



Problems with continuity of care identified by community pharmacists post-discharge

H. T. Ensing*†‡ PharmD, E. S. Koster† PhD, P. I. van Berkel† BPharm, A. A. van Dooren* PharmD PhD and M. L. Bouvy† PharmD PhD
*Utrecht University of Applied Sciences, Research Group Process Innovations in Pharmaceutical Care, †Department of Pharmacoepidemiology and Pharmacotherapy, Utrecht Institute for Pharmaceutical Sciences (UIPS), Utrecht University, Utrecht, and ‡Zorggroep Almere, Outpatient Pharmacy 'de Brug 24/7', Almere, The Netherlands

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SUMMARY

What is known and objective: Medication discrepancies are common at hospital discharge, and medication reconciliation is widely endorsed as a preventive strategy. However, implementation is difficult for instance due to the unreliability of patients medication histories. In the Netherlands, community pharmacies are well-informed about their patients' pre-admission medication status which enables thorough post-discharge reconciliation. Our aim was to study the frequency and nature of medication discrepancies, missing patient's knowledge and administrative problems at admission to primary care.

Methods: A cross-sectional study was conducted in pharmacies belonging to the Utrecht Pharmacy Practice network for Education and Research in the Netherlands. Structured checklists were used to evaluate all discharge prescriptions presented by adult patients discharged from the hospital to their own home during the study period. The primary outcome was all possible problems with continuity of care, defined as (i) the number and type of medication discrepancies, (ii) administrative problems and (iii) the necessity for patient education.

Results and discussion: In forty-four pharmacies, checklists were completed for 403 patients. Most discharge prescriptions (92%) led to one or more problems with continuity of care ($n = 1154$, mean 2.9 ± 2.0), divided into medication discrepancies (31%), administrative problems (34%) and necessity for further education (35%). Medication discrepancies ($n = 356$) resulted mainly from missing pre-admission medication ($n = 106$) and dose regimen changes ($n = 55$) on the discharge prescription. Administrative problems ($n = 392$) originated mainly from administrative incompleteness ($n = 177$), for example missing reimbursement authorization forms, or supply issues ($n = 150$), for example insufficient pharmacy stock. The patients' lack of medication knowledge post-discharge was illustrated by the high need for patient education ($n = 406$).

What is new and conclusion: Community pharmacists are still confronted with problems due to inadequate documentation at discharge which can inflict harm to patients if not properly addressed. To reduce these problems, a rigorous implementation

of the medication reconciliation process at all transition points, standardized electronic transfer of all medication-related information and interdisciplinary collaboration are crucial.

WHAT IS KNOWN AND OBJECTIVE

The transfer of patients from primary care to the hospital and vice versa is a process with an increased risk of patient harm. Patient harm is often caused by medication errors evoked by frequent changes in the medication regimen during hospital admission, involvement of different healthcare professionals and inadequate documentation and transfer of information between healthcare providers.^{1–4} Medication discrepancies account for over half of the medication errors, which in turn represent risk factors for drug-related problems such as adverse drug events (ADEs).^{5,6} Previous research showed that 19% of patients discharged from hospital experienced at least one preventable ADE within 3 weeks after discharge.⁷

Medication reconciliation, the formal process of obtaining a complete and accurate list of each patient's current medication across transitions of care, has been widely implemented and endorsed to prevent medication discrepancies.^{8–16} Additionally, changes in patients' medication status throughout the hospital journey should be documented and transferred to the next healthcare provider and patient at discharge (Fig. 1). However, the intensity of these reconciliation processes varies from solely composing a discharge medication status to adequate patient discharge counselling and transfer of medication changes, including their rationale, directly to primary care providers.¹⁷ Moreover, many hospitals struggle with the implementation of an effective and efficient discharge reconciliation process due to staffing shortages or administrative burden.^{9,10,18} Finally, unreliable patient medication histories are a major barrier to perform adequate medication reconciliation.¹⁹

Evidence supports that integrating pharmacists during hospital admission, discharge and post-discharge can benefit continuity of care.^{20–24} In the Netherlands, community pharmacies are well informed about their patients' actual medication status due to limited pharmacy shopping behaviour, local clustering of computer systems and a nationwide system.²⁵ As from 2011, a governmental law reinforces adequate medication transfer by obliging an up-to-date medication status at the time of dispensing a new prescription.²⁶ Patients discharged from hospital can either collect their discharge prescription at their community pharmacy or at an outpatient pharmacy. The latter is located within a

Correspondence: M. L. Bouvy, Department of Pharmacoepidemiology and Clinical Pharmacology, Utrecht Institute for Pharmaceutical Sciences (UIPS), PO Box 80082, 3508 TB Utrecht, The Netherlands. Tel.: +31 (0)30 – 253 6965; fax: +31 (0)30 – 253 9166; e-mail: m.l.bouvy@uu.nl

