

University of Groningen

Application of intervention mapping to develop and evaluate a pharmaceutical discharge letter to improve information transfer between hospital and community pharmacists

Cornelissen, Nicky; Karapinar-Çarkit, Fatma; En nasery de Heer, Selma; Uitvlugt, Elien B.; Hugtenburg, Jacqueline G.; van den Bemt, Patricia M.L.A.; van den Bemt, Bart J.F.; Bekker, Charlotte L.

Published in:
Research in Social and Administrative Pharmacy

DOI:
[10.1016/j.sapharm.2021.10.001](https://doi.org/10.1016/j.sapharm.2021.10.001)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2022

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Cornelissen, N., Karapinar-Çarkit, F., En nasery de Heer, S., Uitvlugt, E. B., Hugtenburg, J. G., van den Bemt, P. M. L. A., van den Bemt, B. J. F., & Bekker, C. L. (2022). Application of intervention mapping to develop and evaluate a pharmaceutical discharge letter to improve information transfer between hospital and community pharmacists. *Research in Social and Administrative Pharmacy*, 18(8), 3297-3302. <https://doi.org/10.1016/j.sapharm.2021.10.001>

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



Application of intervention mapping to develop and evaluate a pharmaceutical discharge letter to improve information transfer between hospital and community pharmacists

Nicky Cornelissen^a, Fatma Karapinar-Çarkit^a, Selma En-nasery-de Heer^b, Elien B. Uitvlugt^a, Jacqueline G. Hugtenburg^b, Patricia M.L.A. van den Bemt^c, Bart J.F. van den Bemt^{d,e}, Charlotte L. Bekker^{e,*}

^a Department of Clinical Pharmacy, Jan Tooropstraat 164, 1061AE, Amsterdam, the Netherlands

^b Amsterdam UMC, Location Vumc, Department of Clinical Pharmacology and Pharmacy, De Boelelaan 1117, 1081 HV, Amsterdam, the Netherlands

^c Erasmus MC, University Medical Center Rotterdam, Department of Hospital Pharmacy. University Medical Center Groningen, Department of Clinical Pharmacy and Pharmacology, Groningen, the Netherlands

^d Department of Pharmacy, Sint Maartenskliniek, Nijmegen, the Netherlands

^e Department of Pharmacy, Radboud University Medical Centre, Nijmegen, 6525 GA, the Netherlands

ARTICLE INFO

Keywords:

Intervention mapping
Information transfer
Continuity of care
Hospital discharge
Discharge information
Medication safety

ABSTRACT

Background: Insufficient information transfer is a major barrier in the transition from hospital to home. This study describes the systematic development and evaluation of an intervention to improve medication information transfer between hospital and community pharmacists.

Objective: To develop and evaluate an intervention to improve the medication information transfer between hospital and community pharmacists based on patients', community and hospital pharmacists' needs.

Methods: The intervention development and evaluation was guided by the six-step Intervention Mapping (IM) approach: (1) needs assessment to identify determinants of the problem, with a scoping review and focus groups with patients and healthcare providers, (2) formulation of intervention objectives with an expert group, (3) inventory of communication models to design the intervention, (4) using literature review and qualitative research with pharmacists and patients to develop the intervention (5) pilot-testing of the intervention in two hospitals, and (6) a qualitative evaluation of the intervention as part of a multicenter before-after study with hospital and community pharmacists.

Results: Barriers in the information transfer are mainly time and content related. The intervention was designed to target a complete, accurate and timely medication information transfer between hospital and community pharmacists. A pharmaceutical discharge letter was developed to improve medication information transfer. Hospital and community pharmacists were positive about the usability, content, and comprehensiveness of the pharmaceutical discharge letter, which gave community pharmacists sufficient knowledge about in-hospital medication changes. However, hospital pharmacists reported that it was time-consuming to draft the discharge letter and not always feasible to send it on time.

The intervention showed that pharmacists are positive about the usability, content and comprehensiveness.

Conclusion: This study developed an intervention systematically to improve medication information transfer, consisting of a discharge letter to be used by hospital and community pharmacists supporting continuity of care.

* Corresponding author.

