Information transfer and medication safety for elderly patients in care transitions

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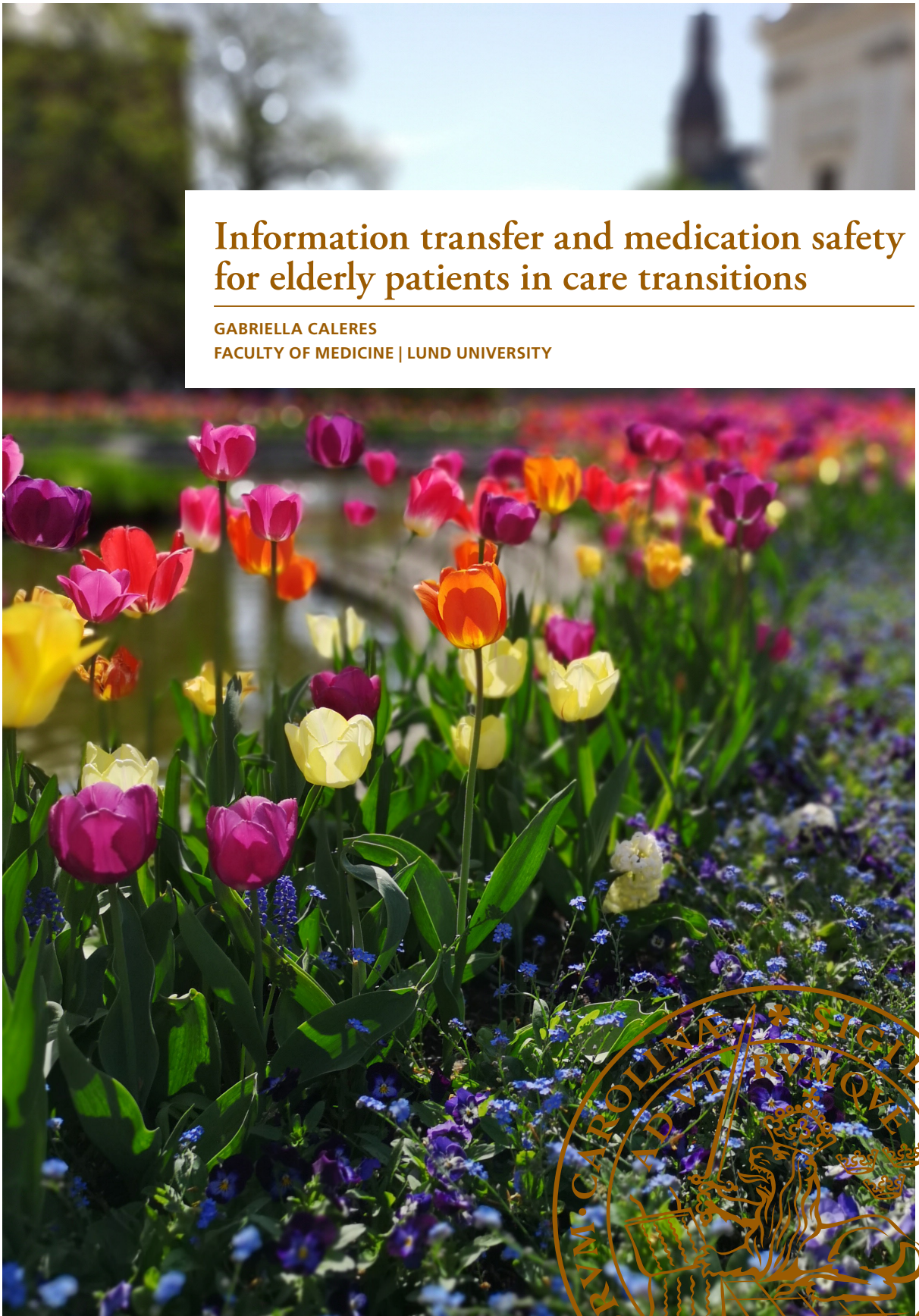

Information transfer and medication safety for elderly patients in care transitions

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Information transfer and medication safety for elderly patients in care transitions

Gabriella Caleres is a resident physician in Family Medicine at Tåbelund primary care center in Eslöv. Her thesis assesses the information transfer mainly regarding medication to primary care when elderly patients are discharged from hospital. The studies show that deficits in the quality, transfer and use of the discharge summary are common. Overall, improving information transfer and follow-up may help increase medication safety for elderly patients in care transitions.

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Introduction: Accurate discharge summaries counteract drug-related problems due to insufficient information transfer in care transitions, but require optimal transfer and use. Careful follow-up is often essential after hospital discharge, for example when it comes to pain management in elderly patients; a common and challenging task in primary care.

Aims: To assess the transfer and use of the discharge summary for elderly patients, including the experiences and perceptions of the GPs, and to examine the presence of any discharge summary medication discrepancies and associated risk factors. In addition, to examine a common medication situation, i.e. pain medication, and its follow-up in primary care after hospital discharge.

Methods: Data on pain medication and any follow-up plans were collected from electronic medical records, nurses in municipality care and the multidose drug system. Community-dwelling patients with medication aid from nurses in municipality care and nursing home residents ≥ 75 years discharged from orthopaedic care were included (paper I). Data on discharge summary medication discrepancies and related factors as well as transfer rate and the use of the discharge summary were collected from electronic medical records for patients ≥ 75 years with ≥ five drugs (paper II and IV). Primary care experiences of the information transfer were examined by using an electronic survey (paper II), and the views and perceptions of the GPs were further investigated by focus group discussions and analysed with qualitative content analysis (paper III).

Results: The proportion of patients prescribed paracetamol and opioids increased significantly from prior to admission to after 12 weeks, and primary care pain medication follow-up plans were not very common (paper I). Transfer to primary care was noted for less than half of the discharge summaries, and one-third of the respondents of the electronic survey noted that the discharge summary was never/seldom received. Patient chart entries regarding medication or its follow-up were noted for less than half of the patients and medication lists were updated for one-third of the patients with drug changes during hospitalization, while noted as being performed to a higher extent by the survey respondents (paper II).
Three final overall themes appeared: “Importance of the discharge summary”, “Role of the GP” and “Create dialogue”. The GPs viewed the discharge summary to be of considerable advantage when it was accurate, particularly regarding medication information, but also expressed great distrust due to lacking quality (paper III). Medication discrepancies were noted in more than one-third of the discharge summaries. The most common discrepancy type was unintentional addition of drug, and central nervous system drugs/analgesics were most commonly affected. Main risk factors for the presence of discrepancies were multidose drug dispensing and increasing number of drugs in the discharge summary, while an increasing number of drug changes reduced the likelihood of a discrepancy (paper IV).

Conclusions: Information transfer shortcomings in the quality, transfer and use of the discharge summary were common. While accurate medication information was much appreciated by the GPs, deficits were rife and the discharge summary was often perceived to be of poor quality, which may affect its use. Overall, improving information transfer and follow-up may help increase medication safety for elderly patients in care transitions.

Key words Aged, Primary Health Care, General Practitioners, Patient Discharge Summaries, Patient Transfer, Pain Management

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To Mikael, Viktor & Isa with eternal love

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Abstract

Introduction

Accurate discharge summaries counteract drug-related problems due to insufficient information transfer in care transitions, but require optimal transfer and use. Careful follow-up is often essential after hospital discharge, for example when it comes to pain management in elderly patients; a common and challenging task in primary care.

Aims

To assess the transfer and use of the discharge summary for elderly patients, including the experiences and perceptions of the GPs, and to examine the presence of any discharge summary medication discrepancies and associated risk factors. In addition, to examine a common medication situation i.e. pain medication, and its follow-up in primary care after hospital discharge.

Methods

Data on pain medication and any follow-up plans were collected from electronic medical records, nurses in municipality care and the multidose drug system. Community-dwelling patients with medication aid from nurses in municipality care and nursing home residents $\geq$ 75 years discharged from orthopaedic care were included (paper I). Data on discharge summary medication discrepancies and related factors as well as transfer rate and the use of the discharge summary were collected from electronic medical records for patients $\geq$ 75 years with $\geq$ five drugs (paper II and IV). Primary care experiences of the information transfer were examined by using an electronic survey (paper II), and the views and perceptions of the GPs were further investigated by focus group discussions and analysed with qualitative content analysis (paper III).

Results

The proportion of patients prescribed paracetamol and opioids increased significantly from prior to admission to after 12 weeks, and primary care pain medication follow-up plans were not very common (paper I). Transfer to primary care was noted for less than half of the discharge summaries, and one-third of the respondents of the electronic survey noted that the discharge summary was never/seldom received. Patient chart entries regarding medication or its follow-up were noted for less than half of the patients and medication lists were updated for one-third of the patients with drug changes during hospitalization, while noted as being performed to a higher extent by the survey respondents (paper II). Three final overall themes appeared: “Importance of the discharge summary”, “Role of the GP” and “Create dialogue”. The GPs viewed the discharge summary to be of considerable advantage when it was accurate, particularly regarding medication information, but also expressed great distrust due to lacking quality (paper III). Medication discrepancies were noted in more than one-third of the discharge summaries. The most common discrepancy type was unintentional addition of drug, and central nervous system drugs/analgesics were most commonly affected. Main risk factors for the presence of discrepancies were multidose drug dispensing and increasing number of drugs in the discharge summary, while an increasing number of drug changes reduced the likelihood of a discrepancy (paper IV).

