

Developing a procedure for medication reconciliation and review on admission to geriatric wards

→ Leena H. Riukka*

MSc (Pharm), Chief Pharmacist
Päijät-Häme Joint Authority
for Health and Wellbeing,
Hospital Pharmacy
leena.riukka@phhyky.fi

→ Anna E. Niskanen

MSc (Pharm), Faculty of Pharmacy,
Clinical Pharmacy Group,
University of Helsinki,
Finland (at the time)
anna.e.niskanen@gmail.com

→ Anna-Riia Holmström

PhD, Clinical Teacher,
Faculty of Pharmacy,
Clinical Pharmacy Group,
Specialisation Programme
in Community and Hospital
Pharmacy, University of Helsinki
anna-riia.holmstrom@helsinki.fi

→ Suvi Hakoinen

MSc (Pharm), University Instructor,
Faculty of Pharmacy,
Clinical Pharmacy Group,
Specialisation Programme
in Community and Hospital
Pharmacy, University of Helsinki
suvi.hakoinen@helsinki.fi

→ Sirkku Lavonius

MD, Chief Physician,
Päijät-Häme Joint Authority
for Health and Wellbeing,
sirkku.lavonius@phhyky.fi

→ Marja Airaksinen

PhD, Professor in Social
Pharmacy, Faculty of Pharmacy,
Clinical Pharmacy Group,
University of Helsinki
marja.airaksinen@helsinki.fi

→ Raisa Laaksonen

PhD, Senior Lecturer,
Docent in Clinical Pharmacy,
Faculty of Pharmacy,
Clinical Pharmacy Group,
Specialisation Programme
in Community and Hospital
Pharmacy, University of Helsinki
raisa.laaksonen@helsinki.fi

*Correspondence

ABSTRACT

Objective: To develop a procedure and tool for medication reconciliation and review of geriatric patients' medications on hospital admission.

Methods: Action research, with literature review, and physicians, nurses and clinical pharmacists as experts, was used in the collaborative development process that first identified problems in the current admission process and then developed a procedure and tool in a medium-sized secondary care hospital. The use of the procedure and the tool was piloted; the final versions were developed based on the outcomes of the pilot.

Results: Several problems were identified in the admission medication process, including patients not having an up-to-date home medication list and problems with polypharmacy. To solve these problems, the experts recommended that clinical pharmacists should reconcile and review patients' medications. A medication reconciliation and review procedure and tool were developed and piloted. The final tool comprised the following sections: Patient Background, Patient Interview, Reconciled Medication and Medication Review, and Cautions with Medication. As part of the implementation, a new page was created for the pharmacists' medication reconciliation and review notes in the electronic medical record. The study emphasized the central role of the clinical pharmacist in the healthcare team.

Conclusions: The role of a clinical pharmacist in the multidisciplinary healthcare team should be increased to promote medication safety. The study introduces a novel tool and procedure for medication reconciliation and review that has been developed and piloted with a multidisciplinary healthcare team. The tool and the clinical pharmacist-led procedure were found feasible to use and central to the rational use of medicines.

Key words: Medication reconciliation, medication review, hospital admission, geriatric patients, clinical pharmacist, medication safety

INTRODUCTION

Medication discrepancies, defined as unexplained differences between documented regimens across different sites of care may give rise to adverse drug events (ADEs) (Pippins *et al.* 2008). Unintentional medication discrepancies are often due to errors in taking a medication history or not reconciling a list of medications. Medication reconciliation at different stages of health care has been recognised to reduce ADEs and discrepancy rates (National Prescribing Centre NPC 2008, Meguerditchian 2013). Sometimes viewed as time consuming (Meguerditchian 2013), medication reconciliation also helps to identify medication errors between transitions of care, thus, preventing ADEs from occurring (Haig 2006, Pippins *et al.* 2008, Meguerditchian 2013, Institute for Safe Medication Practices ISMP 2017). Other benefits of medication reconciliation have been shown to be, for example, the potential avoidance of medicines-related admissions to hospital, improved multidisciplinary team-working and greater patient involvement in their own care (National Prescribing Centre NPC 2008).

Admission to, and discharge from, hospital are shown to produce a large number of discrepancies in patients' drug therapy (Climente-Martí 2010). Thus, medication reconciliation should occur at these points of transfer, or, ideally throughout a patient's hospital stay (Knez *et al.* 2011). This is important especially for geriatric patients. If a list of medications is not correct at hospital admission, such problems can carry over to the discharge medication (Karapinar-Carkit *et al.* 2010) and cause medication errors and harm to the patient on other wards or even after discharge.

Especially in the treatment of older patients, it is not enough to reconcile the list of home medicines without questioning their appropriateness (Quélenec 2013). It is important also to review whether all the medicines are clinically appropriate to be continued at admission, during the hospital stay and at discharge. The aim of the study was to develop a tool and a procedure for medication reconciliation and medication review of older patients at admission to a primary care geriatric ward.

METHODS

Context of the study

The study was conducted in the city of Lahti located near to the capital area in Finland between February 2011 and May 2013. In 2017, the city had a popu-

lation of 119 000 of whom 24 % are aged ≥ 65 years (Tietoa Lahdesta 2017). The study site was Lahti City Hospital, providing secondary care services to older patients. The participating wards were an acute secondary care ward with 40 beds and an acute rehabilitation primary care ward with 30 beds. In early 2017, the Lahti City Hospital was incorporated into the Päijät-Häme Joint Authority for Health and Well-being integrating primary and secondary care further. The permission for conducting this study was obtained from Lahti Social and health services. At the time of the study, no ethics approval was required as this study was regarded as a service development.

Study design, participants and methods

An action research based method comprising six stages (Table 1, Figure 1) was utilised (Baum 2006). The study process consisted of research, action and participation, typical to action research. The aim was to achieve a standardised medication reconciliation and review procedure. Consequently, a multiprofessional research team of researchers (n=2), academic supervisors (n=2), chief physicians (n=2), and clinical pharmacists (n=2) of the hospital were involved in the development of the tool and the procedure. The study and its stages are described briefly in Table 1 and Figure 1.