E-mail addresses: f.karapinar@olvg.nl (F. Karapinar-Çarkit), s.en-nasery@amsterdamumc.nl (S.E.-n.-d. Heer), e.uitvlugt@olvg.nl (E.B. Uitvlugt), jg.hugtenburg@amsterdamumc.nl (J.G. Hugtenburg), m.l.a.van.den.bemt@umcg.nl (P.M.L.A. van den Bemt), b.vandenbemt@maartenskliniek.nl (B.J.F. van den Bemt), charlotte.bekker@radboudumc.nl (C.L. Bekker).

<https://doi.org/10.1016/j.sapharm.2021.10.001>

Received 20 May 2021; Received in revised form 27 September 2021; Accepted 1 October 2021

Available online 4 October 2021

1551-7411/© 2021 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

1. Introduction

An adequate transition process from hospital to home is needed to ensure patient safety. Adequate documentation and accurate transfer of information between healthcare providers are important components for an adequate transition from hospital to home.¹ However, insufficient information transfer is an important barrier in the transition from hospital to home^{2–4} Specifically, community pharmacists receive insufficient information that is needed to support and monitor patients' medication regimen after hospital discharge to enhance continuity of care. Various studies showed that community pharmacists are often not or too late informed on medication changes that occur during hospitalization and the reasons for these changes.^{5–7} In addition, hospitalized patients frequently experience medication related problems after discharge due to, for example, difficulties in implementing medication changes in daily life.^{8–10} These problems can result in discontinuity of care.^{6,11–14} Complete and accurate discharge information is necessary to prevent or solve patients' problems after discharge.

According to community pharmacists, information is needed about admission diagnosis, indications for medications, laboratory values, medication changes, reimbursement of medicines, stop-orders for medications to be discontinued, and medication started during hospitalization.^{4,15} Few studies have aimed at developing tools to improve the medication information transfer between hospitals and community pharmacists. A small-scale study showed that discrepancies in drugs prescribed at discharge and the patient's actual medication use at home could significantly be reduced by sending a copy of the patients' discharge letter intended for the general practitioner to the community pharmacist.¹⁶ However, this discharge letter was intended for the general practitioner and did not focus on information relevant for the community pharmacist to support patients after hospital discharge. In addition, previous studies do not describe how a hospital pharmacist can provide information accurately and completely to the community pharmacist and what patients' wishes are in the communication of medication related information to their community pharmacist.

Up to now, no studies have systematically developed and evaluated an intervention with both patients and healthcare providers to improve medication information transfer between hospital and community pharmacists. Developing an intervention that is evidence-based and based on the needs of its end users receives more support for implementation in daily practice. Therefore, the aim of this study is to develop and evaluate an intervention to improve the medication information transfer between hospital and community pharmacists based on patients', community and hospital pharmacists' needs.

2. Methods

The intervention mapping (IM) approach was used to systematically develop and evaluate an intervention to improve the medication information transfer between hospital and community pharmacists. IM guides the development of an intervention that is theoretically and empirically substantiated and is widely used in healthcare to develop health promotion programs.¹⁷ IM consists of six steps: (1) conducting needs assessment, (2) formulating intervention objectives, (3) inventory of a theoretical model to design the intervention, (4) development of the intervention (5) pilot-testing of the intervention, and (6) evaluation.¹⁸ In this study, the development steps were discussed with an expert group consisting of hospital and community pharmacists. The experts were required to have experience with intervention development and/or enhancing continuity of care at hospital discharge in daily practice. In Table 1 an overview of all IM steps is given. The different steps of the IM process were evaluated with a patient representative.

2.1. Needs assessment

Determinants related to insufficient medication information transfer

Table 1

The different steps of the intervention mapping process.