Conclusions

Information transfer shortcomings in the quality, transfer and use of the discharge summary were common. While accurate medication information was much appreciated by the GPs, deficits were rife and the discharge summary was often perceived to be of poor quality, which may affect its use. Overall, improving information transfer and follow-up may help increase medication safety for elderly patients in care transitions.

Abbreviations

ADE	Adverse Drug Event
BPMH	Best Possible Medication History
EMR	Electronic Medical Record
GP	General Practitioner
MDD	Multidose Drug Dispensing System
OTC	Over the Counter
RCT	Randomized Controlled Trial
WHO	World Health Organisation

Original papers

This thesis is based on the following papers referred to in the text by their Roman numerals:

I. Caleres G. Midlöv P. Bondesson Å. Modig S. A descriptive study of pain treatment and its follow-up in primary care of elderly patients after discharge from orthopaedic care. Submitted.

II. Caleres G. Bondesson Å. Midlöv P. Modig S. Elderly at risk in care transitions when discharge summaries are poorly transferred and used –a descriptive study. *BMC Health Services Research* 2018, 18:770.

III. Caleres G. Strandberg EL. Bondesson Å. Midlöv P. Modig S. Drugs, distrust and dialogue –a focus group study with Swedish GPs on discharge summary use in primary care. *BMC Family Practice* 2018, 19:127.

IV. Caleres G. Modig S. Midlöv P. Chalmers J. Bondesson Å. Medication discrepancies in discharge summaries and associated risk factors for elderly patients with many drugs. *Drugs Real World Outcomes.* December 2019. DOI: 10.1007/s40801-019-00176-5. E-pub ahead of print.

Introduction

The proportion of elderly people is steadily increasing worldwide [1]. In Sweden, a 50% rise in the number of people aged 80 years or older is anticipated over the next decade [2]. Simultaneously, the use of multiple drugs, i.e. polypharmacy, has increased [3, 4]. Although polypharmacy may be justified in some cases, the use of multiple drugs increases the risk for drug-related problems; a very costly and common cause of hospitalization especially for elderly patients [5, 6], who also have a high risk of re-admission and preventable adverse drug events after hospital discharge [7, 8]. Medication errors may lead to preventable adverse drug events [9, 10], and such errors are frequently noted for elderly in care transitions [11]. Accordingly, care transitions are targeted by the World Health Organization (WHO), as a prioritized area in need of urgent action to increase medication safety in its' global patient safety challenge on medication related harm [6]. Patient harm in care transitions may result from poor communication and information transfer [12], this commonly occurs by means of a discharge summary from the hospitals to primary care [13-16]. Medication reconciliations and an accurate discharge summary with medication list help to decrease the number of medication errors as well as health care consumption [17-19]. However, deficits in the quality and transfer of discharge summaries are common [14, 16, 20, 21]. To be of full benefit, the discharge summary must be adequately written, transferred, received and used for medication management by the patient and nurses in municipality care when applicable, as well as for follow-up in primary care. Increased knowledge concerning how this works at discharge is an essential piece of the puzzle when it comes to the urgent task of improving medication safety for elderly in care transitions.

Drug treatment of the elderly

Drug treatment of the elderly is complex due to age-associated physiological and pharmacokinetic changes such as an increased proportion of body fat and decreased liver and kidney function, which affects the distribution of the drug in the body as well as its elimination [4, 22]. In addition, pharmacodynamic changes in, for example, the brain, the blood pressure regulation and the gastrointestinal tract render

the elderly more sensitive to drugs in general. Moreover, elderly patients also commonly suffer from comorbid conditions as well as the tendency to have multiple drugs [4, 22]. Thus, choosing the most appropriate treatment and ensuring careful evaluation and follow-up is essential.

Polypharmacy

The most common definitions of polypharmacy are the use of five or more drugs or simultaneous use of many drugs [3, 4, 23, 24], although no unified definition exists [3]. Maher et al. described polypharmacy as the use of more drugs than is medically necessary [25], and the importance to differentiate between appropriate and inappropriate polypharmacy has also recently been emphasized [3]. Thus, the number of drugs does not always reflect the quality of the medication use [4], and polypharmacy is sometimes clinically appropriate.

Polypharmacy is common worldwide as well as in Sweden [23, 26]. Out of all individuals residing in Sweden aged 65 years or older, a total of 44% use five or more drugs [26]. Twelve percent use at least ten drugs [26], noted for more than one-third of nursing home residents [4, 26]. The increase in polypharmacy is due to the aging population suffering from more diseases [4, 23, 25], as well as the emergence of new medical treatments [4]. However, as stated by the Swedish National Board of Health and Welfare, treating every disease individually rather than adopting a holistic approach as well as lacking information transfer regarding medication in care transitions are also contributory factors to polypharmacy [4]. The same applies to routine prescription of drugs without adequate review and/or lack of follow-up [4, 24]. Hence, risk-benefit analysis of the drug treatment, as well as continual follow-up including evaluation of effect and side effects are important measures to prevent inappropriate polypharmacy [4].

Polypharmacy increases the risk of medication non-adherence as well as patient harm due to drug interactions, medication errors and adverse drug events thus leading to significant health care costs as well as reduced quality of life and reduced functional capacity for the patients [4, 6, 23, 25]. As elderly patients are at particularly high risk of such drug-related harm, polypharmacy in elderly signals the need of devoting greater attention to the medication list, notably in care transitions [23, 24, 27].

Pain treatment

According to the National Board of Health and Welfare, many elderly are prescribed pain medications continuously without regular review, which may lead to persistent treatment without clear indication and risk of side effects [4]. However, pain is

common in the elderly [22], and under-treatment is also frequently noted, especially among nursing home residents and patients with cognitive deficits [28, 29].

Non-pharmacological pain treatment alternatives such as appliances and physiotherapy should always be primarily considered [4]. Pharmacological pain treatment in the elderly is complicated and requires careful follow-up and evaluation [4, 30]. Mild to moderate musculoskeletal pain in elderly patients should primarily be treated with paracetamol [31]. When further pain treatment is needed concerning moderate to severe persistent pain, opioids may be added while monitoring possible side-effects [31].

Multidose drug dispensing

Multidose drug dispensing (MDD) means machine-dispensed disposable sachets in which drugs are packaged according to the time of administration, which may suit patients on stable medication in need of medication management assistance [32]. In Sweden, eight percent of the population aged 65 years or older use MDD [26]. Using the MDD system provides a good overview of the patients' medication as it comprises a common electronic medication list for all prescribers. However, MDD use has also been associated with polypharmacy, poorer drug quality and fewer changes in drug treatment [26, 33, 34].

Medication discrepancies and errors

Although the definition varies, a medication error is basically a failure in the treatment process with potential to harm the patient [35]. Medication errors can be categorized based on stages of medication use (such as prescribing or administrating) or according to the type of error (such as wrong drug or dose) [9, 36]. Equally, medication discrepancies do not have a universal definition [37] although they commonly include a broader range of inconsistencies.

Medication error, according to type, often refers to unintentional addition or omission of a drug, or incorrect daily dose [11, 15]. In addition, a medication discrepancy often also includes incorrect details on mode, frequency, timing or duration of medication [38-40].

To identify discrepancies, the current medication list is preferably compared to a gold standard list or a Best Possible Medication History (BPMH); this means an extensive history of all medication use derived from various sources of information [37]. The process of identifying and clearing up medication discrepancies is known as medication reconciliation [40] and aims to result in an accurate, complete and up-

to-date medication list. Although the effectiveness of medication reconciliation interventions has not been clearly proven [41], reductions in readmissions, -visits to the emergency department as well as hospital revisits due to adverse drug events have been noted [42].

Medication discrepancies and errors are common in care transitions [11, 43, 44]. Polypharmacy, as well as poor communication and coordination of care, are important risk factors of medication discrepancies and errors [36, 45, 46], which contribute to considerable drug-related harm worldwide [10, 36, 47]. The WHO stresses the need to focus on the care of elderly populations as well as the need of further research to understand the causal factors of medication discrepancies and errors and create a basis for targeted interventions [36].

Adverse drug events

An adverse drug event (ADE) is any injury due to a drug [6, 9, 10]. ADEs are commonly divided into potential, preventable and non-preventable ADEs. At least one-third of ADEs are associated with medication errors [10]. Potential ADEs are medication errors which are corrected or intercepted, thus not resulting in any harm [6, 9, 10]. Medication errors may, however, lead to preventable ADEs, while non-preventable ADEs are not due to an error in the medication process [6, 9, 10]. Non-preventable ADEs constitute adverse drug reactions (ADRs); which according to the WHO definition is “a response to a drug which is noxious and unintended and occurs at doses used in humans”, such as an allergic reaction [6].

ADEs are a common cause of emergency department visits and hospitalizations, of which many are avoidable [48, 49]. Elderly with polypharmacy are at particularly high risk of serious ADEs [48, 49]. Accordingly, one in ten hospital admissions of elderly are associated with ADEs, commonly due to cardiovascular, central nervous system drugs or NSAIDs [5]. Preventable ADEs are also common after discharge, hence why adequate follow-up is essential to prevent readmissions and patient suffering [8].

The consequences of medication errors and adverse drug reactions are commonly referred to as drug-related problems; defined by the Pharmaceutical Care Network Europe as “an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes” [50]. The causes of drug-related problems are often related to the drug and its use, but also to the patient or patient transfer [50].

Care transitions

Care transitions occur when a patient moves between health care facilities or settings or to and from their home [51, 52].