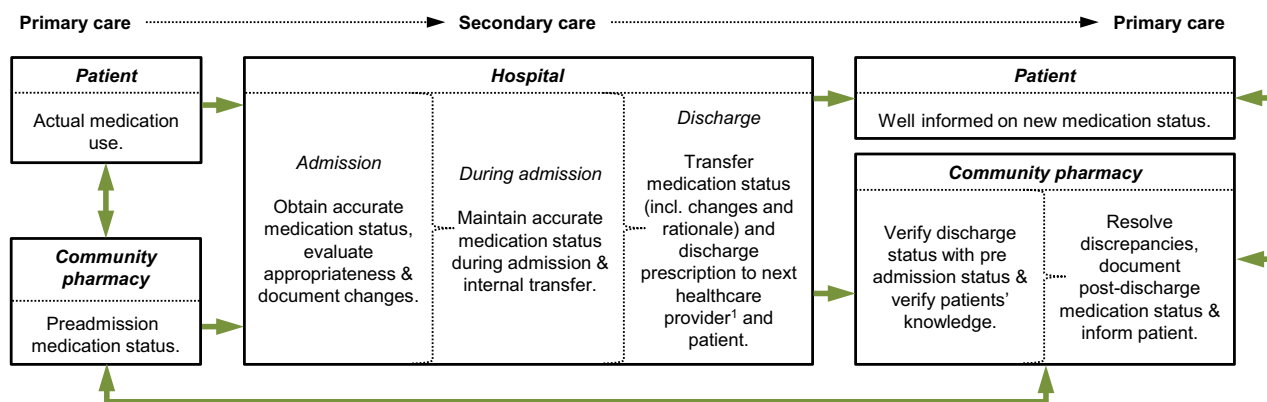


Fig. 1. Communication pathways to secure continuity of care. [Colour figure can be viewed at wileyonlinelibrary.com]

hospital. Both pharmacy types are generally the first primary care provider consulted by patients post-discharge. Altogether, this enables community pharmacies to verify whether the received discharge information is a logical result of the hospital admission as compared to patients' pre-admission status.

Previous studies in the Netherlands lacked evaluation of the nature of post-discharge problems with continuity of care, focused on a specific population or were performed in a single pharmacy.^{27–29} Furthermore, all were performed before the introduction of the above-mentioned law on transferring medication data. Therefore, our aim was to study the frequency and nature of medication discrepancies and administrative problems and the necessity for patient education at admission to primary care.

METHODS

Study setting

This cross-sectional study was conducted in pharmacies belonging to the Utrecht Pharmacy Practice Network for Education and Research (UPPER).³⁰ The UPPER network consists of approximately 1300 Dutch community and outpatient pharmacies which regularly participate in research and traineeships for pharmacy students from Utrecht University. In the Netherlands, all community pharmacies collect electronic dispensing data and perform clinical risk management whenever a medicine is to be dispensed.³¹ Recently, community pharmacists were recognized as healthcare specialists equivalent to in-hospital specialists and general practitioners.

Ethics approval

The study protocol was approved by the Institutional Review Board of the division of Pharmacoepidemiology and Clinical Pharmacology of Utrecht University. All checklists and other patient information (e.g. copy of the discharge prescription) were encrypted within the pharmacy using unique patient identification numbers consisting of patients' gender and age combined with a pharmacy designation.

Study sampling

All discharge prescriptions presented by adult patients (aged >18 years) discharged from the hospital to their own home during

the study period were eligible for inclusion. A discharge prescription contains the complete list of medication that the patient should use post-discharge (according to the in-hospital physician), ideally containing the changes made, including the rationale behind those changes. Discharge prescriptions that were presented when the trainee or pharmacy staff member was unavailable were excluded.

Definition of outcomes

The primary outcome of this study was all possible problems with continuity of care experienced by community pharmacists, defined as (i) the number and type of medication discrepancies, (ii) the number and type of administrative problems and (iii) the necessity for patient education at admission to primary care (Table 1). Medication discrepancies were defined as any unclear difference seen between the medications listed on the discharge prescription and the pre-admission medication status (Fig. 1). A pragmatic categorization was used to structure medication discrepancies due to the absence of a well-designed taxonomy.³² Four categories of discrepancies were defined, based on its origin: newly started, changed or missing medication or other (Table 1). Administrative problems were defined as any problem originating from a logistic or administrative background. Finally, necessity for patient education was defined as patients lacking relevant information concerning their discharge medication, for example dose changes or information on medication that should be discontinued (Table 1).

Data collection

Data were collected during the 6-week traineeship period of PharmD students somewhere between September 2013 and December 2014. Data were either collected by the students themselves or by pharmacy staff members. Both received oral instructions and a written protocol from the principal researcher (HE). Structured checklists were used to systematically identify and categorize the primary outcome. A copy of the discharge prescription, patients' medication status before and after processing the discharge prescription, general pharmacy information and general hospital information were collected. In addition, general information (e.g. staff member involved, processing date), supply information (e.g. adequate pharmacy supplies, inventory of patients' home stock) and processing time spent was gathered.