Step	Description
1. Needs assessment	<ul style="list-style-type: none"> - Scoping review in PubMed to identify publications about barriers and facilitators of adequate medication information transfer during the transition for hospital to home. - Two focus groups healthcare providers (overall n = 19)³ and three focus groups with patients (overall n = 19)⁴ to identify barriers of the transition from hospital to home.
2. Intervention objectives	<ul style="list-style-type: none"> - To formulate the intervention objectives, which improve the information transfer between hospital and community pharmacists. - Discussion with expert group in multiple rounds
3. Theoretical model of the intervention	<ul style="list-style-type: none"> - To identify the most suitable model to achieve the formulated intervention objectives. - Literature search in PubMed of which results were discussed during an expert group meeting.
4. Development of the intervention	<ul style="list-style-type: none"> - To design the intervention characteristics. - Literature search in PubMed of which results were used to set up a topic list for the intervention design, relevant for discussion during the focus groups. - Three focus groups pharmacists (overall n = 17) and two focus groups with patients (overall n = 13) to develop a preliminary intervention design. - Discussion expert group for the final version of the intervention.
5. Pilot	<ul style="list-style-type: none"> - To examine the feasibility of the intervention - Pilot of the intervention in two hospitals with 10 patients and pharmacists.
6. Evaluation of the intervention	<ul style="list-style-type: none"> - To implement and evaluate the developed intervention. - Multicenter prospective before-after study in two hospitals with 369 patients. - Evaluation of intervention during individual interviews with 16 community and 3 hospital pharmacists.

and targets to improve the problem, were identified by conducting a scoping review and focus groups with patients and healthcare providers.

2.1.1. Scoping review

A scoping review was conducted to identify barriers and facilitators of adequate medication information transfer during the transition from hospital to home. The search strategy was performed in PubMed to identify relevant publications published in English. The search included the following terms *barriers and facilitators, hospital discharge, continuity of patient care, transition from hospital to home, multidisciplinary and interdisciplinary communication, and information transfer.*

2.1.2. Focus groups

Focus groups were held with patients and primary and secondary healthcare providers to identify barriers of the transition from hospital to home, and facilitators needed to overcome those barriers. Three patient focus groups were conducted face-to-face using a semi-structured interview guide to discuss participant's perspectives on barriers and facilitators with medication use during the transition from hospital to home.³ Participants were patients discharged from the department of internal medicine, cardiology, pulmonology or neurology who participated in a pharmacy-led transitional care study (n = 197), of which 147 were eligible for participation in the focus group. 125 patients were invited by phone and 37 expressed interest, of which 24 patients randomly received confirmation letter by post for focus group participation. Two focus groups with primary and secondary healthcare providers, including medical specialists, general practitioners, hospital and community pharmacists, and nurses were held to identify their perspectives on barriers and facilitators for continuity of medication management.³ Eligible participants were identified using purposive sampling based on profession and were required to provide medication-related care to patients during hospital discharge. Focus

groups were held by a trained moderator in qualitative research. Qualitative data were analyzed using thematic content analysis. Specifically, barriers related to the communication and information transfer between hospital and community pharmacists were selected for the development of the intervention. Methods have been described elsewhere in-depth, see for patient focus groups³ and healthcare provider focus groups.⁴

2.2. Intervention objectives

In this step, intervention objectives were formulated, which describe the objectives to achieve in order to improve the information transfer between hospital and community pharmacists. Modifiable determinants of the information transfer, which need to be changed to have the desired outcome and that can easily be adjusted in practice, were selected from the results of step 1 by the expert group.

2.3. Theoretical model of the intervention

Literature on communication models was studied, to identify the most suitable model to achieve the formulated intervention objectives of step 2. Models were required to describe components of effective information transfer. In a consensus meeting with the expert group the most appropriate model was selected.

2.4. Development of the intervention

2.4.1. Design

This step aims to design the intervention characteristics, including main content, mode of delivery and required context. Therefore, a literature search and qualitative study were carried out to develop an intervention to improve the medication information transfer between hospital and community pharmacists. The literature search was aimed to set up a topic list regarding the content, channel and context for the intervention design, relevant for discussion during the focus groups. These topics were subsequently reviewed, adjusted and refined during five focus groups with both hospital and community pharmacists and separately with patients. First, three focus groups with hospital and community pharmacists were held to develop a preliminary intervention design using an iterative process. Hospital and community pharmacists were recruited from the Amsterdam area by email. In total 83 pharmacists were invited, of which 42 were interested to participate and eventually 20 pharmacists provided consent. Participants were asked what should be included, how the information should be provided, and for which patients. The preliminary intervention was subsequently refined on its content, channel and context during two focus groups with patients who were discharged and used five or more long-term medications. Patients were eligible for participation when using 5 or more different medications, aged 18 years or older, and discharged from the hospital. A total of 21 patients were contacted, of which 20 were interested to participate and 14 provided consent. Patients were asked about discharge information they considered important for their community pharmacist to know. A final version was made, that was agreed upon by the expert group.