Adverse drug events, readmissions and patient dissatisfaction are common problems in care transitions [51-53], and patients with many drugs and multiple diseases, such as many of the elderly, are especially vulnerable [6, 53].

Lacking information transfer and communication between hospital and primary care are major contributory factors to incidents in care transitions [12]. Hence, better communication including standardized, timely discharge documents of high quality, especially with regard to medication information, medication reconciliation at transitions as well as ensuring adequate follow-up are crucial actions needed to improve care transitions [51-53]. These measures were also identified as most effective in a systematic review on interventions to improve patient discharge from hospital to primary care [19]. The interventions lead to a reduction in hospital use (such as emergency department visits and re-hospitalization), enhanced continuity of care (such as completeness and timeliness of discharge summaries) and improved patient status (such as satisfaction and medication adherence) after discharge [19]. Further research to examine the attitudes of the health care providers was suggested [19].

Discharge summary

A discharge summary is a document describing the reason for hospitalization, an overview of the hospital stay and a medication report describing any medication changes as well as an accurate medication list [15, 20, 54]. The discharge summary is commonly given to the patient and sent to the next care giver, i.e. primary care. The aim of the discharge summary is to ensure accurate communication between health care providers as well as with the patient, in order to decrease the risk of medication errors and drug-related problems upon patient discharge from hospital [54]. Indeed, a discharge summary with an accompanying medication report has been shown to clearly decrease the risk of medication errors for elderly patients, including errors with considerable clinical risk [17]. Consequently, the use of a discharge summary also reduces care consumption due to medication errors [17]. Correspondingly, the study results from van Walraven et al. suggested a reduced risk of re-hospitalization when patients were followed-up by a physician who had received a discharge summary [55].

However, in order to have such a positive impact on clinical outcomes after hospital discharge, the accuracy of the discharge summary is very important, especially in view of the medication report and list in the discharge summary generally constituting the sole medication information to primary care.

However, lacking quality and timeliness of discharge summaries including absent medication information has been widely noted [14, 56, 57], which discontents the GPs and negatively affects follow-up [20]. Further, the medication list in the discharge summary is frequently affected by varying degrees of medication discrepancies and errors according to several international studies [38, 45, 58-60]. In Sweden, a 32% medication error rate in the transfer of information was noted when the discharge summary was first introduced in 2005 [17]. In 2005-2006, a subsequent study assessing a structured pharmacist intervention to improve the quality of the discharge summary, noted a 27% medication error rate for the patients in the intervention group versus 37% in the control group when comparing the medication list in the discharge summary with the first medication list used by the community health care after discharge [15]. The most commonly noted discrepancy/error in many studies is drug omission [21, 58, 59], and the risk of a discrepancy or error seems to increase with the number of drugs [45, 59]. The varying study results may be due to different definitions of medication discrepancies and errors, as well as varying study designs and settings. Not all studies focus on elderly with many drugs; i.e. patients particularly prone to errors and adverse outcomes in care transitions. To our knowledge, there are no current studies describing neither the discharge summary transfer nor the medication discrepancy rate for elderly patients with multiple drugs in Sweden.

As a large number of medication discrepancies and errors may lead to patient harm [21, 60, 61], further efforts to improve the quality and accuracy of the medication information transfer with discharge summaries in care transitions are essential.

Views of the General Practitioners

In the Swedish National Board of Health and Welfare report on the role of the physician in the quality of medication in the elderly, poor information transfer was identified as an area in need of improvement, in order to ensure adequate follow-up of medication initiated during the hospital stay [62]. Nevertheless, according to a qualitative study, the GPs seem to vary in their views on the overall responsibility for the patient's medication list [63].

To supply proper follow-up in general, it was concluded from a systematic review that the GPs primarily wanted information on discharge medication including reasons for any change, follow-up plans and needs, information given to the patient

and results of tests including pending in addition to diagnosis and physical findings [20]. Another study, which included a large number of American GPs, reported that the "medication list with changes" was noted as the most important item in the discharge summary, followed by "list of diagnoses" and "treatment provided" [13]. However, these studies focused mainly on the content of the discharge summary, rather than its use. In an English study, GPs identified lacking medication reconciliation in care transitions, insufficient patient medication education and poor discharge summaries as the main causes of medication errors in primary care [64]. Poor communication between hospital physicians and GPs, as well as a lack of a follow-up structure, were identified as major causes of lacking continuity of medication changes for elderly patients after discharge in a Danish study [65]. To reach a more complex understanding and knowledge on obstacles and possibilities for optimal use of the discharge summary, further exploration of GPs perceptions would be of value.

Aims

The overall aim of this thesis was to study information transfer in general and medication information, in particular, in order to help increase medication safety for elderly patients in care transitions.

Specific aims:

- To examine medication in the form of pain treatment as well as medication follow-up in primary care for elderly patients during a period after discharge from orthopaedic care. (Paper I)
- To assess the transfer of discharge summaries from hospital to primary care both directly and through exploring primary care experiences, as well as the use of the information, i.e. the updating of medication lists in primary care electronic medical records after drug changes and making a patient chart entry regarding medication or its follow-up. (Paper II)
- To explore and understand GPs experiences, perceptions and feelings concerning the use of the discharge summary. (Paper III)
- To examine the medication discrepancy rate and types in discharge summaries for elderly patients with multiple drugs as well as associated risk factors. (Paper IV)

Methods

This thesis comprises three quantitative and one qualitative study. An overview of the studies is presented in Table 1.

Table 1.
Overview of the papers

Paper	Participants	Study design	Method	Data collection period
I	49 patients aged 75 years or older, with medication aid from municipality care or nursing home residents	Cross-sectional	Data collected from electronic medical records, nurses in municipality care and the MDD system	2014-2017
II	1.115 patients aged 75 years or older, using five or more drugs, enrolled at public primary care units 2. 107 primary care units	Cross-sectional	1. Data collected from electronic medical records 2. Electronic survey	2015
III	18 GPs and resident physicians in family medicine	Qualitative	Focus group discussions	2016-2017
IV	933 patients aged 75 years or older, using five or more drugs	Cross-sectional	Data collected from electronic medical records	2015-2016

Study settings and participants

All studies were conducted in Skåne county, a region in the south of Sweden that has ten hospitals, just over 150 primary care units and over 900 General Practitioners, and where almost 1.4 million (13%) of the Swedish population live (2019). The hospitals and the primary care units have separate electronic medical records that are not shared. Paper II and IV were part of a Swedish regional quality improvement project on routines for and content of the discharge summary [66].

On the day the patient is discharged, a discharge summary including a medication report summarizing which medication changes were made and why as well as a medication list should be printed from the hospital electronic medical records. The discharge summary is given to the patient as well as sent by post to the next care-giver, i.e. primary care, where it is scanned to the primary care electronic medical record. When applicable, the discharge summary is also sent to the nurses in municipality care. The discharge summary is partly electronically generated (data

elements such as the medication list, admission and discharge dates and the patient's name are automatically derived from the electronic medical records), while information such as the course of events during the hospital stay and the medication report is written by a physician. Information transfer also occurs via a medical case history; a medically detailed document on the hospital stay without any medication information that is intended only for the next caregiver.

Paper I

Inclusion criteria were community-dwelling patients with medication aid from nurses in municipality care and nursing home residents, aged 75 years or older, enrolled at two rural public primary care units, discharged from in-patient orthopaedic care (Figure 1). Exclusion criteria were patients who died or renounced medical aid from nurses in municipality care within two weeks after discharge.

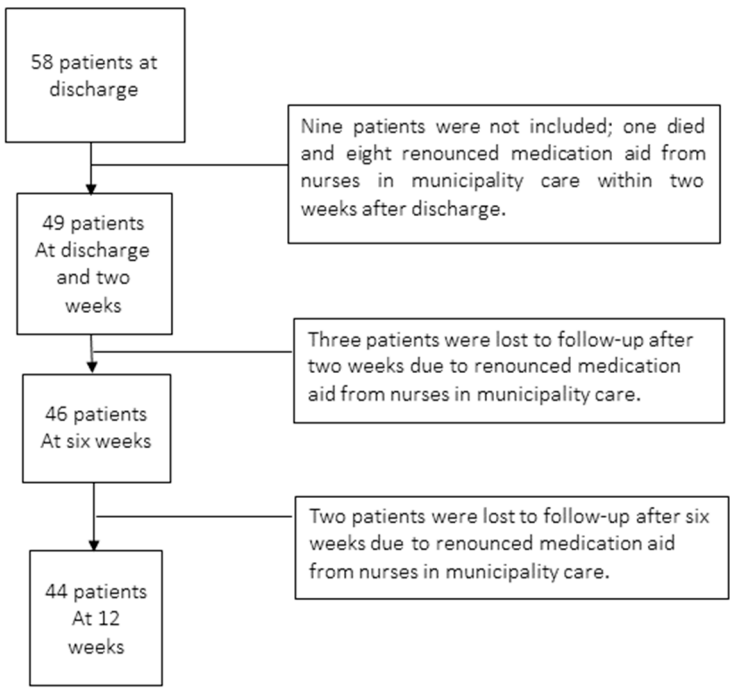

Figure 1
Inclusion flow chart paper I.

Paper II

For the primary care medical record review, inclusion criteria were patients aged 75 years or older with five or more drugs, enrolled at public primary care units, discharged from hospital during one week (Figure 2). Exclusion criteria were patients who died within two weeks from discharge. As the medication list in primary care medical records is commonly not used for patients with multidose drug dispensing, these patients were excluded from the research question regarding updated medication lists.