Stages of the study

Stage 1: Literature search for, and narrative review of, medication reconciliation and review procedures applicable to admissions to geriatric wards

The aim of the literature search and review was to gather national and international guidelines for, and examples of, existing tools and procedures for medication reconciliation and review. This was to support the development of the first version of the tool and procedure for the Lahti City Hospital. After having searched for actual guidelines, tools and procedures, the literature search was extended to include articles from peer-reviewed journals. The following search terms were used for data screening independently and as a combination: "medication reconciliation", "medication review" and "admission".

Stage 2: Interviews with physicians, nurses and clinical pharmacists

Following the literature search and review, several interviews were conducted with healthcare staff of Lahti City Hospital. Two physicians, three nurses and two clinical pharmacists were purposively selected to be interviewed individually as expert informants due

to their experience in patient admission to geriatric wards as in Smith (2010).

A semi-structured interview guide was developed based on a) the literature found in Stage 1 and b) several discussions with the research team consisting of academic and practising experts in medication safety (Ritchie *et al.* 2003, Smith 2010). In the individual interviews, the informants were invited to describe their previous experiences of, opinions on, expectations for, challenges with, and solutions for, the medication reconciliation and review on admission. The interviewees were also asked to describe how clinical pharmacists could contribute to the medication reconciliation and review process on admission. The interviews were conducted by two researchers (LHR and AN). The interviews were audio-recorded and transcribed verbatim. Qualitative framework analysis was employed in the analysis of all interviews (Ritchie *et al.* 2003, Smith 2010).

Stage 3: Developing a tool and procedure for medication reconciliation and review

Based on the literature search and review (Stage 1) and the interviews (Stage 2), the researchers (AN and LHR) developed the first versions of the procedure

and the tool for medication reconciliation and review for the participating hospital wards. Detailed instructions were developed for the procedure to ensure that different healthcare professionals, such as pharmacists and nurses, would operate in a standardised way. The research team further refined the procedure and the tool (Appendix 1) before the pilot as is usual in action research.

Stage 4: Piloting the medication reconciliation and review procedure and the tool

The medication reconciliation and review procedure was piloted in two parts to ensure the feasibility of the use of the tool (Appendix 1). The two clinical pharmacists who had participated in the interviews in Stage 2 conducted the pilots during patients' admission to the two wards. The pharmacists were provided with detailed instructions for completing the medication reconciliation and review to ensure they operated in a standardised way.

Altogether eight patients, whose medication was reconciled and reviewed according to the procedure under development, were included in the pilots. The medication reconciliation and review procedure was observed by one of the researchers (AN) on the first

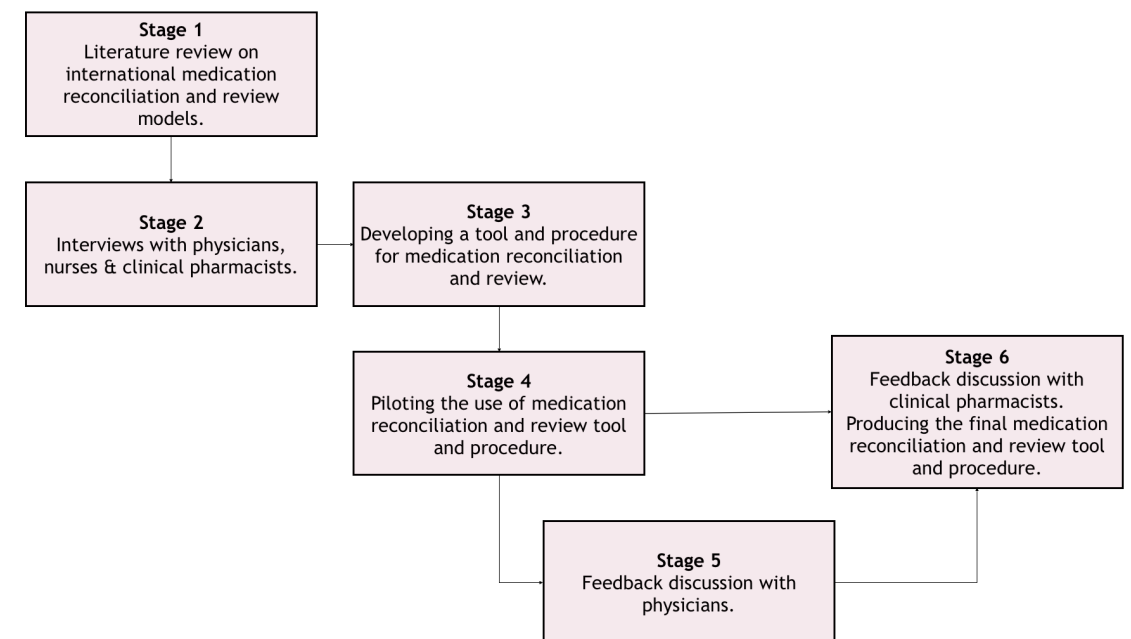


Figure 1. A simplified description of the study process to develop a tool and procedure for medication reconciliation and review of geriatric patients on hospital admission.

Table 1. Outline of the stages of the study to develop a tool and procedure for medication reconciliation and review of geriatric patients on hospital admission.

Stages of the study		Purpose of the stage	Method
No.	Description		
1	Literature search and review on (inter)national medication reconciliation and review models.	To identify (inter)national models and experiences on the topic to inform the development and implementation of the tool and procedure for medication reconciliation and review.	Literature search and narrative review
2	Assessing current medication reconciliation and review practices and needs for their development on admission to the geriatric ward.	To identify possible problems in the current medication process on admission to the geriatric ward; potential improvements that interviewees could suggest to solve those problems.	Interviews of informants (physicians (n= 2), nurses (n=3) and clinical pharmacists (n=2)) involved in the development and piloting of the tool in a geriatric ward of the study hospital; qualitative framework analysis of the interviews.
3	Developing a tool and procedure for medication reconciliation and review.	To develop a preliminary medication reconciliation and review procedure and tool	Research team discussions, utilising the literature review and interviews with informants.
4	Piloting the medication reconciliation and review procedure and the tool.	To explore how the tool and the instructions for the procedure worked in practice.	Observations and feedback from the ward pharmacists: Clinical pharmacists (n=2) completed four reconciliations and reviews. The use of the tool was observed by the student researcher.
5	Feedback discussions with physicians.	To explore the opinions of the doctors working on the ward during the first pilot on the functionality of the tool and the procedure.	Feedback discussion with the student researcher and physicians (n=3).
6	The development of the final version of the tool and the procedure.	To use the feedback obtained from the two pilots and to get approval from researchers and practical team for the final tool and procedure.	Feedback discussion with researchers (n=2), clinical pharmacists (n=2) and the geriatrician.