2.5. Pilot

The feasibility of the intervention in daily clinical practice was examined during a small pilot in two Dutch hospitals, a general teaching (OLVG) and a university hospital (Amsterdam UMC, location VU university medical center (VUmc)). Hospital pharmacists used the designed intervention to transfer information to the community pharmacist of the discharged patient using chronic medications (for details see step 6). Individual semi-structured interviews were conducted virtually to question participating pharmacists about their experience with the intervention, including qualitative evaluation of usability of the intervention in clinical practice, comprehensibility and clarity of the

included information, and feasibility to share the information on time. Adjustments to the intervention were made based on the feedback received and a final version was developed.

2.6. Evaluation of the intervention

Implementation of the developed intervention was carried out in the MARCH trial (Medication Actions to Reduce hospital admissions through a collaboration of Community and Hospital pharmacy) as a part of the multicomponent intervention.³³ The MARCH trial is a multicenter prospective before-after study, performed in a general teaching (OLVG) and university hospital (VUmc) evaluating a transitional pharmaceutical care program on patient-reported adverse drug events post-discharge. The program consisted of a teach-back to patients at discharge, a pharmaceutical discharge letter, a home visit by a community pharmacist and a medication review by both community and hospital pharmacist. The control group received usual care consisting of medication reconciliation at admission and discharge. Patients that were prescribed at least five long-term medications at discharge, with at least one medication change during their hospitalization, and who were hospitalized for over 24 h were suitable for inclusion. Patients were recruited from the following wards: internal medicine and cardiology (OLVG and VUmc) and surgery (VUmc). Exclusion criteria were discharge to a nursing home, life expectancy below 6 months, mental constraints, language barriers, and affiliated community pharmacist was located outside the adherence area. Here, the hospital pharmacists used the developed intervention (i.e. pharmaceutical discharge letter) to transfer medication information to the community pharmacists, within one working day after discharge as part of the MARCH trial.

2.6.1. Evaluation

The developed discharge letter was solely used by community and hospital pharmacists and therefore these were included in the evaluation. All hospital (n = 3) and community pharmacists (n = 49) that participated in the MARCH trial in the intervention group were invited to participate in the semi-structured interviews to evaluate the use of the developed intervention. Participants were asked about the teach back method that was used at discharge, the home visit by a community pharmacist, the transitional medication review and the pharmaceutical discharge letter. Regarding the discharge letter, they were asked about the perceived advantages, disadvantages of the intervention, and pre-conditions that should be met to enable implementation of the intervention in daily practice. Data were thematically analyzed.

3. Results

3.1. Needs assessment

3.1.1. Scoping review

The needs assessment revealed that a complete and accurate information transfer is of great importance for patients' transitions from hospital to home. The identified publications showed that barriers in the information transfer are mainly time (e.g. delayed information transfer) and content (e.g. lack of information about medication changes) related, and the lack of standardization (e.g. different formats and definitions on overviews sent to community pharmacies).^{6,21–23} A community pharmacist receives a list with the discharge prescriptions that need to be dispensed. However, rather than a medication list, community pharmacists need a medication overview with information about medication substitution, reason for new prescriptions, and drug-drug interactions of which some might have already been acknowledged within the hospital, medication changes and reason for these changes.^{5,21,24,15} To overcome these barriers information should be delivered in a structured way to prevent that every hospital uses his own format.⁵ Ensing et al. mentioned that there is need for a standardized electronic transfer of all medication-related information.⁶

3.1.2. Focus groups

Of the 24 patients who agreed to participate, 3 cancelled due to health issues and 2 did not show up. Three focus groups with in total 19 patients (mean age 70.8 (SD 9.3) years, 63% female) were held, with each group having 7, 7 and 5 participants respectively. Focus groups lasted between 92 and 124 min. Of the 22 approached healthcare providers, 19 participated (2 were not interested in participation and 1 cancelled) in two focus groups (two community care registered nurses, two community pharmacists,

Four general practitioners, two hospital nurses, two hospital pharmacists, four outpatient pharmacists, two pharmacy technicians, and one physician). One was conducted with 9 healthcare providers and one with 10 healthcare providers. The sessions lasted between 105 and 120 min.