In addition, an electronic survey was sent to the heads of primary care units in the region. They were recommended to answer the survey in consultation with the chief physician who holds the overall medical responsibility since the head of the primary care unit is rarely a physician.

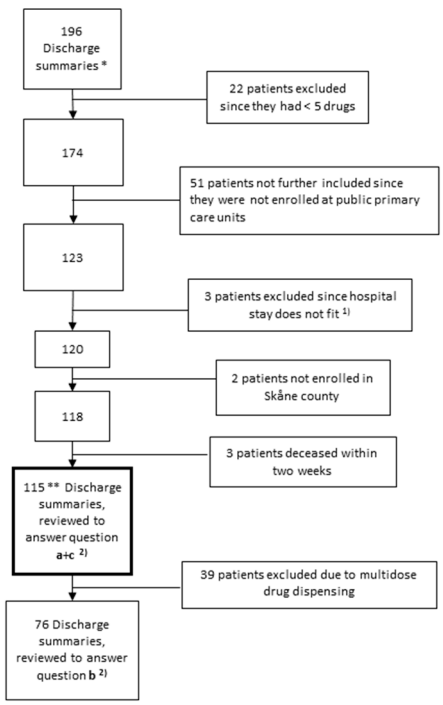

Figure 2
Inclusion flow chart paper II

Research questions referred to:

a. Is the discharge summary transferred from the hospital to the primary care electronic medical records?

b. Is the medication list in the primary care electronic medical records updated after drug changes during hospitlisation?

c. Is a patient chart entry regarding medication or its follow-up made in the primary care electronic medical records?

Paper III

We included 18 General Practitioners and resident physicians in family medicine. Focus groups were recruited from pre-existing groups ("FQ-groups"; an acronym for training and quality in Swedish), originally formed to ensure in-service training and quality development in family medicine by the professional and scientific college of GPs in Sweden (SFAM) [67]. For some years, all resident physicians in family medicine in this region are referred to a FQ group from the outset of their training, while GPs are otherwise generally members due to interest. We expected that the use of pre-existing groups would help to create a fruitful climate of dialogue. FQ-groups also include male and female GPs and resident physician of different ages with varying lengths of time in the profession, joined by their common experiences of working in primary care

Paper IV

Inclusion criteria were discharge summaries for patients 75 years or older with five or more drugs, discharged from hospital in Skåne county (Figure 3).

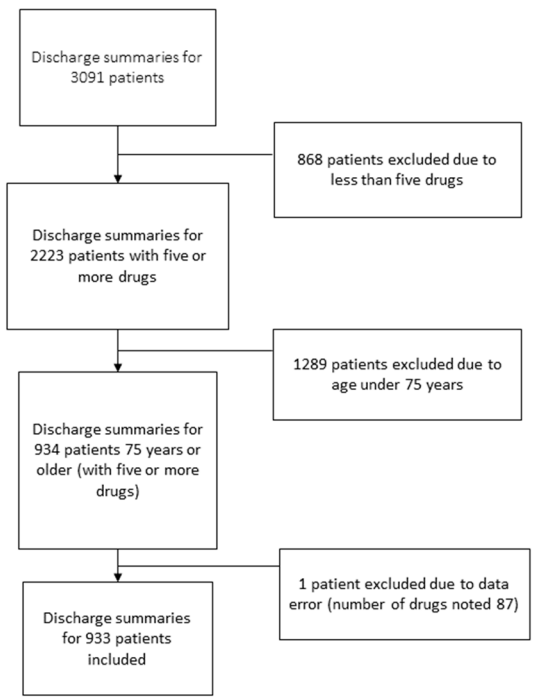

Figure 3
Inclusion flow chart paper IV

Procedure

Paper I

Primary care medical secretaries collected medical case histories for patients aged 75 years or older that were discharged from in-patient orthopaedic care. Further inclusion was based on electronic medical record review and communication with nurses in municipality care. By consulting the nurses at regular weekly meetings or by fax (according to usual practice), examining the electronic medical records as well as the medication lists in the multidose drug dispensing system, information on current pain medication prior to admission, at discharge as well as two, six and 12 weeks later was obtained. Residence status at discharge and whether the patient had a diagnosis of dementia was noted. Discharge planning regarding pain medication follow-up was sought in any hospital referrals and in the discharge summaries. Primary care pain medication follow-up plans were sought in the primary care electronic medical record. Paracetamol was noted as either regular or as-needed use. Both regular and as-needed use of slow-release and/or fast-acting strong opioids were noted. Other analgesic substances were collectively described as 'other pain medications'.

Paper II

We included all discharge summaries produced during one week in March 2015 in 28 different hospital wards. The primary care electronic medical record was reviewed to assess the transfer of the discharge summary as well as any notation of the medication or any related follow-up. Information on any drug changes was derived from the discharge summaries as well as other hospital discharge documents such as the medical case history and referrals.

The questionnaire for the electronic survey was developed by two of the authors (ÅB and SM) in association with the pharmacists participating in the overall regional quality improvement project (Appendix 1). The survey was conducted in September-November 2015, and included questions regarding the respondents' opinions about the transfer and content of the discharge summaries as well as possible current routines and use of the summaries. Questions included a 4-point rating scale and free-text space to leave optional extra comments.

Paper III

To explore and understand GPs' experiences and perceptions of the use of the discharge summary, data were collected via focus group discussions; a suitable method to explore experiences, perceptions and views of a group with shared knowledge and experiences [68, 69].

A total of four focus group discussions were conducted between December 2016 and February 2017 to reach saturation [68]. Altogether, 18 women and five men working in both rural and urban areas participated. Fourteen of the participants were GPs, and nine were resident physicians in family medicine. The selection of groups was mainly purposive and strategical to ensure a variation of gender, age, professional experience and working environment. Two groups consisted of only GPs, one group consisted of only resident physicians and one group was mixed. For clarity, all participants are referred to as GPs.

The semi-structured interview guide was developed by two of the authors (ELS and GC) (Appendix 2). The interview guide also involved a checklist that was used to ensure that relevant issues were touched upon. If a new issue emerged, the interview guide was revised between the focus group discussions.

Two of the authors (GC and ELS) conducted the focus group discussions. Two of the focus group discussions took place in primary care units. One focus group discussion took place in an administrative building that was connected with the hospital. One focus group discussion was conducted in the home of one FQ-group member, which was where they normally met.

The discussions were audio recorded and transcribed verbatim.

Paper IV

Random samples of discharge summaries were collected by pharmacists from 150 departments of all types (Appendix 3) from all hospitals in Skåne county. To identify any medication discrepancies, the pharmacists performed a comprehensive, retrospective medication history. First, they compiled an admission medication list as accurately as possible, this was done, by means of information from hospital electronic medical records on previous hospitalizations and outpatient care visits, previous prescriptions as well as the multidose drug dispensing system. Next, information on medication changes and adjustments from the current hospitalization was retrieved from the hospital electronic medical records including the discharge summary. The resulting, supposedly accurate, discharge medication list was compared to the medication information in the discharge summary. The following were defined and included as medication discrepancies: unintentional addition or omission of a drug, incorrect daily dose as well as incorrect details on mode or

frequency of medication. In addition, the medication discrepancy 'noted as temporarily stopped but should be taken' was also included. The discrepancy noted as 'inheritance of previous prescriptions' (i.e. adding all prescriptions in the electronic medical record from the patient's previous hospital stay) was equated with unintentional addition of drug.

The pharmacists also noted organizational factors such as department, patient-specific factors (including age, sex, number of drugs, multidose drug dispensing, discharge to home or nursing home and whether any medication changes were performed during hospitalization) as well as care-specific factors (including physician medical training level, whether discharge occurred on a weekday or on the weekend and whether a medication reconciliation or review was performed).

Included in the study were discharge summaries for patients aged 75 years or older with five or more drugs collected from May 2015 until May 2016.

Statistical analysis

The data were analysed using IBM SPSS version 22.0 and 24.0. Descriptive statistics (such as means, medians and measures of variability) was used in paper I-II and IV to describe the data. Chi-square, Fisher's exact test and t-tests were used to compare groups. The level of statistical significance was set to $p<0.05$.

Paper I

The non-parametric McNemar test was used to detect any change in proportion for nominal paired data. A sample of 40 patients was estimated to give enough data for descriptive analyses.

Paper II

Time-span and number of wards was based on the number of discharge summaries produced in the preceding year, but the number of wards was increased to compensate for the expected loss due to enrolment at private primary care units (approximately 40% of inhabitants at the time), which was not expected to affect the results. A convenience sample of 120 discharge summaries was estimated to give enough data for descriptive analyses.

Data from the electronic survey were quantified.

Paper IV

Sample size was determined by the available sample, which was estimated as more than sufficient for the planned statistical analyses. Univariate and multivariate logistic regression analyses were performed to identify independent variables associated with the occurrence of a medication discrepancy. Assumptions for multivariate binary logistic regression were met. Negative binomial regression was performed to assess the association between the independent variables and the medication discrepancy and error count.

Qualitative analysis

Paper II

The free-text comments from the electronic survey were analysed according to summative content analysis of the manifest data [70], which means that the content was grouped into categories.