Table 2. International medication reconciliation models adapted from the literature.

Source of the model	Country	Main contents *
Joint Commission (JC) 2013	USA	The following steps should be covered in the reconciliation process: obtaining information on the current medications, identifying and resolving discrepancies, providing written information on the medications at the time of patient discharge from the hospital
Institute for Healthcare Improvement (IHI) 2013	USA	The medication reconciliation process should include three steps: medication verification (collection of medication history), medication clarification (ensuring that medications and doses are appropriate), medication reconciliation (documentation of changes in the orders)
National Patient Safety Agency (NPSA) 2007	UK	Medication reconciliation should be done to all adult patients admitting to hospital. Pharmacist should be involved in medication reconciliation as soon as possible after admission.
National Prescribing Centre (NPC) 2013	UK	NPC suggests prioritizing medication reconciliation to certain patients groups; those with long-term conditions, those aged 65 years and over, those on four or more medicines or on complex dosing regimens. The process comprises the "3Cs" - collecting, checking and communicating on the medications.
World Health Organization (WHO) 2007	International	Reconciling medication should happen within 24 hours of admission. The process should be multidisciplinary and involve patients and their careers. Points of transition that require special attention are: <ul style="list-style-type: none"> • Admission to hospital • Transfer from the emergency department to other care areas (wards, intensive care, or home) • Transfer from the intensive care unit to the ward • From the hospital to home, residential aged care facilities or to another hospital.

* The key contents in the Table are selected from the presented medication reconciliation models in relation to the focus of the present study.

day of both pilots to gather information on how pharmacists operated and to ensure the feasibility of the tool. The first pilot was conducted in January 2013 and the second in March 2013. The two clinical pharmacists also provided their feedback to the research team. As is usual in action research, further changes to the procedure and the tool were based on the observations of the researcher and the experiences of the clinical pharmacists who piloted the use of the medication reconciliation and review procedure and the tool and were discussed with the research team.

Stage 5: Feedback discussions with physicians

Three physicians who had been working on the study wards during the first pilot were purposively selected to feed back on their perceptions of the medication reconciliation procedure and the tool discussions with one of the researchers (AN). Specific open questions were presented to extract information about medication reconciliation on admission, the role of the clinical pharmacist in medication reconciliation and review procedure and what kind of medication-related issues are important on admis-

sion. The physicians were also asked whether they would prefer to receive the medication reconciliation and review recommendations electronically or by paper from the clinical pharmacists.

Stage 6: Feedback discussion with clinical pharmacists and development of the final medication reconciliation and review procedure and the tool

After the second pilot the research team and the two clinical pharmacists held a feedback discussion as described in Ritchie *et al.* (2003) and Smith (2010). In the discussion, the researchers received feedback on the feasibility and usability of the procedure and the tool. The final versions of the tool (**Appendix 1**) and the procedure (**Appendix 2**) were developed by the research group based on the feedback discussions at stages 5 and 6.

RESULTS

Literature review

The international medication reconciliation models and guidelines relevant to the development of the medication reconciliation and review process in this study are presented in **Table 2**.

Interviews with physicians, nurses and clinical pharmacists

The main themes raised in the individual interviews of physicians (n=2), nurses (n=3) and clinical pharmacists (n=2) were: a) problems in the current medication process and b) the role of the clinical pharmacist. The interviewees recommended that the role of the clinical pharmacist should be significantly increased in the hospital admission process. The tasks should focus more on medication reconciliation and review, and patient care. Other proposals for clinical pharmacists' contribution to patient care in the admission process were patient interviews about their medications and possible encountered problems, and identification of symptoms that might be attributed to drug-related problems (DRPs).

The interviewees were concordant regarding the problems experienced, such as lack of an up-to-date home medication list in the current medication process of the hospital wards (**Table 3**). The healthcare professionals interviewed also presented solutions to the problems identified with the help of clinical pharmacists in the medication reconciliation and review process. Furthermore, the interviewed physicians and nurses expressed a need for the clinical pharmacist to be present on the wards more often to contribute to patient care with their expertise. This was perceived

pivotal to improving patient safety and facilitating both nurses' and physicians' work. Additionally, one of the physicians suggested that clinical pharmacists could perform clinical medication reviews focussing on the indications of drugs, their potential interactions and inappropriate medications prescribed to older patients (for example suitability of medicines according to the age and kidney function of a patient). The interviewed clinical pharmacists thought this could be helpful in identifying and solving DRPs (**Table 3**). During the first pilot, the clinical pharmacists fed back that the procedure was time consuming.

Feedback discussion with physicians between the pilots

Physicians (n=3) participating in the study found the medication reconciliation and review procedure completed by the clinical pharmacists in the first pilot central to the rational and safe medication use. The physicians suggested a concept in which the clinical pharmacist would document their medication therapy related notes and recommendations into the electronic medical record. In this way, also other physicians working at the hospital and other health care providers in outpatient care could later access the notes and recommendations. One of the physicians suggested that a specific page in the electronic patient records should be created for the notes for the medication reconciliation and review; this was implemented. The physicians emphasised that the clinical pharmacists should not only document but also discuss any identified DRPs and recommendations to solve them with the physician in charge of any patient's treatment. They also suggested that pharmacists should prioritise the recommendations for medication changes for each patient.

Development of the final version of the tool and procedure through the feedback discussion with the clinical pharmacists

The interviewees (n=7) found the medication reconciliation and review procedure to be very useful in solving DRPs among older patients on admission. The clinical pharmacists agreed with the physicians' opinion suggesting that a specific page should be created for the medication reconciliation and review in the electronic medical record to promote information transfer. This would support the medication reconciliation and review in a structured way so that the physician could easily see which DRPs are to be addressed.

Table 3. Perceived problems in the current medication process and suggested improvements based on the interviews of physicians (n=2), nurses (n=3) and clinical pharmacists (n=2) at first stage of the study.