Table 1. (Sub)categories and descriptions of the problems with continuity of care used in this study

Category	Subcategory	Description
Discrepancies 'new'	No clear indication	There is no clear indication for use of the newly prescribed drug
	Contraindication/intolerance	The patient has a contraindication (e.g. renal impairment, heart failure, diabetes, hypertension) or intolerance for the newly prescribed drug
	Duplication	Possible incorrect start of a newly prescribed drug because another drug from the same therapeutic class is already in use
	Drug–drug interaction	Interaction between a newly prescribed drug and one which is already in use
Discrepancies 'change'	Other	For example, unclear dose, unclear regimen, unclear dose form or unclear quantity of newly prescribed drug or unclear restart of a discontinued drug
	Dose regimen change	Unclear dose regimen change
	Dose change	Unclear dose change
	Drug change	Possible incorrect drug change within the same therapeutic class
	Dose form change	Unclear dose form change
Discrepancies 'missing'	Other	For example, unclear stop date, unclear temporarily discontinuation, unclear stop reason, unclear phase-out regimen
	Continuing of home medication	No explicit mentioning of discontinuation of pre-admission medication which results in lack of clarity
Discrepancies 'other'	Preventive therapy required	Missing medication based on pharmacological grounds/no drug prescribed but clear indication
	–	Discrepancies that cannot be categorized otherwise, for example unclear pre-admission drug list, missing laboratory report (needed for dose control)
Administrative problems	Incomplete prescription	Missing administrative information concerning the discharge prescription
	Supply problems	All problems regarding pharmacy supplies and patients' stock
Necessity for patient education	Other	Administrative problems that cannot be categorized otherwise
	Medication information	Patients' educational needs regarding their discharge medication, for example instruction how to use a newly started inhaler
	Medication management	Patients' educational needs regarding their discharge medication regimen, for example which drugs should be discontinued
	Other	Necessity for patient education that cannot be categorized otherwise

Data analysis

LimeSurvey (www.limesurvey.com) and Microsoft Excel 2010 (Microsoft Corporation, Redmond, WA, USA) were used for data entry. The dataset was checked for completeness by two researchers (HE, PvB) and missing data were verified with the original paper document. Descriptive statistics of the primary outcome – frequencies, means or median and standard deviations or interquartile ranges (IQR) – were calculated. Continuous data were checked for normality and either parametric *t*-tests or either nonparametric Mann–Whitney *U*-tests or Kruskal–Wallis tests were used to compare differences between groups (e.g. age and number of drugs post-discharge). Categorical data were compared with Chi-square tests. *P*-values <0.05 were considered statistically significant. All analyses were performed using IBM SPSS 23.0 (SPSS Inc., Chicago, IL, USA).

RESULTS

General characteristics

Of the 55 invited pharmacies, 11 were unable to identify discharge prescriptions during the study period; thus, 42 community and two outpatient pharmacies collected information on 403 patients (median of 5.0, IQR 2.8–5.0). Patients received more drugs post-discharge compared to pre-admission (9.2 ± 4.6 vs. 7.4 ± 4.9 , $P < 0.05$). Prescriptions were mostly received by fax and originated from a variety of hospitals and wards (Table 2).

Encountered problems during processing of prescriptions

The majority of the discharge prescriptions ($n = 372$, 92.3%) contained at least one problem with continuity of care. In total, 1154 problems were encountered (2.9 ± 2.0 problems per prescription). Community pharmacies encountered more problems per prescription compared to outpatient pharmacies (3.1 ± 2.2 vs. 2.4 ± 1.4 , $P < 0.05$). Mean processing time, including physician and/or patient contact if necessary, was 23.1 min (median 16, IQR 10–30) for prescriptions leading to a problem vs. 17.2 min (median 10, IQR 6–15) for prescriptions which did not ($P < 0.05$). For 54.3% ($n = 202$) of the prescriptions that led to one or more problems, the pharmacy contacted the prescriber for clarification. The remaining 170 prescriptions were either clarified by (additional) patient contact (81.8%), or within the pharmacy itself when consultation of patient or physician was considered unnecessary (e.g. an administrative problem) (18.2%).

A total of 356 medication discrepancies (mean of 0.9 ± 1.1 per prescription) and 392 administrative problems (mean 1.0 ± 1.0) were encountered. Additional patient education was necessary in 406 times (mean 1.0 ± 1.0 , Table 3).