Paper III

A qualitative content analysis of the manifest and latent content was performed by three of the authors (GC, ELS, SM) [69, 71]. The interviews were listened to and read through several times to gain a sense of the whole. Meaning units were identified and condensed. The material was initially briefly classified into tentative themes, inspired by Malterud [69]. Thereafter, it suited the material better to proceed with content analysis guided by Graneheim and Lundman [71]. After a preliminary categorization, the material was elaborated into sub-categories. Categories were finalized, framed by three overall themes. The analysis was confirmed by the other two authors (PM and ÅB). An example of the analytical process is shown in Table 2.

Table 2
Example of the analytical process paper IV.

Meaning unit	Sub-category	Category	Theme
Sometimes I feel vague... When information is missing, I feel I have to decide, because I hold the main responsibility for the patient, should she take this yes or no. (FG 1)	Main responsibility	Terminus/End station	Role of the GP
It would be good, or one would wish to be able to see the patient quite rapidly after discharge, to check quickly to make it right. (FG 4)	Follow-up		
After drug changes they (*i.e. hospital physicians*) forget to correct the multidose dispensed drugs . You have to change this very often, and they often make mistakes, in every other case. And this takes extra time for us to correct. (FG 4)	Clean up		

Ethical considerations

The Regional Ethical Review Board, Lund approved study III and IV. Study I and II did not require any ethical approval according to the Regional Ethical Review Board, Lund.

In study I and II, written approval for medical record reviewing was obtained from the heads of the primary care units. The use of the survey results in study II for research was approved by the head of the health-care organization. Participation was voluntary and the answers were analysed without risk of identifying any primary care unit nor individual respondent.

In study III, written informed consent was obtained from all participants. Participation was voluntary and the data couldn't be linked to any participant.

Study IV was also approved by the Regional Advisory consultation group for quality control and healthcare data registers.

Results

Pain treatment and its follow-up in primary care for elderly patients after discharge from orthopaedic care (Paper I)

A total of 49 patients were included, out of which 31 (63%) were nursing home residents. Fifteen patients (31%) suffered from dementia. Five patients were lost to follow-up at 12 weeks.

Nine patients (18%) had a discharge plan for gradual reduction of the opioid treatment. A primary care follow-up plan was noted for 15 patients (31%).

The proportion of patients prescribed paracetamol increased from prior to discharge to 12 weeks later, from 28/49 (57%) to 36/44 (82%). The proportion of patients prescribed opioids for regular use and/or as needed also increased over the same period, from 5/49 (10%) to 18/44 (41%). Details of the pain treatment are shown in Table 3.

Table 3.
Pain treatment prior to and after discharge from orthopaedic care paper I.

	Prior to admission (n=49)	At discharge (n=49)	Two weeks after discharge (n=49)	Six weeks after discharge (n=46)	12 weeks after discharge (n=44)
No pain medication (%)	18 (37%)	0	0	3 (6%)	7 (16%)
Paracetamol as-needed (%)	8 (16%)	5 (10%)	6 (12%)	10 (22%)	9 (21%)
Paracetamol regular use (%)	20 (41%)	43 (88%)	43 (88%)	32 (70%)	27 (61%)
Opioids as-needed (%)	2 (4%)	22 (43%)	24 (49%)	18 (39%)	13 (30%)
Opioids regular use (%)	5 (10%)	25 (51%)	22 (45%)	13 (28%)	12 (27%)
Other pain medications[a] (%)	8 (16%)	6 (12%)	8 (16%)	7 (15%)	5 (11%)

a. Tramadol, amitriptyline, pregabalin, prednisolone, gabapentin, paracetamol with codeine.

Patients with dementia were prescribed opioids as-needed to a significantly lesser extent as compared to patients without dementia; 2/15 vs 19/34 at discharge (p= 0.006) and 1/14 vs 12/30 at 12 weeks (p= 0.026). Nursing home residents were prescribed less opioids at discharge as compared to community-dwelling patients. This difference was noted both for as-needed (10/31 vs 11/18, p= 0.049) and regular opioid use (12/31 vs 13/18, p= 0.024).

Discharge summary transfer and use (Paper II)

Discharge summaries from 115 patients were included, out of which 47 (41%) were transferred to the primary care medical records after two weeks. Drug changes during hospitalization were noted for 51 out of 76 patients without multidose drug dispensing. For 16 out of these patients (31%), medication lists were updated in the primary care medical record. Patient chart entries on medication or its follow-up were noted in the primary care medical records for 53/115 patients (46%).

The response rate of the electronic survey was 107/151 primary care units (71%). Twenty-two respondents (21%) reported the discharge summary was often transferred on the day of discharge. A greater proportion (66%) noted the discharge summary was always/often transferred but later. More than half of the respondents (57%) indicated that the medication list update and patient chart entry was always/often done upon receipt of the discharge summary. Yet even more respondents (68%) indicated this was not done until the patients' next planned contact. Although the majority of the respondents (87%) said the discharge summary was always/often of great help for medication follow-up, almost half (42%) reported that reason for drug change was never/seldom present in the medication report and one-third (31%) noted that drug indication was never/seldom indicated in the medication list. After drug changes during hospitalization, three quarters of the respondents (73%) said the doctor would often/always follow-up treatment if needed.

The qualitative analysis of the survey free text comments resulted in three major categories concerning issues on 'Inaccuracies regarding medication, medication lists and the discharge summary', 'Care transitions information transfer and follow-up' and 'How to handle the discharge summary'.

GPs' experiences and perceptions of the use of the discharge summary (Paper III)

The GPs' experiences and perceptions of the use of the discharge summary were ambiguous. While the GPs truly appreciated an accurate discharge summary in particular regarding medication information, great deficits in the quality of the discharge summaries and lacking communication was also pointed out.

The overall final main themes (T) were: "Importance of the discharge summary", "Role of the GP" and "Create dialogue" with six categories (C) as well as subcategories in italics described below.

Importance of the discharge summary (T)

Benefits for the GP and perceived benefits for the patient (C)

Having an accurate *updated medication list* was often described as the main benefit of the discharge summary, but also knowledge of any *plans for the patient* as well as *shared knowledge* of responsibilities as described here:

> "The advantage for us when it exists and it is good, is that a well-informed patient who can follow the plan simplifies for us, who knows when something deviates and can act. In that way…the chance of things going right increases when the patient is informed."

The same applied for *knowing what the patient knew* and understood about their hospitalization. Some would describe the discharge summary as *mainly the patient's document*, of less use for the GP. There was also agreement regarding that the patients also benefited from *an accurate medication list*.

GP use of the discharge summary (C)

In line with the benefits noted above, the main use of the discharge summary related to its *information on medication*, and the wish for detailed information such as clear motivation for adding or withdrawing a drug was expressed. However, due to deficits in the quality of the discharge summaries, a high level of *distrust* was also expressed. This distrust could vary depending on where and by whom it was written.

> "If the patient has received care in the orthopaedic or surgical department, I reckon these are the drugs the patient has been given during the hospital stay, nothing else, it says nothing about the big picture."

When the medication list in the discharge summary had many discrepancies in regard to the medication list in the primary care electronic medical record, it was even described as "useless".

Lack of time was often stated as a reason for not fully using the discharge summary, often due to a great workload as noted here:

> "I don't always have time, sometimes the (medication) lists are so dreadfully long that I sort of…that it isn't done until the patient's next visit."

Significance of different documents (C)

The strictly medical *medical case history* was viewed as better than the discharge summary by many GPs. However, this does not include any medication information. Furthermore, a *referral* was often described as a pre-requisite for taking on the responsibility including initiating any follow-up of the patients.

Role of the GP (T)

Spider in the web (C)

The role of the GP entails having an overview of the patient including receiving and using information such as the discharge summary. This challenging and rewarding position was viewed as *a basic condition of being a GP*, as noted below:

> "Primary care holds the overall responsibility…they expect that from us, for us to be the spider in the web and make sure everything is done and done in the right way. The patients also believe…we have control."

> "/…/ the GP is the spider in the web somehow, we can think what we want, we have to do it anyway."

Being the *patient's interpreter* in regard to their care was also viewed as a key element of being a GP. Many GPs felt like *detectives*, searching information in various ways including by obtaining access to the hospital electronic medical record, which meant additional work.

> "There is no balance in this, we in primary care fight tooth and nail in all different systems to…to find the truth somehow. We have to work with this all the time, is is a prerequisite for us to be able to do our job, to be everywhere."

The need for *consistent information to the patient* from all different caregivers was also noted, to improve medication safety.

Terminus/End station (C)

In this category, the GPs described the distress of holding the *main responsibility*.

> "I feel it's quite hard sometimes actually.
> Yes, sometimes it would've been very nice to be able to say: Go to your GP!
> Yes, it feels like we are the last resort."

Some of the frustration came from having to *"clean up*", such as resolving outstanding items like updating the multidose drug dispensing system as well as other consequences due to lacking information transfer. Furthermore, improved early *follow-up* in primary care was believed to prevent adverse events.

Create dialogue (T)

Improved information transfer in care transitions(C)

The GPs expressed a wish for increased dialogue, for example by *participating in the discharge* of the patients although deemed impossible to apply in practice. A more feasible option discussed was to *formally acknowledge the discharge summary* before taking over the medical responsibility, which would increase the trust in the discharge summary as would the *information regarding any pharmacist medication review*.

The results described above have been clarified regarding levels of subheadings as well as italicizations since they are somewhat obscure in the published version of the study due to a problem of communication during the proof-reading process.