Perceived problems in the current medication process	Suggested improvements to the medication process
Patients do not remember which medicines they are taking	A clinical pharmacist could interview the patient, family members, physicians and other healthcare professionals and check patient records.
Patients do not have an up-to-date home medication list with them on admission	A clinical pharmacist could interview the patient, family members, physicians and other healthcare professionals and check patient records.
Patient medical records are not accurate, up to date, or have discrepancies between different care settings (e.g. care homes, primary and secondary care, and private and public healthcare providers)	A clinical pharmacist could reconcile the medication on hospital admission.
Polypharmacy (increased risk of therapeutic duplication, interactions, prescribing without indication or inappropriate therapy)	A clinical pharmacist could clinically review the medication.
Incorrect medication, incorrect dose, route, or frequency especially in aged patients	A clinical pharmacist could clinically review the medication.
Differentiating between co-morbidities and adverse side effects	A clinical pharmacist could have an important role on identifying whether the patient is suffering due to illness or having an adverse side effect, even the rare adverse effects could be noticed.

Consequently, the final versions of the tool and procedure were developed based on the findings of all the previous stages of the study. The final version of the tool (**Appendix 1**) comprised four main sections (1) Patient Background (e.g. reason for admission and laboratory data), (2) Patient Interview (e.g. experiences of symptoms from, and problems with, medicines), (3) Medication Reconciliation and Review (i.e. identified DRPs), and (4) Recommendations (i.e. actions to solve DRPs). The final medication reconciliation and review procedure recommends that all parts of the process are completed by a clinical pharmacist who provides recommendations for any medication related changes required to the physicians.

DISCUSSION

Our study introduces a tool and a procedure for medication reconciliation and medication review of older patients' medications on admission to the geriatric ward of a secondary care hospital. This study also

presents a practical action research based method for developing and implementing clinical pharmacy services through multidisciplinary collaboration in clinical environments where such approaches to medication care are novel. The literature describes, similarly, multidisciplinary teams, involving pharmacists, using sophisticated models of medication optimization in countries pioneering in clinical pharmacy (Gillespie *et al.* 2009, Hellstrom *et al.* 2012, Kaboli & Fernandes 2012).

The practitioners and nurses interviewed in the study expressed an urgent need for clinical pharmacists as operators in medication reconciliation and review to assure safe and rational use of medications. Special value was attributed to the clinical pharmacists in their contribution to addressing the suitability of medicines according to the age and renal function of a patient, suitable dosages and forms of medication and identification of clinically relevant interactions. Indeed, many studies have recognized

the important role of a clinical pharmacist in these processes of care (Beckett 2012, Aag 2014, Leguelinel-Blache 2014). Moreover, it is reported that clinical pharmacists collect more complete and accurate information on patients' medications when compared to nurses and physicians due to the consultation of more information sources in medication reconciliation processes (Lizer & Brackbill 2007, Steurbaut *et al.* 2010).

Our study is timely as the number of older patients needing primary care level hospital care with special expertise in geriatrics is increasing in Finland as well as in all over the world. Geriatric patients in particular have usually many DRPs and, therefore, there is a specific need to ensure that medications are reconciled and reviewed during their stay in hospital (Knez *et al.* 2011, Spinewine *et al.* 2012, Bulajeva *et al.* 2014). It is reported that the geriatric patients benefit most from medication reconciliation and medication reviews (Gillespie *et al.* 2009, Steurbaut *et al.* 2010, Mueller *et al.* 2012). Indeed, the medication reconciliation and review procedures were combined to ensure that up-to-date information of patients' medications and possible discrepancies are brought to the attention of the physician during the hospital admission. This represents a more thorough approach to medication optimization and ensuring medication safety while many hospitals have limited the process to medication reconciliation (Nester 2002, Gleason 2004, Beckett 2012). The admission phase of the medication process has been identified as especially prone to medication errors due to insufficient information about the patients' previous medications (Tam *et al.* 2005, Steurbaut 2010). This emphasizes the importance of the identification of patients' up-to-date medication lists. Equally important would be to cover possible inappropriate medications, interactions or other DRPs in the current medication to avoid further discrepancies with the newly prescribed medications during the hospital stay (Karapinar-Carkit *et al.* 2010). Moreover, DRPs are a common reason for hospital admissions, especially in geriatric patients (Gillespie *et al.* 2009, Somers 2010, Chau *et al.* 2016).

The participating physicians called for clearer and more accessible documentation of medication related problems identified by the pharmacist on hospital admission. The physicians suggested that there should be a clearly identified place in the electronic medical records for a ward pharmacist to document their notes and recommendations in a

standardised way. This has been identified as a central success factor of a well-functioning medication reconciliation and review procedure also in other studies (Gillespie *et al.* 2009, Steurbaut *et al.* 2010, Meguerditchian 2013, Leguelinel-Blache 2014). Indeed, medication reconciliation and review on admission improves the quality and safety of medicine use throughout a patient's hospital stay until discharge (Knez *et al.* 2011). Electronic medical records shared between primary and secondary care enable also primary care physicians to read notes written by clinical pharmacists. Thus, the procedure can also benefit the quality and safety of medication use of the home-dwelling aged – a healthcare domain that would urgently need adoption of clinical pharmacy services in many countries (Chau *et al.* 2016).

Strengths and limitations

While the study was conducted on two geriatric wards, providing secondary and primary care services, in a Finnish middle-sized hospital, the laws and regulations governing healthcare are universally valid, and, thus, the admission processes and practices might not vary too much across different settings in Finland. Indeed, the medication reconciliation and review procedure and the tool could be transferable to other healthcare settings in Finland and to other countries as the development of the procedure and the tool was based on international models (Table 2). Thus, with some additional local adaptation, the tool could also be useful for medication reconciliation and review of geriatric patients in all types of wards and settings. With the number of geriatric patients steadily increasing in Finland and many other countries, the need for the use of expertise of clinical pharmacists, and the developed procedure and the tool, in patient care increases.

The tool was piloted independently by two clinical pharmacists on a secondary and primary care ward, representing the possibility for different ways of reconciling and reviewing medications, and hence, influencing the findings of the study. Indeed, the different experiences and perspectives of the clinical pharmacists provide rich data (Ritchie *et al.* 2003) on the feasibility of the use of the medication reconciliation and review procedure and the tool in practice, enhancing the feasibility of their use in other settings. On the other hand, no clinically relevant differences in the clinical pharmacists' contribution to patient care were observed in the pilots, showing the medi-

cation reconciliation and review were completed in a standardised way.