Medication discrepancies were categorized in 'new', 'change', 'missing' and 'other' (Table 1 and Table 3). The subcategory 'no clear indication' was the major contributor (37.1%) to discrepancies concerning newly started medication ($n = 89$). A change in the pre-admission medication was the largest category of discrepancies ($n = 139$). These discrepancies mostly originated from a lack of information concerning dose regimen changes (39.6%). Next, discrepancies due to missing medication ($n = 113$) resulted mainly

Table 2. General characteristics of processed prescriptions

Patient characteristics	
Male gender, <i>n</i> (%)	189 (46.9)
Age, mean years (SD)	64.0 (15.3)
No. of drugs pre-admission, mean (SD)	7.4 (4.9) ^a
No. of drugs after discharge, mean (SD)	9.2 (4.6) ^a
Pharmacy type, <i>n</i> (%)	
Community pharmacy	277 (68.7)
Outpatient pharmacy	126 (31.3)
Discharge prescription presentation, <i>n</i> (%)	
By fax	296 (73.4)
Over the counter by patient	55 (13.6)
Over the counter by (informal) caregiver	45 (11.2)
Other ^b	7 (1.7)
Hospital type, <i>n</i> (%)	
Teaching hospital	215 (53.3)
General hospital	161 (40.0)
University hospital	23 (5.7)
Other ^c	4 (1.0)
Ward type, <i>n</i> (%)	
Internal medicine ^d	131 (32.5)
Cardiology	69 (17.1)
Surgery	67 (16.6)
Respiratory medicine	39 (9.7)
Orthopaedics	33 (8.2)
Neurology	32 (7.9)
Other ^e	14 (3.5)
Unknown	18 (4.5)

^aCalculated for *n* = 355 (88.1%).

^bFor example by e-mail.

^cFor example categorical hospital.

^dIncluding gastroenterology, oncology, geriatrics and haematology.

^eGynaecology, ENT section, psychiatry, rheumatology, revalidation and urology.

from lacking information on the discontinuation of pre-admission medication (93.8%). Administrative problems originated mostly from administrative incompleteness (45.1%), for example missing reimbursement authorization forms, or pharmacy supply problems (38.3%). The patients' lack of knowledge concerning their medication post-discharge was illustrated by the necessity for patient education (*n* = 406) on both medication information (*n* = 244, 60.1%) and medication management (*n* = 151, 37.2%).

Checklists were completed by trainees or pharmacy staff members. Trainees and staff recorded similar mean processing time. The proportion of prescriptions that led to at least one problem was compared between both groups of which only the proportion of administrative problems revealed a difference (64.6% vs. 51.9%, *P* < 0.05).

Prescription characteristics and problems with continuity of care

Both the number of problems and the three categories (medication discrepancies, necessity for patient education and administrative problems) per prescription were stratified for age, number of prescribed drugs and ward type (Table 4). The number of problems per prescription increased from 2.4 ± 1.6 to 3.3 ± 2.3 with increased number of prescribed drugs post-discharge (*P* = 0.002). Cardiology and respiratory medicine were the wards with the highest mean number of problems per prescription, 3.3 ± 2.1 and 3.2 ± 2.0, respectively.

DISCUSSION

Even though this study was conducted in a setting where medication reconciliation at discharge has been mandated for several years,^{10,26} over 90% of the presented discharge prescriptions in the outpatient or community pharmacy led to one or more problems with continuity of care. A total of 1154 problems were encountered in 403 prescriptions (2.9 ± 2.0 per prescription). Furthermore, this study revealed the nature of these problems, which were almost equally divided between medication discrepancies, administrative problems and the necessity for patient education.

A previous study in the Netherlands identified a comparable average of 2.9 medication-related problems per patient.³³ However, these patients received a structured medication review besides reconciliation. Moreover, a recent study from New Zealand, mainly focusing on administrative issues, revealed that 25% of the discharge prescriptions contained an average of 1.2 problems per prescription.⁴ Concerning discrepancies, a small American study conducted post-discharge medication reviews and found an average of 3.9 discrepancies per patient.³⁴ Finally, a Dutch study performed before the introduction of the law on transferring medication data revealed an average of 2.2 discrepancies per patient.²⁹ The lower number of discrepancies found in the current study (0.9 ± 1.1) might be a result of the extensive efforts made in improving transitional care.^{10,26} On the other hand, the quality of the community pharmacy system in the Netherlands possibly revealed extra problems as it enabled thorough post-discharge reconciliation. Most patients collect their prescriptions in the same pharmacy and pharmacists keep up-to-date medication records enabling them to identify changes in the medication regimen.²³ In countries where a lower proportion of patients fill their prescriptions in the same pharmacy, patients' medication records are generally unreliable which has been reported as a major barrier for adequate reconciliation.¹⁹ This could lead to two equally undesirable scenarios; either the problems concerning discharge medications are even more prominent or community pharmacists rely on the provided hospital information.

In the past decennium, outpatient pharmacies have been established within hospitals to facilitate care transitions for discharged patients.³⁵ In this study, outpatient pharmacies encountered fewer problems than the community pharmacies. This could either be due to outpatient pharmacies having access to additional hospital-based data (e.g. laboratory values) partially allowing them to solve problems by themselves, or to a lack of community-based data (e.g. pre-admission medication) resulting in potentially overlooking certain problems. As only two outpatient pharmacies were enrolled, these results must be interpreted cautiously. More research is needed to evaluate the specific roles of both pharmacy types in transitional care. Both types of pharmacies may have different roles in the reconciliation process, and as they have access to different data, close collaboration seems desirable.