Medication discrepancies in discharge summaries and associated risk factors (Paper IV)

Discharge summaries for a total of 933 patients discharged from nine hospitals were included. Average age for all patients was 83.1, and 55% were women. Mean number of drugs was 11.4, of which nine were continuous drugs.

For all discharge summaries, a total of 812 medication discrepancies were noted (mean 0.87 per discharge summary, CI 0.76-0.98), of which 530 for continuous use

drugs and 282 for on demand drugs. The discrepancies were noted for 353/933 patients (38%), with a median of two discrepancies for these 353 patients (interquartile range 1-3). No discrepancies were noted for 580 patients (62%).

Out of all discrepancies, addition of drug was the most common type (Table 4), of which 59% (206/347) were inherited prescriptions from a previous hospital stay.

Table 4
Types of all medication discrepancies noted in the discharge summaries, n (%).

	All drugs (n=812)	Continuous use drugs (n=530)	On demand use drugs (n=282)
Unintentional addition of a drug	347 (43%)	224 (42%)	123 (44%)
Omission of a drug	268 (33%)	150 (28%)	118 (42%)
Incorrect daily dose	146 (18%)	108 (20%)	38 (13%)
Missing information on temporarily stopped drugs	27 (3%)	27 (5%)	0
Incorrect details on frequency	12 (1.5%)	12 (2%)	0
Incorrect details on mode	12 (1.5%)	9 (2%)	3 (1%)

The most commonly involved medication groups according to the Anatomical Therapeutic Chemical (ATC) classification system [72] main groups were Nervous system (229/812, 28%), Alimentary tract and metabolism (139/812, 17%) and Cardiovascular system (115/812, 14%) drugs. The most commonly involved therapeutic subgroups were analgesics (150/812, 19%), drugs for constipation (62/812, 8%) and psycholeptics (54/812, 7%). The most commonly involved substances were paracetamol (74/812, 9%), oxycodone (39/812, 5%) and furosemide (37/812, 5%).

According to the final multivariate binary logistic regression analysis, multidose drug dispensing (adjusted OR 3.42; CI 2.48-4.74, $p<0.001$), increasing number of drugs in the discharge summary (adjusted OR 1.09; CI 1.05-1.13, $p<0.001$), discharge from the department of surgery (adjusted OR 2.96; 95% CI 1.55-5.66, $p=0.001$), or the department of oncology (adjusted OR 3.86; 95% CI 1.24-12.1, $p=0.02$) significantly increased the odds of at least one medication discrepancy or error in the discharge summary. A decreasing odds of a medication discrepancy or error was associated with an increasing number of drug changes (adjusted OR 0.93; 95% CI 0.88-0.99, $p=0.017$). The identified risk factors were also significantly associated with the number of medication discrepancies and errors in the negative binomial regression.

Discussion

This thesis shows that information transfer with discharge summary is dissatisfying in terms of transfer, use and medication information quality, which is also reflected in the experiences and perceptions of the GPs, although an accurate discharge summary regarding mainly medication information and follow-up is clearly viewed as beneficial. Furthermore, the examination of a common medication management situation in primary care suggests that persistence of pain treatment is common when elderly patients are discharged from orthopaedic care while medication follow-up plans are not.

Transfer and use of the discharge summary

Adequate transfer to primary care is essential for full usage of the discharge summary. However, this was only seen for less than half of elderly patients with multiple drugs (paper II) corresponding to transfer rates at two weeks in a recent review [56]. In this review, although a large proportion of discharge summaries were available at four weeks, a median of 9% were never transferred to primary care [56]. Albeit lower than suggested by the survey respondents, of which more than one-third noted that the discharge summary was never/seldom received (paper II), the range from the included studies was 5-38% [56]. A previous review noted an even poorer discharge summary transfer, which often affected the quality of care in follow-up visits and discontented the GPs [20], who generally prefer transfer on the day of discharge or within a week [20, 56, 73]. The absence of a discharge summary often meant the patient and her relatives had to provide information concerning the hospitalization [20]. Such unsystematic information from different sources may be difficult for the GP to assess and use.

Patient chart entries regarding medication or its follow-up signal an active stance being taken regarding the discharge summary, but were only seen for every other patient (paper II). Even though the discharge summary is scanned into the primary care EMR, failure to update the medication list means uncertainty concerning which list that is correct. Although nearly two-thirds of the respondents noted that they always/often updated the medication list/made patient chart entries when the discharge summary was transferred, only one third of medication lists were actually

updated in primary care EMR after drug changes during hospitalization. Our results are well in-line with a Dutch study in which one third of in-hospital prescription changes was not or incorrectly documented in the primary care EMR [74]. An accurate medication list is essential to assess the patient's symptoms as well as the risks and effects of treatment [75]. Failure to update the medication list may also increase the risk of errors upon a patient's admission to hospital. Although many respondents noted that the discharge summary was of great help for medication follow-up, many also reported deficits such as lack of reason for drug changes (paper II). Hence, the extent to which the GPs update the medication list may depend on the quality of the discharge summary. Further, lack of time was identified as a barrier for optimal use (Paper II-III); this was also noted by the GPs in a Swedish National Board of Health and Welfare report as an essential factor in caring for the elderly, negatively affecting follow-up [62]. The importance of the direction to allocate resources including sufficient time to signal the significance of this issue was emphasised [62]. Lack of time and relationships with other physicians as well as a high incidence of medication discrepancies were also identified by Jones et al as care transition challenges [76]. Hence the importance of a high quality discharge summary worth spending time on using is crucial. Our participants also stressed the need of a formal referral for any follow-up, and one-quarter said they would seldom follow-up drug changes if needed (paper II-III). This may reflect upon a heavy work burden. Nevertheless, the GP is responsible for medication follow-up after discharge with a medication report [77], and patient safety should be a major priority for all physicians. The discharge summary was also viewed to be of great help regarding communication with the patients by providing shared knowledge of what had happened during hospitalization (paper III), which may also contribute to patient safety.

Quality of the discharge summary

The GPs perceived accurate medication information as the major benefit of the discharge summary (paper III); this corresponds well with the needs and views of GPs expressed in previous studies [13, 20, 73, 78]. However, major discharge summary quality deficiencies were noted in a review from 2007, including frequently lacking discharge medications [20]. Similar deficits in discharge medication information were also widely noted in other studies [13, 14, 20, 57]. The discharge summary aims to prevent errors in transfer of medication information and is the only medication information primary care receives in Skåne, hence its quality is of high importance. However, we noted a 38% discharge summary medication discrepancy rate (paper IV) and this is similar to previous international studies [79-81]. In a recent Australian study of a slightly different discharge procedure,

discrepancies were noted in more than half of the electronic discharge summaries [60]. A higher discrepancy rate (66%) was noted in an Irish study which, however, included a wider range of inconsistencies [21], although a similar proportion was noted in another European study [82]. An even higher proportion of discharge medication discrepancies (87%) was recently noted in Denmark, mainly for regular medications although OTC medications were also included [45]. The study was conducted at a single hospital and included an extensive review of the entire shared EMR, possibly influencing the results [45].

The varying medication discrepancy rates in different studies may be due to varying definitions, study designs, study populations and settings. Neither medication discrepancy nor error has one unified definition, and the terms are sometimes interchangeably used thus making comparison difficult. Some studies define medication errors as unintentional medication discrepancies [80, 81, 83], and the medication discrepancies in paper IV largely correspond to what are often described as types of medication errors [44]. Despite this heterogeneity, it can safely be said that the quality of the discharge summary including the medication information is frequently affected by considerable shortcomings, which was also well reflected by the distrust the GPs expressed in paper III.

Whereas drug omission is reported as most frequent in many previous studies [38, 60, 79, 82], unintentional addition of a drug was the most common medication discrepancy type in our study (paper IV). Most of these were inherited prescriptions from previous hospitalisations, which may imply a risk with integrated e-prescribing systems where outdated information can easily be re-used when a patient is admitted to hospital. Indeed, admission medication histories are frequently affected by both omission and addition errors [44], which may persist until discharge.

In total, the highest number of discrepancies occurred for central nervous, alimentary tract and metabolism as well as cardiovascular drugs (paper IV); this is consistent with findings in previous studies [11, 45, 59, 79] and likely some of the most common drugs for these patients. The most commonly affected medication group was analgesics, which have a high risk of side effects for elderly patients and need careful monitoring [84]. Still, lack of follow-up plans regarding analgesics for elderly in primary care was noted in paper I, which may reduce the chance of detecting any medication discrepancies.

Identified risk factors for the presence and number of discrepancies included multidose drug dispensing (MDD) and increasing number of drugs (paper IV). The association between increasing number of drugs and discrepancies is consistent with several other studies [21, 45, 79, 82], and corresponds well with the relation between polypharmacy and drug-related problems [4, 23, 25]. The association between MDD and medication discrepancies is previously noted [11]. The importance of an adequate discharge summary medication list may be disputed for these patients

since drug changes also should be carried out in the electronic MDD system. However, the lack of such changes being performed was described by the GPs (paper III). Accordingly, these patients are at risk of having no accurate medication information, as are the GPs. Our results support previous findings of MDD as a clear risk area regarding drug safety for elderly patients [33, 85] despite its original intent.