Both patients and healthcare providers experienced insufficient transfer of medication information as the most prominent barrier of the transition from hospital to home. Incomplete, overdue and inaccurate communication between healthcare providers and more specific absence of a complete medication overview were identified as major barriers of adequate information transfer. Especially lack of communication about changes in pharmacotherapy between healthcare providers was considered as barrier. According to patients, a medication overview both for patients (on paper) and healthcare providers electronically will help to ensure a complete overview. Also, patients suggested the use of a national health record system and regular meetings with healthcare providers to prevent insufficient information transfer.³

All participants experienced insufficient transfer of medication information as the most prominent barrier of the transition from hospital to home. Specifically, insufficient information transfer was perceived by primary healthcare providers as delayed discharge letters, overload and complexity of information in the current discharge letters, and limited information provided by the hospital on medication changes and reasons thereof. Medical specialist mentioned that they have limited time to review all the medication of a patient during a visit. Facilitators needed to overcome those barriers included the use of one national health record system, the implementation of an interdisciplinary checklist in the patients' electronic health record for all healthcare providers, improving the collaboration between different healthcare providers and assigning a case manager who is responsible for the information transfer.

3.2. Intervention objectives

As both the focus groups and the scoping review revealed that transfer of medication information is often incomplete, overdue and inaccurate. The expert group formulated the following intervention objectives: improving information transfer, reducing discrepancies in medication, and improving continuity of care. The expert group selected the following modifiable determinants as targets to improve the information transfer and achieve the intervention objectives: timely transfer (within 24 h) of medication information between hospital and community pharmacists after hospital discharge, and an accurate and complete medication overview including all relevant information matching community pharmacists needs.

3.3. Theoretical model of the intervention

The 3 Components to Behavior Change (3CBC) model was selected to guide the design of the intervention and achieve the intervention objectives. This model describes that three dimensions of an intervention need to be optimized to increase its effectiveness: content, channel and context.²⁶ Content is defined as the components of medication information that should be transferred between care settings. Channel relates to how this information should be delivered, e.g. in writing or verbally. Context covers the contextual aspects that should be included during the implementation of the intervention, such as timeframe to transfer the information and selection of the target patient population.

3.4. Development of the intervention

3.4.1. Design

Three focus groups with in total 17 participants (5 hospital and 12 community pharmacists) and two focus groups with 13 patients (age range 54–83 years, 62% male) were held. Focus groups lasted around 2 h. Items that were considered relevant by participants and required to be included in the final version of the developed intervention are described in Table 2.

The developed intervention comprised a pharmaceutical discharge letter consisting of detailed medication overview, including medication changes that occurred during hospitalization as well as reasons thereof, that was filled out by the hospital pharmacist and digitally transferred to the community pharmacist.

3.5. Pilot

During the pilot with the prototype, for 10 patients the hospital pharmacist created a pharmaceutical discharge letter that was sent to the community pharmacist. All community pharmacists reported to be positive about the usability and comprehensiveness of the pharmaceutical discharge letter. They were satisfied with the content that they received. As points of improvement the community pharmacists mentioned: timely sharing (date of sending) and the same layout for the discharge letters from the two hospitals.

Hospital pharmacists reported that it was not easy to record all relevant medication information in the discharge letter because of incomplete documentation in the patient's medical record. Besides, it was not always feasible to send the discharge letter to the community pharmacists within 1 working day after the patients' discharge because of the current workload, and late communication of the patient's discharge date. The points from the evaluation did not lead to any substantial adjustments to the intervention because differences in the lay-out between the hospitals were technical issues that could not be solved immediately.