The need for interdisciplinary collaboration, including physicians and pharmacists, is also supported by the substantial number of patients in need of further education encountered in this study (*n* = 406). Providing information on medication is of course part of usual pharmacy care, but the lack of patient knowledge on their medication post-discharge is alarming. It can be questioned whether solely providing information on medicine use at discharge is sufficient. At hospital discharge, patients may be overwhelmed with information, whereas they may primarily be concerned with going home as quickly as possible. Post-discharge

Table 3. Number and percentage of encountered problems with continuity of care per category (N = 1154)

Category	Subcategory	N (% within category)	Example
Discrepancies 'new' (n = 89)	No clear indication	33 (37.1)	A 78-year-old female received a discharge prescription for temazepam. The drug was initiated during admission, but reasons for continuation post-discharge were unclear.
	Contraindication/intolerance	13 (14.6)	Celecoxib was prescribed for a 74-year-old female with known angina pectoris.
	Duplication	13 (14.6)	Pre-admission, a 81-year-old male already used zolpidem. Temazepam was initiated on the discharge prescription.
	Drug-drug interaction	11 (12.4)	A 65-year-old male was using losartan. Potassium chloride suppletion was initiated on the discharge prescription, while potassium levels were unknown to the pharmacy.
	Other	19 (21.3)	Both amlodipine 5 and 10 mg were newly prescribed on the discharge prescription for a 57-year-old male. It was unclear which one was temporary and which one should be continued post-discharge.
Discrepancies 'change' (n = 139)	Dose regimen change	55 (39.6)	An 85-year-old female used 300 mg of gabapentin three times a day before admission. The discharge prescription was 300 mg six times a day. It was not clear whether the dose was purposely increased.
	Dose change	44 (31.7)	Pre-admission, a patient (male, 61 years) already used olmesartan 20 mg, on the discharge prescription from the cardiology ward olmesartan 40 mg was prescribed. It was unclear which one should be continued.
	Drug change	20 (14.4)	A 84-year-old male used pantoprazole at home, and esomeprazole was prescribed on the discharge prescription. Reasons for adaptation were unclear.
	Dose form change	13 (9.4)	A 66-year-old male was using 20 mg of oxycodone sustained release (SR) before admission. After discharge, the patient received 10 mg of oxycodone immediate release (IR) if needed. Grounds for adaptation and which one to continue were unclear.
	Other	7 (5.0)	Pre-admission, a 83-year-old female was using metoprolol. The discharge prescription contained both metoprolol and bisoprolol. It was unclear which one should be used and which one should be discontinued.
Discrepancies 'missing' (n = 113)	Continuing of home medication	106 (93.8)	Pre-admission, a 59-year-old female used 4 mg of perindopril once daily and 50 mg of metoprolol immediate release twice daily. The discharge prescription lacked both but did not explicitly state that these were discontinued. Therefore, it remained unclear whether those drugs should be continued or stopped.
	Preventive therapy required	7 (6.2)	The discharge prescription for a 77-year-old male contained oxycodone IR 5 mg six times a day but lacked a laxative.
Discrepancies 'other' (n = 15)	–	15 (100)	The pre-admission drug list of a 49-year-old male contained only insulin while he told the community pharmacy he used more drugs. This resulted in problems with verifying his medication post-discharge.
Administrative problems (n = 392)	Incomplete prescription	177 (45.2)	Ticagrelor was prescribed for a 61-year-old male. For this drug, a reimbursement authorization form was needed; however, this form was not provided with the discharge prescription.
	Supply problems	150 (38.3)	Imatinib 400 mg once daily was prescribed on the discharge prescription for a 80-year-old female which was not available in the pharmacy at time of dispensing.
	Other	65 (16.6)	The discharge prescription of a 66-year-old female was faxed to the pharmacy, patient contact learned that she was unable to visit the pharmacy, and home delivery was arranged.
Necessity for patient education (n = 406)	Medication information	244 (60.1)	A 63-year-old female was discharged with four new drugs and needed information on the indication and user instructions.
	Medication management	151 (37.2)	A 63-year-old female was discharged with a changed medication regimen; two drugs were discontinued (tolbutamide 500 mg once daily and metoprolol SR 100 mg once daily). She was contacted to prevent her from continuing them post-discharge.
	Other	11 (2.7)	A 55-year-old female was refilling enalapril 5 mg irregularly (gaps were found in her pre-admission medication regimen). She was motivated by the pharmacy to be more adherent after discharge.