The distrust expressed was also related to by whom and where the discharge summary was written (paper III). However, physician medical training level did not affect the medication discrepancy rate (paper IV), in-line with an Australian study [59]. A medication discrepancy was more likely to occur for patients discharged from surgery departments (paper IV), for unclear reasons, but surgery included a wide range of departments (Appendix 3). In contrast, medical discharge summaries in a previous study had more errors than surgical summaries [61]. The medical patients had more medication changes [61] shown to be associated with discharge medication errors by Salanitro et al [80], which is in contrast to our findings. However, their study population was younger, had a higher number of drug changes and were all admitted due to acute cardiac disease. It is possible that drug changes draw the physician's attention to the medication list and thereby increase its accuracy, for example by the physician noticing and ending inherited prescriptions -a substantial contributory factor to medication discrepancies in our study (paper IV).

Consequences of deficit medication information transfer in care transitions

The high proportion of medication discrepancies and errors noted in discharge documents are disquieting as 20-80% were judged as potentially harmful, i.e. clinically significant with risk of causing adverse effects [60, 79-82]. An Irish study noted that post-discharge medication errors were common, often potentially harmful and mostly consisted of persisting discharge prescribing errors [86]. The error types most likely to persist after discharge were equivalent to the discrepancies in paper IV, which underlines the importance of identifying and rectifying such errors. ADEs are indeed common after discharge [8], even more so for older patients [87]. The risk of ADEs increases with the number of drugs, and many are preventable for example by better follow-up [8, 87], especially for high-risk patients such as those with multiple prescribers and hospitalisations [7].

Deficit medication information communication at discharge has been shown to contribute to preventable ADEs and readmissions for elderly patients [88], and led to medication errors in a study from Norway; errors which were often potentially harmful when assessed according to a National Index for Categorising Medication

Errors [89]. However, a large American study showed no association between direct physician communication, the presence of a discharge summary or GP awareness of the hospitalisation and mortality, emergency department visits or readmissions [90]. Still, non-significant reductions in the composite outcome was noted for direct communication and discharge summary availability. In addition, the patients were younger, and the number of drugs was not noted.

Overall, the deficits in the quality and transfer of the discharge summaries noted in papers II-IV affected its usefulness, which was reflected in the views of the GPs. A low-quality discharge summary arriving late or not at all implies a risk of negatively affecting medication safety for elderly patients with multiple drugs who often require prompt follow-up in primary care to decrease the risk of drug-related problems and harm post-discharge. Although communication flaws are not the single reason for poor outcome, improvements would likely be beneficial for patient safety.

Aspects of improving patient safety in care transitions

To maximise the benefits of the discharge summary, improvements in all essential steps of this information transfer are desirable (Figure 4).

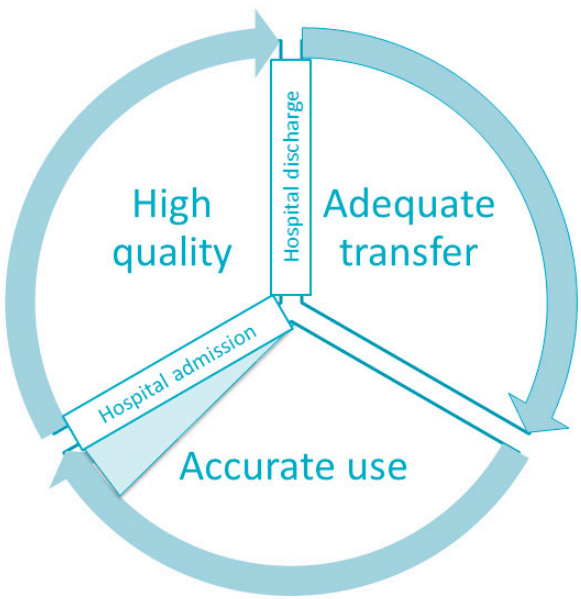

Figure 4
Essential steps for maximum advantage from information transfer with discharge summary.

Based on their experiences and perceptions of the use of the discharge summary, the GPs wished for improved communication (paper III), similar to a study including both hospitalists and GPs [76]. Shared EMRs, direct access to one another and greater efforts in coordinating care for high risk patients were suggested [76]. While a new Swedish law aiming to encourage cooperation between care-givers including more primary care participation in discharge and follow-up came into effect in early 2018, it is unclear to what extent this has been achieved. Regionally, the discharge summary quality improvement project [66] has led to further education for hospital physicians on how to use the prescription systems as well as the creation of an information leaflet with practical tips on how to keep the medication list updated in the hospital EMR.

Health care information technology

Introduction of electronic discharge summaries seems to ameliorate their *transfer* and timeliness but not clearly their quality [20, 56]. A shared EMR would help the GPs in their crucial coordinating role (paper III), and enable making discharge summaries easily available to the GPs, who must however still be notified of the discharge [56]. However, the GPs already described seeking information through multiple sources, which clearly suggests failure of information transfer with the discharge summary (paper III). Such "detective work" means spending a lot of time searching for information that should be available in the discharge documents intended for primary care. Even though being the spider in the web was described as a basic and often pleasant condition of being a GP (paper III), frustration was also expressed, possibly related to the increase in workload that such deficient information transfer brings. Still, a shared EMR is obviously an important means of improving communication [62].

Unlike Skåne, shared electronic medication list are used within most Swedish counties, and a much-anticipated shared national medication list will be introduced during 2020 and will be in full use by 2022. However, in a large study of elderly patients with multiple drugs, care transition reconciliation errors between the BPMH list and prescriptions were common despite shared EMRs [79]. It was concluded that integration of medical records is necessary but not enough to prevent such errors; the records still require careful review and medication reconciliations and routine pharmacist participation are also much-needed. Similarly, a recent Danish study noted no difference in the discharge medication discrepancy rate after the introduction of a National shared electronic medication list, although this system was not yet in use by all GPs [45]. Previous Swedish studies have also noted frequent discrepancies between the patients' intended medication regimen and the medication list despite shared EMRs [91, 92]. Hence, to be of value, a shared

medication list must be kept rigorously accurate [62]. The GPs have an important and crucial role to play by taking the main responsibility for this challenging task.

Medication reconciliations and pharmacist involvement

Medication reconciliations identify and correct medication discrepancies and errors in care transitions [81], and are strongly supported to enhance patient safety [79, 93, 94]. Yet, pharmacist medication reconciliation or team-based medication review during hospitalization did not affect the likelihood of a medication discrepancy in our study (paper IV). However, these were only performed for a small proportion of patients and not in immediate association with discharge. Also, the *quality* of the discharge summary was viewed as higher when information regarding any pharmacist medication review was included (paper III), in-line with the GPs in a Dutch study [73]. Medication improvement and improved transfer of medication related information due to pharmacist involvement at discharge has been previously widely noted [15, 95-99]. The importance of clear and complete medication information including results from any medication reviews in discharge summaries was emphasised in the study by Freyer et al [96], well in-line with the views of the GPs in our study (paper III). In addition, pharmacist BPMH at admission also reduces medication discrepancies [100]. However, although it is clear that medication reconciliations decrease the risk of medication discrepancies and errors in care transitions, the effect on post-hospital ADEs and healthcare utilisation are not unanimous [42, 101]. Mekonnen et al noted significantly reduced risks of ADE-related hospital revisits and readmissions [42], while only non-significant reductions were noted in another recent review solely including RCTs [101].

All in all, increased pharmacist involvement is clearly of benefit for improved medication safety at several points of care transitions, in particular for certain risk patients such as elderly patients with multiple drugs.

Role of the GP including follow-up

The discharge summary should be *used* to reconcile and keep medication lists accurate. Yet, only 16% of medication lists in the primary care EMR were updated and correct after a recent visit to the GP according to a Swedish study [102], which conflicts with the results from the survey in which many respondents noted they would update the medication list when the discharge summary was received or at the patient's next contact (paper II). However, optimal use of the discharge summary presupposes that the heads of the primary care units create the necessary conditions required. The importance of an accurate discharge summary was also reflected in the description of the GP role as the patients' interpreter who explains certain aspects of the care as well as follow-up directives, which may facilitate the care

transition (paper III). However, discharge summaries commonly lack follow-up plans despite being perceived as beneficial by the GPs (paper III) [20, 56]. Also, such follow-up does not seem to occur in a standardised manner, which may affect both the updating of medication list as well as revision of the medication negatively.

The importance of follow-up is well-known when it comes to pain treatment of elderly patients [84]. We noted that the use of paracetamol and/or opioids was still common 12 weeks after discharge while primary care pain medication follow-up plans were rather infrequent (paper I). Lack of follow-up may contribute to persistent treatment without clear indication with risk of side effects, potentially harmful polypharmacy and unnecessary costs. Opioid use one year after hip surgery was common in a recent comprehensive Danish study [103]. The patients in our study were elderly and many were nursing home residents. Such patients commonly use MDD, which was associated with fewer changes in drug therapy six months after discharge in a Swedish study of elderly patients with hip fractures [33]. The proportion of patients using opioids at 12 weeks in our study was in-line with hip fracture patients in a previous study [104]. In contrast, considerably fewer new opioid users still used opioids at six months in a Swedish study, which however focused on younger patients with tibia shaft fractures [105]. Nonetheless, persistent pain in elderly fracture patients has also been previously noted [106, 107]. However, if pain remains for more than three months, opioid treatment should be reduced and ended and the patient referred to multidisciplinary treatment if needed [108], as chronic pain management requires a holistic rehabilitative approach rather than solely focusing on drug treatment [109, 110]. Many patients in our study also still used paracetamol at 12 weeks. Although still the first-line analgesic in nociceptive pain [84], both safety and efficacy concerns regarding paracetamol have emerged [111, 112] and continued use without clear indication is inappropriate.