While the experiences of this study might not be directly transferable into countries and healthcare systems where pharmacists involved in multidisciplinary teams are not an everyday practice, this practical action research based method for developing and implementing clinical pharmacy services can also be used in settings where such approaches to medication care are novel. Our study successfully employed an action research based method facilitating the development and implementation of an innovative medication reconciliation and review procedure and tool. The central key benefit of the chosen method was its ability to involve and commit local healthcare professionals, physicians, nurses and pharmacists in the development of the procedure and the tool and in the change of their own and their co-workers' practices.

Recommendations

The present work and previous studies have found medication reconciliation time consuming (Meguerditchian 2013). Thus, standardisation of the medication reconciliation process and more well-organised use of health information tools could improve the efficiency of the process. While our medication reconciliation and review procedure might be too comprehensive and time consuming (this was the start of the service) for use at admission of every aged patient, the alternative courses of action would be to develop a shorter procedure with a simple check-list outlining the most central items to be covered on admission for all geriatric patients and target a more limited group of geriatric patients, for example, based on screening of DRP-related admissions (Gillespie *et al.* 2009, Dimitrow *et al.* 2014), when using the current procedure. Consequently, there is a need for further research to identify which patients benefit the most from the current medication reconciliation and review procedure on admission.

There is also a need to promote the use of clinical pharmacists and their competence in patient care teams. While the number of clinical pharmacists is on the increase in Finnish hospitals (Schepel 2018), the numbers might not be sufficient for every patient to benefit from clinical pharmacist-led medication reconciliation and review. In the future, medication reconciliations and medication reviews should be documented electronically to facilitate sharing and transferring the most accurate information on pa-

tients' medications between different healthcare professionals and settings, and patients and their carers.

Conclusions

The study introduces a novel tool and procedure for medication reconciliation and review on hospital admission of geriatric patients that has been developed and piloted with a multidisciplinary healthcare team, using an action research based method. The tool and the clinical pharmacist-led procedure were found feasible to use and central to the rational use of medicines. While multidisciplinary team work ensured the implementation, medication reconciliation and reviews were recommended to be completed by clinical pharmacists who provide their medication-related recommendations to the physicians.

TIIVISTELMÄ

Lääkityksen arviointiin tarvittavan työkalun ja toimintamallin kehittämisen käyttäväksi iäkkään potilaan tullessa perusterveydenhuollon osastolle

→ Leena H. Riukka*

proviisori, sairaala-apteekkari,
Päijät-Hämeen hyvinvointikuntayhtymä,
sairaala-apteekki
leena.riukka@phhyky.fi

→ Anna E. Niskanen

Proviisori, Farmasian tiedekunta,
Kliinisen farmasian osasto, Helsingin yliopisto,
anna.e.niskanen@gmail.com

→ Anna-Riia Holmström

FaT, kliininen opettaja,
Farmasian tiedekunta, Kliinisen farmasian ryhmä,
Apteekki- ja sairaalafarmasian erikoistumiskoulutus,
Helsingin yliopisto
anna-riia.holmstrom@helsinki.fi

→ Suvi Hakoinen

Proviisori, yliopisto-opettaja,
Farmasian tiedekunta, Kliinisen farmasian ryhmä,
Apteekki- ja sairaalafarmasian erikoistumiskoulutus,
Helsingin yliopisto
suvi.hakoinen@helsinki.fi

→ Sirkku Lavonius

LL, ylilääkäri,
Päijät-Hämeen hyvinvointikuntayhtymä

→ Marja Airaksinen

FaT, Sosiaalifarmasian professori,
Farmasian tiedekunta, Kliinisen farmasian ryhmä,
Helsingin yliopisto
marja.airaksinen@helsinki.fi

→ Raisa Laaksonen

FaT, Sosiaalifarmasian professori,
Farmasian tiedekunta, Kliinisen farmasian ryhmä,
Helsingin yliopisto
raisa.laaksonen@helsinki.fi

*Kirjeenvaihto

Tavoite: Tutkimuksen tavoitteena oli kehittää työkalu ja toimintamalli lääkityksen arviointiin iäkkään potilaan tullessa perusterveydenhuollon osastolle.

Aineisto ja menetelmät: Työkalun ja toimintamallin kehittämisessä käytettiin toimintatutkimusmenetelmää. Tutkimus tehtiin keskikokoisessa terveyskeskussairaalassa. Kehitysprosessiin osallistui yhteistyössä lääkäreitä, hoitajia ja osastofarmaseutteja (n=7). He tunnistivat ongelmia nykyisessä osastolle tulon yhteydessä tehtävässä lääkityksen arvioinnissa ja kehittivät alustavan työkalun, josta pilotoinnin avulla kehitettiin lopullinen versio.

Tulokset: Useita ongelmia havaittiin lääkitysprosessissa iäkkään potilaan saapuessa osastolle. Potilaalla ei useinkaan ollut ajan tasalla olevaa kotilääkityslistaa mukanaan, tai eri tietolähteissä oli toisistaan poikkeavia lääkitystietoja. Useilla potilailla oli monilääkitykseen liittyviä ongelmia. Kehitysprosessiin osallistuneet asiantuntijat ehdottivat näiden ongelmien ratkaisemiseksi osastofarmaseuttien ajantasaistavan ja arvioivan lääkityksiä aikaisempaa useammin. Heidän myös toivottiin haastattelevan potilaita osastolle tuloarviointia. Toimintamallin kehittämisen yhteydessä kehitettiin potilastietojärjestelmään erillinen sivu farmaseutin lääkitysarviomerkintöjä varten. Lopullinen työkalu sisältää seuraavat osiot: potilaan taustatiedot, potilaan haastattelu, ajantasaistettu ja arvioitu lääkitys, lääkitykseen liittyvät huomiot ja ehdotukset.

Johtopäätökset: Osastofarmaseutin roolia pitäisi lisätä iäkkäiden potilaiden sairaalaan tulovaiheessa lääkitysturvallisuuden lisäämiseksi. Tässä tutkimuksessa kehitettiin ja pilotoitiin moniammatillisenä yhteistyönä työkalu ja toimintamalli lääkityksen tuloarviointiin. Lääkityksen ajantasaistaminen ja lääkityksen arviointi ovat tärkeitä ja aikaa vieviä osastofarmaseutin tehtäviä. Lisäkehittämistä tarvitaan, jotta kaikki farmaseuttisen henkilökunnan tekemät havainnot saadaan sähköisinä ja helposti kaikkien potilasta hoitavien henkilöiden saataville.