3.6. Evaluation of the intervention

3.6.1. MARCH trial

In total, 369 (control n = 195, intervention n = 174) patients participated in the MARCH trial. Patients in the intervention group received the pharmaceutical care program, including the discharge letter. No significant effect on the number of adverse drug events was seen between the control and intervention group. For almost all patients (n = 173, 99%) in the intervention group the pharmaceutical discharge letter was created by a hospital pharmacist and sent to the affiliated community pharmacists. The median duration for sending the letter after discharge was 1 (IQR 0–3) days in the general teaching hospital and 2 (IQR 1–4) days in the university hospital. [data on file].

3.6.2. Evaluation

Of the 52 invited community and hospital pharmacists who participated in the MARCH trial in the intervention group, 19 participated in semi-structured interviews to evaluate the pharmaceutical discharge

Table 2
Major intervention design aspects identified during the focus groups.

Content	<ul style="list-style-type: none"> Medication information that should be transferred: reason of hospitalization, reason of medication changes, current medication list, laboratory values, relevant drug-drug interactions, relevant side effects and practical medication problems (e.g. dysphagia).
Channel	<ul style="list-style-type: none"> Delivery of the discharge letter by mail was considered most feasible.
Context	<ul style="list-style-type: none"> Target population: patients using multi drug dispensing systems, using five or more chronic medications or having mental/physical constraints. Timeframe: within 24 h after patients' hospital discharge.

letter (response rate 36%, 16 community pharmacists and 3 hospital pharmacists). Almost all pharmacists had positive views on the pharmaceutical discharge letter. Reported advantages by both hospital and community pharmacists included receiving the letter by mail, sufficient and correct medication information (e.g. reason of hospitalization, laboratory values, drug-interactions). Community pharmacists indicated that this provided more information about the patient's hospital stay and enabled them to support and monitor the patient's medication regimen. Disadvantages reported by hospital pharmacist included that it was time consuming to make numerous discharge letters and lack of IT support needed to generate a discharge letter, and difficulties with extracting the specific reason for hospitalization and medication changes from the patient's medical record. Disadvantages reported by community pharmacists included sometimes delayed information (e.g. within 72 h instead of 24 h) and differences in the lay-out (e.g. structure and visual representation of information) of the discharge letters between the two participating hospitals. No substantial points for improvement were identified.

The following preconditions that should be met when using the pharmaceutical discharge letter in clinical practice were identified: complete documentation in the hospital medical record and adequate IT support, complete, accurate and timely medication information transfer and additional manpower for hospital pharmacists for the additional time required to generate the discharge letter.

4. Discussion

This article describes the systematic development and evaluation of an evidence-based pharmaceutical discharge letter to improve the medication information transfer between hospital and community pharmacists. Evaluation of the pharmaceutical discharge letter in the MARCH trial demonstrated improvements in the information transfer. In addition, both community and hospital pharmacists were positive the pharmaceutical discharge letter. Major limitation of the discharge letter was the limited feasibility to compose the pharmaceutical discharge letter available timely and to send the discharge letter timely to community pharmacists.

Medication information transfer is a crucial element in the patient's discharge process from hospital to home.²⁷ Thus, collaboration between primary and secondary care is essential.²⁸ Community pharmacists need sufficient, accurate information about the patient's hospital stay, to guarantee continuous care. Previous studies have shown similar needs for pharmacists, to provide accurate and secure care.²⁹ Hockly et al. showed that sending the patient's discharge letter to the affiliated community pharmacist reduces prescribing discrepancies, however, they included a small study population of 33 patients.¹⁶ In the PROMPT study, discharge prescription and summary information was sent to a patient's community pharmacy followed by a telephone call to improve communication between hospital and primary healthcare providers. Both community and hospital pharmacists recognized the potential benefits that PROMPT offered. However, the intervention lacked feasibility due to poor fidelity and was also small in scale.³¹ Nazar et al. evaluated a new electronic transmission of medication information between hospital and community pharmacists.³² However, this is not transferable directly to the current Dutch setting as it requires digitalization of medication information transfer systems. In our study, intervention mapping was used to systematically develop a tool to optimize the medication information transfer, the needs of patients and community pharmacists were included and an iterative development process with them was conducted. Likely this enabled the development of a tool that was perceived needed and valuable by its end users.

