2 (27)
Physician has prescribed a medicine that has been withdrawn	6.0 (10)
Other	14.4 (24)

<sup>a</sup> Respondents could choose up to three options.

<sup>b</sup> In Finland, the marking SIC! specifies that the physician is consciously prescribing a medicine with an exceptionally high dose or for off-label use.

<sup>c</sup> Respondents could report more than one ambiguity or error in the open question (n = 200 comments).

<sup>d</sup> Pharmaceutical product prepared in the pharmacy according to the physician’s instructions.

<sup>e</sup> The physician can use iteration to allow the supply of the medicine at regular intervals.

## Highlights

- In Finland, ePrescriptions have improved medication safety, particularly by reducing prescription forgeries, the misinterpretation of prescriptions, and the risk of dispensing errors, and facilitated better management of the patient's overall medication.
- Ambiguities and errors are still common in ePrescriptions.
- Some of ambiguities or errors can delay dispensing, whereas others can cause serious risks to the patient.
- The ePrescription system needs further development so that it better supports correct prescribing and hence smooth and safe dispensing.

## Questionnaire study for pharmacists regarding electronic prescriptions (ePrescriptions)

Answer the questions by circling the number of the most suitable alternative and/or writing the answer in the space provided. It is important for the study that you answer all the questions.

### 1. Are you currently working at a pharmacy?

1. No     → Do not answer the questions. Return the blank questionnaire in the envelope provided.
2. Yes    → Continue filling in the questionnaire.

### 2. How often do you personally process ePrescriptions?

1. Daily
2. Weekly
3. Less than once a week

### 3. How large a proportion (%) of the prescriptions you process daily are ePrescriptions?

1. < 10
2. 10–24
3. 25–49
4. 50–75
5. > 75

### 4. What pharmacy system is used at the pharmacy where you work? (If you use several systems, circle the one you use most often and answer the questions about your experiences with that system).

1. Maxx
2. Salix
3. PD3

### 5. Has the use of ePrescriptions affected your own job description at the pharmacy?

1. No
2. Yes. How? \_\_\_\_\_

### 6. What is your opinion on the following statements? (Circle the most suitable alternative for each statement.)

	I fully agree	I agree somewhat	I disagree somewhat	I fully disagree	I don't know
The ePrescription application is difficult to use	1	2	3	4	5
The ePrescription application is easy to learn to use	1	2	3	4	5
The ePrescription application is inflexible and I can't use it as I would like to	1	2	3	4	5
The ePrescription application is clear and understandable	1	2	3	4	5

### 7. Do you think the ePrescription system is safe from the standpoint of data protection?

1. Yes
2. No. What issues are problematic?  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

### 8. How often have you experienced a technical problem in using the ePrescription system that has hindered/slowed dispensing of a prescription?

1. Daily or almost daily
2. About once a week
3. A few times a month
4. About once a month
5. Less than once a month
6. Never



**9. Of the ePrescriptions you have dispensed, how often have there been ambiguities or errors that have required clarification during the process?**

1. Daily or almost daily
2. About once a week
3. A few times a month
4. About once a month
5. Less than once a month
6. Never → (go to question 11.)

**10. What kinds of ambiguities or errors have there been in the ePrescriptions? (Circle the three most common.)**

1. Incorrect pharmaceutical product
2. Incorrect strength
3. Incorrect pharmaceutical form
4. Incorrect total amount of medication
5. Unclear or incorrect dosage instructions
6. Missing dosage instructions
7. Child's (under 12) weight missing
8. Missing notation of exceptional dosage instructions or exceptional purpose of use (SIC!)
9. Unit dose distribution marking is missing or unnecessary
10. Other, please specify

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**11. In your opinion, how have ePrescriptions affected the various phases of prescription dispensing? (Circle the most suitable alternative for each work phase.)**