Avainsanat: Lääkityksen ajantasaistaminen, lääkitysarvio, sairaalaan tulovaihe, iäkkäät potilaat, osastofarmasia, lääkitysturvallisuus

REFERENCES

Aag T: Should nurses or clinical pharmacists perform medication reconciliation? A randomized controlled trial (report). *Eur J Clin Pharmacol* 70: 1325-1332, 2014

Baum F, MacDougall C, Smith D: Participatory action research. *J Epidemiol Community Health* 60: 854-857, 2006

Beckett RD: Effectiveness and feasibility of pharmacist-led admission medication reconciliation for geriatric patients. *J Pharmacy Practice* 25: 136-141, 2012

Bulajeva A, Labberton L, Leikola S, et al.: Medication review practices in European countries. *Res Social Adm Pharm* 10: 731-740, 2014

Chau SH, Jansen APD, van de Ven PM, Hoogland P, Elders PJM, Hugtenburg JG: Clinical medication reviews in elderly patients with polypharmacy: A cross-sectional study on drug-related problems in the Netherlands. *Int J Clin Pharm* 38: 46-53, 2016

Climente-Martí M: Potential risk of medication discrepancies and reconciliation errors at admission and discharge from an inpatient medical service. *Ann Pharmacother* 44: 1747-1754, 2010

Dimitrow MS, Mykkänen SI, Leikola SNS et al.: Content validation of a tool for assessing risks for drug-related problems to be used by practical nurses caring for home-dwelling clients aged >65 years; a Delphi survey. *Eur J Clin Pharmacol* 70: 991-1002, 2014

Gillespie U, Alassaad A, Henrohn D, et al.: A comprehensive pharmacist intervention to reduce morbidity in patients 80 years or older A randomized controlled trial. *Arch Intern Med* 169: 894-900, 2009

Gleason KM: Reconciliation of discrepancies in medication histories and admission orders of newly hospitalized patients. *Am J Health Syst Pharm* 61: 1689-1695, 2004

Haig K: Medication reconciliation (case study). *Am J Med Qual* 21: 299-303, 2006

Hellstrom LM, Hoglund P, Bondesson A, Petersson G, Eriksson T: Clinical implementation of systematic medication reconciliation and review as part of the Lund integrated medicines management model - impact on all-cause emergency department revisits. *J Clin Pharm Ther* 37: 686-692, 2012

Institute for Safe Medication Practices (ISMP) Canada. Medication reconciliation in acute care - getting started kit. www.ismp-canada.org/medrec/. Accessed May 30, 2017.

Kaboli PJ, Fernandes O: Medication reconciliation moving forward. *Arch Intern Med* 172: 1069-1070, 2012

Karapinar-Carkit F, Borgsteede SD, Zoer J, et al.: The effect of the COACH program (continuity of appropriate pharmacotherapy, patient counselling and information transfer in healthcare) on readmission rates in a multicultural population of internal medicine patients. *BMC Health Services Research* 10: 39, 2010

Knez L, Suskovic S, Rezonja R, Laaksonen R, Mrhar A: The need for medication reconciliation: A cross-sectional observational study in adult patients. *Respir Med* 105: S60-S66, 2011

Leguelinel-Blache G: Impact of admission medication reconciliation performed by clinical pharmacists on medication safety. *Eur J Intern Med* 25: 808-814, 2014

Lizer MH, Brackbill ML: Medication history reconciliation by pharmacists in an inpatient behavioral health unit. *American Journal of Health-System Pharmacy* 64: 1087-1091, 2007

Meguerditchian A: Medication reconciliation at admission and discharge: A time and motion study. *BMC Health Services Research* 13: 485, 2013

Mueller SK, Sponsler KC, Kripalani S, Schnipper JL: Hospital-based medication reconciliation practices A systematic review. *Arch Intern Med* 172: 1057-1069, 2012

National Prescribing Centre. Medicines reconciliation: A guide to implementation. <https://www.nicpld.org/courses/fp/assets/MM/NPCMedicinesRecGuideImplementation.pdf>. Accessed May 30, 2017.

Nester TM: Effectiveness of a pharmacist-acquired medication history in promoting patient safety. Am J Health Syst Pharm 59: 2221-2225, 2002

Pippins JR, Gandhi TK, Hamann C, et al.: Classifying and predicting errors of inpatient medication reconciliation. J General Internal Medicine 23: 1414-1422, 2008

Quélenec B: Potential clinical impact of medication discrepancies at hospital admission. Eur J Intern Med 24: 530-535, 2013

Ritchie J, Spencer L, O'Connor W: Carrying out qualitative analysis. In: Ritchie J, Lewis J, eds. Qualitative research practice. p. 219-262, London: Sage Publications Ltd., 2003

Schepel L: Strategies for Medication Safety: An organization-based approach focusing on high-alert medications and clinical pharmacy services in Helsinki University Hospital. Väitöskirja. Helsingin yliopisto, Helsinki 2018

Smith FJ: Data collection: Interviews and focus groups. In: Smith FJ, ed. Conducting your pharmacy practice research project. p. 131-148, London: Pharmaceutical Press, 2010

Somers A: Contribution of drug related problems to hospital admission in the elderly. J Nutr Health Aging 14: 477-482, 2010

Spinewine A, Fialova D, Byrne S: The role of the pharmacist in optimizing pharmacotherapy in older people. Drugs Aging 29: 495-510, 2012

Sturbaut S, Leemans L, Leysen T, et al.: Medication history reconciliation by clinical pharmacists in elderly inpatients admitted from home or a nursing home. Ann Pharmacother 44: 1596-1603, 2010

Tam V, Knowles S, Cornish P, Fine N, Marchesano R, Etchells E: Frequency, type and clinical importance of medication history errors at admission to hospital: A systematic review. Can Med Assoc J 173: 510-515, 2005

Tietoa Lahdesta. Väkiluku ja ikärekenne 2017. www.lahti.fi/tietoa-lahdesta/tilastot-ja-tilastojulkaisut/vaesto. Accessed February 18, 2019.