The pharmaceutical discharge letter can be used to improve the transition between care. When using the pharmaceutical discharge letter, community pharmacists can have a better understanding of the reason for the patient's hospital admission as well as information about medication changes that occurred during hospitalization. This can

enable community pharmacists to better monitor patients' medication regimen in the home setting and may improve the medication safety and the continuity of care. To further optimize its usage, an adequate digital information system can overcome the barriers related to timely sending the discharge letter between healthcare providers should be overcome. Future research should focus on implementation of the pharmaceutical discharge letter in clinical practice, including identification of barriers and facilitators thereof.

Strengths of this study included a systematic approach that was used to develop and evaluate an intervention, which included input from its end users. Some limitations should be acknowledged. First, the pharmaceutical discharge letter was evaluated as part of a larger trial among a specific patient population on limited wards. Although its added value among a broader patient population has not been demonstrated, almost all pharmacists regarded it valuable for any hospitalized patient. The pharmaceutical discharge letter was evaluated in the Dutch healthcare setting. Caution is required regarding generalizability of the results to other settings.

5. Conclusion

This study developed systematically an intervention to improve the medication information transfer between hospital and community pharmacists. The developed pharmaceutical discharge letter is useful in practice, can be used to improve medication information transfer and thereby the continuity of care, and was well accepted by pharmacists. Further development is needed to ensure easy information registration in the discharge letter and enabling timely sharing between pharmacists.

Funding

This work was supported by The Royal Dutch Pharmacists Association (Koninklijke Nederlandse Maatschappij ter bevordering der Pharmacie, KNMP). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

CRediT authorship contribution statement

Conceptualization; NC, FK, BvdB, CB; Data curation NC, FK; Formal analysis NC, FK, BvdB, CB; Roles/Writing - original draft NC, CB Writing - review & editing all authors.

Acknowledgements

The authors thank Doortje de Bruijn, Atiya Khtoon Mohammad for their contribution to identify the needs and perspectives of community and hospital pharmacists and patients regarding the content and the implementation, and Aida Alai for her contribution to the evaluation of the pharmaceutical discharge letter.

References

- Kattel S, Manning DM, Erwin PJ, Wood H, Kashiwagi DT, Murad MH. Information transfer at hospital discharge: a systematic review. *J Patient Saf.* 2020;16(1):e25–e33.
- El Morabet N, Uitvlugt EB, van den Bemt, et al. Prevalence and preventability of drug-related hospital readmissions: a systematic review. *J Am Geriatr Soc.* 2018;66(3):602–608.
- Daliri S, Bekker CL, Buurman BM, et al. Barriers and facilitators with medication use during the transition from hospital to home: a qualitative study among patients. *BMC Health Serv Res.* 2019;19(1):204.
- Daliri S, Bekker CL, Buurman BM, op Reimer WS, van den Bemt B, Karapinar-Çarkit F. Medication management during transitions from hospital to home: a focus group study with hospital and primary healthcare providers in The Netherlands. *Int J Clin Pharm.* 2020;1–10.
- Brühwiler LD, Hersberger KE, Lutters M. Hospital discharge: what are the problems, information needs and objectives of community pharmacists? A mixed method approach. *Pharm Pract.* 2017;15(3).