Table 4. Mean number of problems with continuity of care per prescription per characteristic

Characteristic	Prescriptions (N = 403), n (%)	Medication discrepancies, mean (SD)	Administrative problems, mean (SD)	Necessity for patient education, mean (SD)	Total, mean (SD)	P-value
Age						
18–59	139 (34.5)	0.7 (1.0)	1.0 (1.1)	0.9 (0.9)	2.7 (1.6)	0.002
60–74	157 (39.0)	0.9 (1.1)	0.9 (0.9)	1.1 (1.0)	2.9 (2.0)	
>75	107 (26.6)	1.1 (1.3)	1.1 (1.0)	1.1 (1.1)	3.2 (2.5)	
Number of drugs post-discharge ^a						
7 or less	155 (39.7)	0.6 (0.8)	0.8 (1.0)	1.0 (0.9)	2.4 (1.6)	0.561
8–10	107 (27.4)	0.9 (1.1)	1.0 (1.1)	1.0 (1.0)	2.9 (2.1)	
11 or more	128 (32.8)	1.2 (1.4)	1.0 (0.9)	1.1 (1.0)	3.3 (2.3)	
Ward type ^b						
Internal medicine ^c	131 (34.0)	0.9 (1.2)	0.9 (1.0)	1.0 (1.1)	2.8 (2.3)	
Cardiology	69 (17.9)	1.1 (1.1)	1.1 (1.0)	1.0 (1.0)	3.3 (2.1)	
Surgery	67 (17.4)	0.8 (1.2)	0.9 (0.9)	0.7 (0.8)	2.4 (1.7)	
Respiratory medicine	39 (10.1)	1.0 (1.3)	1.1 (1.0)	1.2 (1.0)	3.2 (2.0)	
Orthopaedics	33 (8.6)	0.6 (0.9)	0.6 (1.1)	1.2 (1.0)	2.4 (1.3)	
Neurology	32 (8.3)	0.6 (0.9)	0.7 (0.8)	1.2 (1.0)	2.5 (1.6)	
Other ^d	14 (3.6)	0.6 (0.8)	1.4 (0.7)	0.6 (0.5)	2.6 (1.0)	

^aCalculated for $n = 390$ (96.8%).

^bCalculated for $n = 385$ (95.5%).

^cIncluding gastroenterology, oncology, geriatrics and haematology.

^dGynaecology, ENT section, psychiatry, rheumatology, revalidation and urology.

follow-up enables the identification of possible knowledge gaps and reinforcement of important information. Furthermore, the substantial number of problems in the subcategory 'continuing of home medication' ($n = 106$), for instance, highlights the necessity of communicating the rationale behind medication regimen changes and additional relevant data (e.g. laboratory reports) timely and consistently to the next healthcare provider. Although advocated, the lack of transferring this information was substantial and created confusion in primary care necessitating contact with the in-hospital prescriber for clarification. Consequently, this leads to a shared responsibility for all healthcare (in-hospital and primary care) providers involved as a problem may appear at any reconciliation moment. Therefore, a high number of problems post-discharge do not necessarily imply poor transitional care at hospital discharge, but may also be a consequence of poor information at admission or poor documentation in primary care.³⁶ Thus, medication management before, during and after admission is a complicated process involving multiple healthcare providers at different time-points.³⁷

Finally, an important issue concerns remuneration. An issue also raised in a recent focus group study on the implementation of community pharmacy reconciliation.³⁸ The current pharmacy remuneration systems are mostly based on dispensing fees instead of pharmaceutical care services. The processing time in this study for prescriptions that led to a problem was significantly longer compared to prescriptions that did not. This may impede the implementation of post-discharge reconciliation, especially during peak hours, and necessitates the introduction of funding for these services. It has been shown that implementation of medication reconciliation can be successfully stimulated, even in busy everyday healthcare practice, for instance by focusing specifically on support from experienced pharmacy staff and clarifying the roles and responsibilities of the healthcare providers involved.³⁹

Strengths and limitations

The strengths of this study were its large sample size including a wide variety of hospitals, ward types and pharmacies. Furthermore, the standardized checklists did not focus on a specific part of transitional care but allowed us to study the whole process of handling discharge information in the primary care setting. This resulted in a general overview of the problems at admission to primary care after hospital discharge.

A limitation of this study was that it did not evaluate the clinical significance or risk of the encountered problems with continuity of care. Although relevant, a further classification was beyond the scope of this study and required additional steps like the use of an expert panel. However, focussing on medication discrepancies alone, a recent review showed that clinically relevant discrepancies (defined as discrepancies with some potential or actual harm) were identified in approximately 28%–91% of the total medication discrepancies.²⁴ So, although not all problems will actually cause patient harm nor required action, the extent of these problems indicates that harm is still likely to occur on a regular basis. Furthermore, all problems needed to be addressed as it resulted in a lack of clarity either with the patient or the pharmacy illustrating the relevance to clinical community pharmacy practice. Finally, the examples of the different subcategories (presented in Table 3) give a general idea on the potential clinical relevance of the identified discrepancies and problems.