APPENDIX 1. Tool for Medication Reconciliation and Review on Admission for Pharmacists

Date: _____ Patient code: _____

Starting time for collecting preliminary data: _____

Time pharmacist used collecting preliminary data: ____ minutes

Basic patient data:

Year of birth: _____

Gender: Female Male

Date of admission: _____

Reason for admission: _____

Other diagnoses: _____

Place where admitting:

Primary care Home care services Nursing home Long-term institution

Admitting from central hospital No Yes

Medicine allergies: No Yes: _____

Kidney function: GFR ____ ml/min classification _____

Length: _____ m BMI: _____ kg/m²

	result/date	result/date	result/date	comments
Blood pressure (sitting)				
Pulse				
Weight				

>

Laboratory test	result/date	result/date	result/date	Reference value
P-Krea				50-90 µmol/l
P-K				3,5–4,4 mmol/l
P-Na				137–144 mmol/l
P-INR				varfarin treatment: 2-3,5
B-Hb				f: 117–155 g/l m: 134–167 g/l
E-MCV				82-98 fl
P-CRP				<10
B-Trom				150–360 E9/l
P-Alb				40-69 y: 36-45 g/l over 70 y: 34-45 g/l
fP-Gluk				3,9-6,4 mmol/l
B-HbA1c				20–42 mmol/ml DM: 42–53 mmol/ml
P-ALAT				10–45 U/l
P-Bil				4-20 µmol/l
P-BNP				<100
P-Uraat				155–400 mmol/l
fP-Kol				<5,0 mmol/l
fP-Kol-HDL				> 1,00 mmol/l
fP-Kol-LDL				< 3,00 mmol/l
fP-Trigly				< 2,00 mmol/l
S-D-25				25-175 nmol/l
Ca++				1,05–1,20 mmol/l
S-B12-Vit				140–490 pmol/l
S-TSH				0,4-4,0 mU/l
S-T4-V				9-19 pmol/l
fE-folaat				<360 nmol/l
S-GT				f (> 40 v.): 10-75 U/l m (> 40 v.): 15-115 U/l

Number of deleted medications _____

Medication reconciliation: Patient code: _____

PATIENT INTERVIEW:

Starting time of interview: _____

Time pharmacist used interviewing the patient: _____ min

What's the reason you are in hospital?

What kind of condition have you had at home /in nursing home?

Patient is asked to tell which medicines or over-the-counter-medicines she/he is using, when, why and what is the dose. Patient is asked if she/he is using any creams, inhalations, nasal sprays, sleeping pills etc. In your medication record there is a medicine like this (name of medicine), have you been using it? (*The aid is medication list in the electronical medication record, which is enclosed to this form. All the notes are made to this medication list.*)

In which indication do you use this medication?

Further notes:

With who do you speak about your medicines? From who do you ask about your medicines?
Have you got advices using your medicines?

Do you take care taking your medicines yourself or is someone helping you?
 Do you use any medications aids (for example dispenser)? In which stages do you feel you need help?

How have you managed with your medicines?
 What kind of problems you may have had with your medicines?

Have you had any symptoms (at home /nursing home) related to your illnesses or any other symptoms?

Do you smoke? No Yes: How much? _____

Do you use alcohol? No Yes: How much? _____

Is there something you would like to talk related to your medicines?

Other notices:

The medication reconciled and medication review:

Patient code: _____ Starting time of medication reconciliation and review: _____

Time pharmacist used in medication reconciliation and review (does not include tasks to do prior meeting the patient or patient interview): _____ minutes

Nr	Indication	S/T/K/I	Consumption	Problem (code + description)
1.	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> In use <input type="checkbox"/> Paused <input type="checkbox"/> Should be in use <input type="checkbox"/> Should not be in use <input type="checkbox"/> Not knowledge about use	
2.	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> In use <input type="checkbox"/> Paused <input type="checkbox"/> Should be in use <input type="checkbox"/> Should not be in use <input type="checkbox"/> Not knowledge about use	
3.	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> In use <input type="checkbox"/> Paused <input type="checkbox"/> Should be in use <input type="checkbox"/> Should not be in use <input type="checkbox"/> Not knowledge about use	
4.	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> In use <input type="checkbox"/> Paused <input type="checkbox"/> Should be in use <input type="checkbox"/> Should not be in use <input type="checkbox"/> Not knowledge about use	
5.	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> In use <input type="checkbox"/> Paused <input type="checkbox"/> Should be in use <input type="checkbox"/> Should not be in use <input type="checkbox"/> Not knowledge about use	
6.	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> In use <input type="checkbox"/> Paused <input type="checkbox"/> Should be in use <input type="checkbox"/> Should not be in use <input type="checkbox"/> Not knowledge about use	
7.	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> In use <input type="checkbox"/> Paused <input type="checkbox"/> Should be in use <input type="checkbox"/> Should not be in use <input type="checkbox"/> Not knowledge about use	

>

Nr	Indication	S/T/K/I	Consumption	Problem (code + description)
8.	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> In use <input type="checkbox"/> Paused <input type="checkbox"/> Should be in use <input type="checkbox"/> Should not be in use <input type="checkbox"/> Not knowledge about use	
9.	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> In use <input type="checkbox"/> Paused <input type="checkbox"/> Should be in use <input type="checkbox"/> Should not be in use <input type="checkbox"/> Not knowledge about use	
10.	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> In use <input type="checkbox"/> Paused <input type="checkbox"/> Should be in use <input type="checkbox"/> Should not be in use <input type="checkbox"/> Not knowledge about use	
11.	<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> In use <input type="checkbox"/> Paused <input type="checkbox"/> Should be in use <input type="checkbox"/> Should not be in use <input type="checkbox"/> Not knowledge about use	

S = Regularly used medication T = On demand medication K = Cure I = Self care medication

A. unnecessary medication B. need s additional drug therapy C. medication without effectiveness
D. incorrect dose, too low E. incorrect dose, too high F. incorrect lenght of therapy G. incorrect frequency
H. incorrect dosing time I. adverse effect J. interaction K. therapeutic duplication L. incorrect medicine
M. problems with compliance N. need for monitoring O. need for counselling P. another problem, specify
(choose all the suitable alternatives)

Any problems with reconciling medication:

- No
 Yes, description:

Notices:

Cautions with medication:

Patient code: _____

Medicine (number)	Cautions and change suggestions:	Change suggestions approved:	Approved with changes and/or later :	Rejected with arguments:
		<input type="checkbox"/> immediately <input type="checkbox"/> later <input type="checkbox"/> not at all		
		<input type="checkbox"/> immediately <input type="checkbox"/> later <input type="checkbox"/> not at all		
		<input type="checkbox"/> immediately <input type="checkbox"/> later <input type="checkbox"/> not at all		
		<input type="checkbox"/> immediately <input type="checkbox"/> later <input type="checkbox"/> not at all		
		<input type="checkbox"/> immediately <input type="checkbox"/> later <input type="checkbox"/> not at all		
		<input type="checkbox"/> immediately <input type="checkbox"/> later <input type="checkbox"/> not at all		
		<input type="checkbox"/> immediately <input type="checkbox"/> later <input type="checkbox"/> not at all		
		<input type="checkbox"/> immediately <input type="checkbox"/> later <input type="checkbox"/> not at all		
		<input type="checkbox"/> immediately <input type="checkbox"/> later <input type="checkbox"/> not at all		
		<input type="checkbox"/> immediately <input type="checkbox"/> later <input type="checkbox"/> not at all		

Medication reconciliation and review

1. HOW TO CHOOSE PATIENTS:

Amongst the patients admitted, those who fulfill the following criteria will be selected:

- over 65 years
- several diseases and/or using at least 5 medicines when admitting
- is capable to communicate with a clinical pharmacist (for example, no problems with language or acute confusion)

The choice of suitable patients is made by a physician, nurse or clinical pharmacist. To avoid overlapping work the choice of patient is announced to a physician and nurses caring for the patient or who in other cases would clarify the medication.

2. CODING THE PATIENT:

The patient chosen will be given a patient code and the code will be documented on both a coding list and on each page in the data collection form.

*for example 1001A (ward 1, patient 001, clinical pharmacist A)
or 2001B (ward 2, patient 001, clinical pharmacist B)*

3. PATIENT BACKGROUND DATA:

The patient background data will be entered on the first page of the data collection form.

The medical records and other sources available are used as the source of information.

- The calculator in the Renbase-data base is used for determining the GFR-value.
- Only essential laboratory values are documented.

Time taken for collecting and documenting the patient background data and deleting unnecessary medicines in the medicine list will be documented in the upper part of page one of the data collecting form.

4. INTERVIEWING PATIENT: The patient is interviewed using questions on page two of the data collecting form and with the help of the medication list in the medical records (Pegasos). The medication list used will be attached to the data collecting form. A/the family member or other caregiver can be interviewed if necessary. It is meant to take about 20 minutes to interview the patient. Time consumed in interviewing the patient will be documented in the upper part of page two in the data collecting form.

5. MEDICATION RECONCILIATION:

Current medication will be reconciled with information obtained from the previous point of care, with help by interviewing the patient and/or family member, medical records, medication packages the patient possibly has with him/her, prescriptions or administration aids. The medication reconciled will be documented in the medication list used when interviewing the patient. Medicines in the medication list will be numbered sequentially to enable them to be marked with numbers in a table in the data collecting form (pp. 3-5). The medication list will be attached to the data collecting form.

6. MEDICATION REVIEW:

(table in data collecting form pp. 3–5):

- 1) **Indication:** It will be established if there is an indication of medication. The purpose is to find out whether the medication is necessary for the patient.
- 2) **Starting date of medication:** It will be established whether medication use has started over or under a year ago. Also the starting date of the medication will be documented if it's available. With this data it is possible to review whether a new symptom could be an adverse drug reaction. New medications started within a year will more likely cause new adverse drug reactions than those started over a year ago.
- 3) **Regularity of medication use:** It will be established whether the physician has meant the medication to be used regularly, as a cure or only if needed. In this part it will be documented if the medicine is a without prescription medicine.
- 4) **Medication use:** It will be established, based on patient interview data, how a patient really uses a medicine. Is a patient using a medicine or not? If a patient is not using the medicine ordered for them, it will be documented "should be in use". If a patient is using the medicine which should have been stopped, it will be documented "should not be in use". If it is not clear, based on the patient interview, how the patient is really using the medicine, it will be documented "no knowledge of use". If the medication is paused for example for a hospital stay, it will be documented "paused".
- 5) **Recognition of the problem:** Possible drug-related problems will be determined using at least SFINX-PHARAO- and Renbase-databases in Terveysportti, Duodecim medicine database and Fimea medicine database for the elderly.

To determine potential problems the following will be checked:

- Are all the medicines necessary for the patient?
- Are there any missing drugs in the medication list which should be in use concerning the diagnosis and care guidelines?
- Are the medicines suitable for the patient and is the dosage suitable, taking account of age, indication and possible liver or renal impairment?
- Has the patient medicine duplications?
- Are there any interactions between medicines?
- Are the dosing times and intervals correct?
- Do symptoms or laboratory values indicate that the medication doesn't have sufficient effect?
- Could some of the symptoms in the patient have an adverse drug reaction?

- 6) **Making a change suggestion:** The recognition of a drug-related problem could trigger a change suggestion to solve the problem. Change suggestions and other items taken into account will be documented in a table on a data collecting form (page 6).

Time consumed for reconciling and reviewing medication will be documented on a data collecting form page 3. It will not include time consumed for collecting patient background data or patient interviewing, which have been documented in earlier pages.

7. DISCUSSION ABOUT CHANGE SUGGESTIONS:

When the medication reconciliation and review has been carried out, detected items and possible medication change suggestions resulting from them will be discussed together with the physician responsible and with a nurse, if needed. The physician will approve or reject the change suggestions. A decision made by the physician and arguments for rejecting the decision and possible changes for approved suggestions will be documented in the data collecting form (p. 6). In addition, it will be documented whether the physician approved the changes to be done at once or later.

It will be documented in the medical records whether the patients' medication has been reconciled and reviewed and which notes were made in optimization and which medication changes were made or are planned to be done. If there has been a discussion with the physician responsible about notes and changes it will be enough to write a short description. If there has been no time to meet the physician or changes are meant to be carried out in the next step of care, a more accurate description will be recorded about notes and change suggestions. Therefore the next step of care will get the information about medication changes and can implement them when necessary.