	Made them much easier	Made them slightly easier	No change	Made them slightly more difficult	Made them much more difficult
Receiving a prescription (cf. from the customer/from a database)	1	2	3	4	5
Checking prescription information (cf. from a paper prescription/from the computer terminal)	1	2	3	4	5
Monitoring dispensing intervals from the prescription	1	2	3	4	5
Checking and filling in health insurance compensation	1	2	3	4	5
Detection of possible errors (caused by the physician) on the prescription	1	2	3	4	5
Taking actions to correct errors (caused by the physician) on the prescription	1	2	3	4	5
Transferring prescription data into the pharmacy data system	1	2	3	4	5
Correcting your own processing errors made during prescription dispensing	1	2	3	4	5
Making dispensing entries on the prescription	1	2	3	4	5
Correcting dispensing entries afterward	1	2	3	4	5
Partial dispensing of a prescription	1	2	3	4	5
Delivery of ordered medicine	1	2	3	4	5
Instructing the customer about medicine remaining on the prescription	1	2	3	4	5
Medicine collection	1	2	3	4	5
Medicine checking	1	2	3	4	5
Signature/acknowledgement of dispensing	1	2	3	4	5
Customer invoicing	1	2	3	4	5
Cancellation of medicine dispensing	1	2	3	4	5
Prescription cancellation	1	2	3	4	5
Prescription renewal	1	2	3	4	5

**12. What is your opinion on the following statements?** (Circle the most suitable alternative for each statement.)

	I fully agree	I agree somewhat	I disagree somewhat	I fully disagree	I don't know
ePrescription reduces the risk of dispensing errors	1	2	3	4	5
ePrescription promotes better management of the patient's overall medication when dispensing medicine	1	2	3	4	5
ePrescription does not facilitate monitoring of duplicative therapy	1	2	3	4	5
ePrescription does not promote monitoring of adverse drug reactions	1	2	3	4	5
ePrescription facilitates monitoring of drug interactions	1	2	3	4	5
ePrescription does not lessen the risk of incorrect interpretation of a prescription at the pharmacy (cf. handwritten prescription)	1	2	3	4	5
ePrescriptions contain less ambiguities than paper prescriptions	1	2	3	4	5
ePrescription lowers the number of prescription forgeries	1	2	3	4	5
Customers are not aware that they have been prescribed medicines by ePrescription	1	2	3	4	5
Customers receive sufficient information about ePrescription at other healthcare facilities before coming to the pharmacy	1	2	3	4	5
Customers arriving at the pharmacy usually have instructions with them regarding their ePrescription	1	2	3	4	5
ePrescription has made it easier to provide customers with up-to-date information about their prescriptions and the medicines made available to them by the prescriptions	1	2	3	4	5
Physicians actively use the ePrescription application's message space to communicate information between the physician, the pharmacy, and the patient	1	2	3	4	5
Customers find it difficult to determine the amount of medicine they have not yet received from ePrescription	1	2	3	4	5
Customers need more information from the pharmacy's staff about ePrescription when they visit the pharmacy	1	2	3	4	5

**13. In your opinion, have ePrescriptions affected the amount of contacts between the pharmacy and physicians?**

1. No
2. The amount of contacts have decreased.
3. The amount of contacts have increased.  
What have been the main reasons for the contacts?

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**14. Has your workplace agreed on procedures related to renewal of ePrescriptions with local healthcare?**

1. Yes
2. No
3. I don't know

**15. Has your workplace compiled procedural guidelines with local healthcare regarding error situations between the pharmacy and the Prescription Centre?**

1. Yes
2. No
3. I don't know

**16. In your opinion, are the Electronic Prescription Act and official regulations clear?**

- 1. Yes
- 2. No. What issues are problematic? \_\_\_\_\_

**17. In your opinion, what are the main benefits of ePrescriptions?**

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**18. In your opinion, what are the main problems / areas needing development in ePrescriptions?**

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**19. How satisfied are you with ePrescriptions as a whole? (Circle the most suitable alternative.)**

Not satisfied at all						Very satisfied
1	2	3	4	5	6	

**20. The pharmacy where you work is in?**

- 1. Southern Finland
- 2. Western or Central Finland
- 3. Southwestern Finland
- 4. Eastern Finland
- 5. Northern Finland
- 6. Lapland

**22. Your gender?**

- 1. Male
- 2. Female

**21. Number of prescriptions processed in 2013 at the pharmacy where you work?**

- 1. ≤ 30 000
- 2. 30 001–60 000
- 3. 60 001–100 000
- 4. ≥ 100 001

**23. Your age?**

- 1. ≤ 29
- 2. 30–39
- 3. 40–49
- 4. 50–59
- 5. ≥ 60

**Other thoughts and comments regarding ePrescriptions or this questionnaire:**

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**Thank you!**