The checklists were completed by a large number of trainees and pharmacy staff members. We tried to minimize the risk of observer bias by an initial instruction session, providing a written protocol, the objective nature of the checklist and verifying every checklist afterwards. The use of multiple observers adds to the generalizability of results, and an additional analysis did not reveal major differences in encountered problems between trainees or pharmacy staff members.

WHAT IS NEW AND CONCLUSION

The structure of Dutch community pharmacies combined with the extensive efforts of improving care transitions provided an unique opportunity to study the frequency and nature of problems with continuity of care. The results showed that, despite these efforts, community pharmacists are still confronted with problems due to inadequate documentation at discharge which can inflict harm to patients if not properly addressed. By elucidating the nature of the problems post-discharge, this study contributes to more tailoring of future post-discharge pharmacy interventions. Furthermore, this study illustrates that solely providing medication information at discharge is likely not sufficient; a post-discharge follow-up is crucial to identify possible knowledge gaps. To reduce these problems, a rigorous implementation of the medication reconciliation process at all transition points, standardized electronic transfer of all medication-related information and interdisciplinary collaboration are crucial.

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CONFLICT OF INTERESTS

All authors declare that they have no conflict of interests relevant to the content of this manuscript. Preliminary results were presented at the 43rd European Society of Clinical Pharmacy Symposium, Denmark, in October 2014.

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REFERENCES

- Lisby M, Nielsen LP, Mainz J. Errors in the medication process: frequency, type, and potential clinical consequences. *Int J Qual Health Care*, 2005;17:15–22.
- Ellitt GR, Engblom E, Aslani P, Westerland T, Chen TF. Drug related problems after discharge from an Australian teaching hospital. *Pharm World Sci*, 2010;32:622–630.
- Foss S, Schmidt JR, Andersen T *et al.* Congruence on medication between patients and physicians involved in patient course. *Eur J Clin Pharmacol*, 2004;59:841–847.
- Braund R, Coulter CV, Bodington AJ *et al.* Drug related problems identified by community pharmacists on hospital discharge prescriptions in New Zealand. *Int J Clin Pharm*, 2014;36:498–502.
- Nebeker JR, Barach P, Samore MH. Clarifying adverse drug events: a clinician's guide to terminology, documentation, and reporting. *Ann Intern Med*, 2004;140:795–801.
- Rozych JD, Howard RJ, Justeson JM, Macken PD, Lindsay ME, Resar RK. Standardization as a mechanism to improve safety in health care. *Jt Comm J Qual Saf*, 2004;30:5–14.
- Forster AJ, Murff HJ, Peterson JF, Gandhi TK, Bates DW. The incidence and severity of adverse events affecting patients after discharge from the hospital. *Ann Intern Med*, 2003;138:161–167.
- Gleason KM, Groszek JM, Sullivan C, Rooney D, Barnard C, Noskin GA. Reconciliation of discrepancies in medication histories and admission orders of newly hospitalized patients. *Am J Health Syst Pharm*, 2004;61:1689–1695.
- Leotsakos A, Zheng H, Croteau R *et al.* Standardization in patient safety: the who high 5s project. *Int J Qual Health Care*, 2014;26:109–116.
- de Blok C, Koster E, Schilp J, Wagner C. Implementatie VMS veiligheidsprogramma, evaluatieonderzoek in nederlandse ziekenhuizen [implementation of safety management system safety program, evaluation research in dutch hospitals]. 2013; ISBN 978-94-6122-187-2.
- Accreditation Canada, the Canadian Institute for Health Information, the Canadian Patient Safety Institute, and the Institute for Safe Medication Practices Canada. *Medication reconciliation in Canada: Raising the bar – progress to date and the course ahead*. 2012.
- Australian Commission on Safety and Quality in Health Care and NSW Therapeutic Advisory Group Inc. National quality use of medicines indicators for Australian hospitals. 2014; ISBN 978-1-921983-78-8.
- Berwick DM, Calkins DR, McCannon CJ, Hackbarth AD. The 100,000 lives campaign: setting a goal and a deadline for improving health care quality. *JAMA*, 2006;295:324–327.
- Belda-Rustarazo S, Cantero-Hinojosa J, Salmeron-Garcia A, Gonzalez-Garcia L, Cabeza-Barrera J, Galvez J. Medication reconciliation at admission and discharge: an analysis of prevalence and associated risk factors. *Int J Clin Pract*, 2015;69:1268–1274.
- Kwan JL, Lo L, Sampson M, Shojania KG. Medication reconciliation during transitions of care as a patient safety strategy: a systematic review. *Ann Intern Med*, 2013;158:397–403.
- Mueller SK, Sponsler KC, Kripalani S, Schnipper JL. Hospital-based medication reconciliation practices: a systematic review. *Arch Intern Med*, 2012;172:1057–1069.
- Fernandes O. Medication reconciliation in the hospital: what, why, where, when, who and how?. *Healthc Q*, 2012;15 Spec No: 42–49.
- Boockvar KS, Liu S, Goldstein N, Nebeker J, Siu A, Fried T. Prescribing discrepancies likely to cause adverse drug events after patient transfer. *Qual Saf Health Care*, 2009;18:32–36.
- Boockvar KS, Santos SL, Kushniruk A, Johnson C, Nebeker JR. Medication reconciliation: barriers and facilitators from the perspectives of resident physicians and pharmacists. *J Hosp Med*, 2011;6:329–337.
- Gurwich EL. Comparison of medication histories acquired by pharmacists and physicians. *Am J Hosp Pharm*, 1983;40:1541–1542.
- Ensing HT, Stuijt CC, van den Bemt BJ *et al.* Identifying the optimal role for pharmacists in care transitions: a systematic review. *J Manag Care Spec Pharm*, 2015;21:614–636.
- Nazar H, Nazar Z, Portlock J, Todd A, Slight SP. A systematic review of the role of community pharmacies in improving the transition from secondary to primary care. *Br J Clin Pharmacol*, 2015;80:936–948.
- Urban R, Paloumpi E, Rana N, Morgan J. Communicating medication changes to community pharmacy post-discharge: the good, the bad, and the improvements. *Int J Clin Pharm*, 2013;35:813–820.
- Mekonnen AB, McLachlan AJ, Brien JA. Pharmacy-led medication reconciliation programmes at hospital transitions: a systematic review and meta-analysis. *J Clin Pharm Ther*, 2016;41:128–144.
- Buurma H, Bouvy ML, De Smet PA, Floor-Schreuder A, Leufkens HG, Egberts AC. Prevalence and determinants of pharmacy shopping behaviour. *J Clin Pharm Ther*, 2008;33:17–23.