6. Ensing HT, Koster ES, van Berkel PI, Van Dooren AA, Bouvy ML. Problems with continuity of care identified by community pharmacists post-discharge. *J Clin Pharm Therapeut.* 2017;42(2):170–177.
7. Roughead EE, Kalisch LM, Ramsay EN, Ryan P, Gilbert AL. Continuity of care: when do patients visit community healthcare providers after leaving hospital? *Intern Med J.* 2011;41(9):662–667.
8. 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.
9. Maxwell K, Harrison J, Scahill S, Braund R. Identifying drug-related problems during transition between secondary and primary care in New Zealand. *Int J Pharm Pract.* 2013;21(5):333–336.
10. Daliri S, Hugtenburg JG, Ter Riet G, et al. The effect of a pharmacy-led transitional care program on medication-related problems post-discharge: a before–after prospective study. *PLoS One.* 2019;14(3), e0213593.
11. Coleman EA, Smith JD, Raha D, Min S. Posthospital medication discrepancies: prevalence and contributing factors. *Arch Intern Med.* 2005;165(16):1842–1847.
12. Eibergen L, Janssen MJ, Blom L, Karapinar-Çarkit F. Informational needs and recall of in-hospital medication changes of recently discharged patients. *Res Soc Adm Pharm.* 2018;14(2):146–152.
13. Viktil KK, Blix HS, Eek AK, Davies MN, Moger TA, Reikvam A. How are drug regimen changes during hospitalisation handled after discharge: a cohort study. *BMJ open.* 2012;2(6).
14. Wong JD, Bajcar JM, Wong GG, et al. Medication reconciliation at hospital discharge: evaluating discrepancies. *Ann Pharmacother.* 2008;42(10):1373–1379.
15. 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 Soc Adm Pharm.* 2015;11(4): 517–530.
16. Hockly M, Williams S, Allen M. Transfer of care—a randomised control trial investigating the effect of sending the details of patients' discharge medication to their community pharmacist on discharge from hospital. *Int J Pharm Pract.* 2018;26(2):174–182.
17. Heinen MM, Bartholomew LK, Wensing M, van de Kerkhof P, van Achterberg T. Supporting adherence and healthy lifestyles in leg ulcer patients: systematic development of the lively legs program for dermatology outpatient clinics. *Patient Educ Counsel.* 2006;61(2):279–291.
18. Bartholomew LK, Parcel GS, Kok G. Intervention mapping: a process for developing theory and evidence-based health education programs. *Health Educ Behav.* 1998;25(5):545–563.
21. 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(5):813–820.
22. Dyrstad DN, Laugaland KA, Storm M. An observational study of older patients' participation in hospital admission and discharge—exploring patient and next of kin perspectives. *J Clin Nurs.* 2015;24(11-12):1693–1706.
23. Tetuan CE, Guthrie KD, Stoner SC, May JR, Hartwig DM, Liu Y. Impact of community pharmacist-performed post-discharge medication reviews in transitions of care. *J Am Pharmaceut Assoc.* 2018;58(6):659–666.
24. Karapinar F, van den Bemt, Patricia MLA, Zoer J, Nijpels G, Borgsteede SD. Informational needs of general practitioners regarding discharge medication: content, timing and pharmacotherapeutic advices. *Pharm World Sci.* 2010;32(2): 172–178.
26. Burnier M. *Drug Adherence in Hypertension and Cardiovascular Protection.* Springer; 2018.
27. Hesselink G, Zegers M, Vernooij-Dassen M, et al. Improving patient discharge and reducing hospital readmissions by using intervention mapping. *BMC Health Serv Res.* 2014;14(1):1–11.
28. Daliri S, Boujarfi S, El Mokaddam A, et al. Medication-related interventions delivered both in hospital and following discharge: a systematic review and meta-analysis. *BMJ Qual Saf.* 2021;30(2):146–156.
29. Hambrook M, Peterson S, Gorman S, Becotte G, Burrows A. Medication management surrounding transitions of care: a qualitative assessment of community pharmacists' preferences (MEMO TOC). *Canadian Pharmacists Journal/Revue des Pharmaciens du Canada.* 2020;153(5):301–307.
31. Guilcher SJ, Fernandes O, Luke MJ, et al. A developmental evaluation of an intraprofessional pharmacy communication partnership (PROMPT) to improve transitions in care from hospital to community: a mixed-methods study. *BMC Health Serv Res.* 2020;20(1):99.
32. Nazar H, Brice S, Akhter N, et al. New transfer of care initiative of electronic referral from hospital to community pharmacy in England: a formative service evaluation. *BMJ open.* 2016;6(10).
33. Uitvlugt EB, et al. The effect of a transitional pharmaceutical care program on the occurrence of ADEs after discharge from hospital in patients with polypharmacy. *Res Soc Adm Pharm.* 2021 May 21. <https://doi.org/10.1016/j.sapharm.2021.05.009>. S1551-7411(21)00175-3.