26. Richtlijn medicatieoverdracht [guideline 'Transfer of medication data', website in Dutch]. Available at: <https://www.medicatieoverdracht.nl/de-richtlijn>. Updated 2008 (accessed 29 August 2016).
27. Hugtenburg J, Ahmad A, Dekker JM, Kostense PJ, Nijpels G. Medication review in elderly patients discharged from hospital substantially decreased drug related problems. *Diabetologia*, 2012;**55**:S412.
28. Hugtenburg JG, Borgsteede SD, Beckeringh JJ. Medication review and patient counselling at discharge from the hospital by community pharmacists. *Pharm World Sci*, 2009;**31**:630–637.
29. Geurts MM, van der Flier M, de Vries-Bots AM, Brink-van der Wal TI, de Gier JJ. Medication reconciliation to solve discrepancies in discharge documents after discharge from the hospital. *Int J Clin Pharm*, 2013;**35**:600–607.
30. Koster ES, Blom L, Philbert D, Rump W, Bouvy ML. The Utrecht pharmacy practice network for education and research: a network of community and hospital pharmacies in the Netherlands. *Int J Clin Pharm*, 2014;**36**:669–674.
31. van Mil JW. Pharmaceutical care in community pharmacy: practice and research in the Netherlands. *Ann Pharmacother*, 2005;**39**:1720–1725.
32. Almanasreh E, Moles R, Chen TF. The medication reconciliation process and classification of discrepancies: a systematic review. *Br J Clin Pharmacol*, 2016;**82**:645–658.
33. Ahmad A, Mast MR, Nijpels G, Elders PJ, Dekker JM, Hugtenburg JG. Identification of drug-related problems of elderly patients discharged from hospital. *Patient Prefer Adherence*, 2014;**8**:155–165.
34. Armor BL, Wight AJ, Carter SM. Evaluation of adverse drug events and medication discrepancies in transitions of care between hospital discharge and primary care follow-up. *J Pharm Pract*, 2016;**29**:132–137.
35. Visser T, van Dam JG. Transmurale farmacie staat voor kwaliteit [transmural pharmacy advocates quality]. *Het ziekenhuis*, 1996;**33**:10–12.
36. Karapinar-Carkit F, Borgsteede SD, Zoer J, Smit HJ, Egberts AC, van den Bemt PM. Effect of medication reconciliation with and without patient counseling on the number of pharmaceutical interventions among patients discharged from the hospital. *Ann Pharmacother*, 2009;**43**:1001–1010.
37. Glinborg B, Andersen SE, Dalhoff K. Insufficient communication about medication use at the interface between hospital and primary care. *Qual Saf Health Care*, 2007;**16**:34–39.
38. Kennelty KA, Chewning B, Wise M, Kind A, Roberts T, Kreling D. Barriers and facilitators of medication reconciliation processes for recently discharged patients from community pharmacists' perspectives. *Res Social Adm Pharm*, 2015;**11**:517–530.
39. White CM, Schoettker PJ, Conway PH *et al*. Utilising improvement science methods to optimise medication reconciliation. *BMJ Qual Saf*, 2011;**20**:372–380.