Patients without any follow-up or gradual reduction plans also reduced their pain medication use, although it is not clear how and by whom this was carried out. Pain treatment in elderly patients requires continuous re-evaluation based on regular pain assessments as well as monitoring effect and side effects to avoid both under- and over-treatment, and should not be left to chance.

Strengths and limitations

A diversity of methods was used, of importance for the doctoral studies but also to provide a fuller picture of different aspects of the information transfer.

The main overall strength of this thesis is the primary care perspective, which is where these elderly patients are mostly cared for. Also, focus was generally on elderly with multiple drugs who are at high risk of drug-related problems in care transitions and need adequate follow-up and for whom further knowledge may help form the basis for interventions to improve patient safety.

All studies were performed in Skåne county, hence the generalisability to other counties or to other countries with shared EMRs is uncertain. However, comparisons with studies from various settings including those with comprehensive EMRs were done, to put our results in perspective. The patients' perspective is also lacking, which should be addressed in future studies.

Paper I: Limitations include the small study sample which partly reflects the challenges of conducting research in primary care, and that the results are derived from a limited number of GPs which may also affect the generalisability. Pain assessment was lacking, but this confirms the current situation where such assessment is not regularly carried out. Compliance with prescribed drug therapy is high for the included patients, which strengthens the validity of the data.

Paper II: It is possible that the time-frame of two weeks was too short to allow for medication list update and patient chart entries in the primary care EMR. However, the immediate post-discharge time-period is risky for these patients, and failure to make these updates may negatively affect patient safety. A strength of this study was the assessment of information transfer with both a survey and a medical record review.

Paper III: Although the aim of qualitative research is not to generalise, the views expressed are those of the GPs in this study. Our preunderstandings may have been of importance for the interpretation of the results, but the different perspectives of the authors and researcher reflexivity helped prevent our preconceptions to affect the process. To achieve trustworthiness, credibility was aspired by including participants of different age, gender and experiences, which was a strength. Triangulation was aimed for by all authors participating in the analysis process to various extents.

Paper IV: The strengths were the large study population and the structured collection of data including many factors of interest. As regarding limitations, information on all drugs, length of hospital stays and diagnosis were lacking, which may be of importance. In addition, potential harm was not assessed, which is an important next step.

Conclusions and possible clinical implications

- Persistent pain medication was common and follow-up plans were not always noted for elderly nursing home residents and community-living patients with medication aid after discharge from orthopaedic care (paper I). Regular follow-up including reconsideration of drug treatment as well as pain assessment would likely be of value for these vulnerable patients.
- Many discharge summaries were not transferred to primary care (paper II), which means the GPs did not receive any medication information, this may affect follow-up and possibly patient outcome negatively. The discharge summaries were insufficiently used for updating medication lists (paper II), partly due to lack of time, which may lead to incorrect medication lists and difficulties to assess the patient as well as risk of medication discrepancies and drug-related problems in care transitions.
- The use of the discharge summary was also affected by perceived quality deficits (paper II-III). Medication discrepancies were common for elderly patients, especially with multiple drugs and multidose dispensing (paper IV), which may also affect medication safety in care transitions. While an accurate discharge summary was very helpful for the GP regarding primarily medication information and follow-up, a late or even absent discharge summary with many discrepancies risks becoming "useless" and better communication in care transitions was desired (paper III).

Practical suggestions

Based on the findings of this thesis, some possible practical next steps are suggested:

- Secure electronic transfer could ensure timely delivery to primary care. Primary care confirmation of the information transfer prior to accepting the responsibility for the patient has been proposed [113] and might be of value. In the case of shared EMRs, making the discharge summary available for review by the GP before discharge may help prevent discrepancies.
- Routine notation in the electronic schedule of the GP (which describes the tasks that should be fulfilled during the day) when a discharge summary is received, could signal the importance of allowing adequate time to take a stance including updating the medication list in the primary care electronic record. Currently, this is just an 'invisible' task, competing with many other tasks, hence why it is up to the individual doctor regarding how the use of

the discharge summary is prioritised. It is essential that the heads of the primary care units signal the significance of this issue by supporting such improvement measures.

- Continued quality improvement projects including education regarding primarily the medication information in the discharge summary are likely to be of importance, as well as continued and increased pharmacist attendance. Patients with multiple drugs and/or MDD require particular vigilance, and awareness of the issue of "inherited prescriptions" should be promoted.
- Overall, accurate follow-up after discharge as needed including medication reconciliation for elderly patients with many drugs should be provided to enhance patient safety in care transitions, for example by forming primary care health services for the elderly (Äldremottagning). Ensuring accurate follow-up of pain management for elderly patients would also be of value, including regular pain assessment and GP reconsideration of the treatment at certain points in time on a routine basis.

Future research

Ongoing research includes a systematic literature review on collaborative care between GPs and pharmacists on cardiovascular risk factors in collaboration with an Australian research group, well in line with the scope of this thesis.

It would be of great interest to further explore the views of the patients, around whom this research circles, and also to evaluate the possible effects of using primary care health services for the elderly on, for example, medication list accuracy and prevention of adverse outcomes after discharge.

It is of importance to identify medication discrepancies and errors at high risk of causing harm and also assess the possible costs of poor communication in care transitions, as this may be important for future interventions.

Svensk sammanfattning

Bakgrund

Andelen äldre liksom användningen av många läkemedel (polyfarmaci) ökar stadigt. Polyfarmaci ökar risken för läkemedelsrelaterade problem. Äldre är särskilt känsliga för sådana problem, i synnerhet i övergångar mellan olika vårdformer såsom utskrivning från sjukhus till primärvård. Bristande kommunikation och läkemedelsfel vid informationsöverföring samt otillräcklig uppföljning i samband med vårdövergångar kan också bidra till läkemedelsrelaterade problem och dåligt utfall efter utskrivning.

En utskrivningsinformation beskriver vårdtillfället inklusive eventuella läkemedelsförändringar och innehåller en aktuell läkemedelslista. Den ska ges till patienten samt skickas till primärvården på utskrivningsdagen. En korrekt utskrivningsinformation motverkar läkemedelsrelaterade problem som orsakas av bristande informationsöverföring i vårdövergångar, men kräver optimal överföring och användning. Noggrann uppföljning är också ofta avgörande efter utskrivning från sjukhus, t.ex. av äldres smärtbehandling vilket är en vanlig och utmanande uppgift i primärvården.

Målet var att studera informationsöverföring mellan sjukhus och primärvård med särskilt fokus på läkemedel. Samtliga studier genomfördes i Skåne, där cirka 1,4 miljoner (13%) av Sveriges befolkning bor. I regionen finns tio sjukhus och cirka 150 vårdcentraler, med skilda elektroniska journalsystem.

Metod och resultat

I studie 1 undersöktes aktuell smärtbehandling och uppföljning i primärvården för 49 äldre patienter på särskilt boende (SÄBO) eller med hemsjukvård, efter utskrivning från ortopedisk vård. Andelen patienter som var ordinerade paracetamol ökade från 57% innan inläggning på sjukhus till 82% 12 veckor efter utskrivning, medan andelen som var ordinerade opioider (morfin) ökade från 10% till 41%. Plan från ortopeden avseende uttrappning av opioid-behandlingen sågs för knappt en femtedel, medan en tydlig plan för uppföljning av smärtbehandlingen i

primärvården sågs för en tredjedel av patienterna. SÄBO-patienter ordinerades opioider i mindre utsträckning än hemmaboende patienter.

I studie 2 undersöktes informationsöverföring till primärvården genom att granska överföring av 115 utskrivningsinformationer för äldre patienter med många läkemedel, samt huruvida läkemedelslistan uppdaterades och om någon journalanteckning om medicinering eller dess uppföljning gjordes i primärvårdens journalsystem. Dessutom undersöktes primärvårdens syn på informationsöverföringen via en elektronisk enkät som besvarades av 107 vårdcentraler. Efter två veckor hade färre än hälften av utskrivningsinformationerna överförts till primärvården. För patienter utan dosdispenserade läkemedel, uppdaterades en tredjedel av läkemedelslistorna i primärvårdens journalsystem efter läkemedelsförändringar under vårdtiden. En journalanteckning om medicinering eller dess uppföljning sågs för knappt hälften av patienterna. I enkäten uppgav två tredjedelar att utskrivningsinformationen brukade komma, men inte i samband med utskrivningsdagen. Över hälften uppgav att de ofta eller alltid uppdaterade läkemedelslistan och gjorde en journalanteckning när utskrivningsinformationen togs emot. Enligt färre än hälften angavs orsak till läkemedelsförändringar aldrig eller sällan i utskrivningsinformationen, och en tredjedel angav att orsaken till läkemedelsbehandlingen sällan eller aldrig angavs i läkemedelslistan. Trots det, uppgav majoriteten att utskrivningsinformationen alltid eller ofta var till nytta för läkemedelsuppföljning.

I studie 3 genomfördes fokusgruppsdiskussioner med primärvårdsläkare för att utforska deras erfarenheter och uppfattningar om användningen av utskrivningsinformationen, genom kvalitativ innehållsanalys som resulterade i tre övergripande teman: ’Utskrivningsinformationens betydelse’, ’Allmänläkarrollen’ och ’Skapa dialog’. Överlag sågs stora fördelar med adekvata och korrekta utskrivningsinformationer främst avseende läkemedelsinformation och uppföljning, men också stora brister i dess kvalitet vilket påverkade användningen och bättre kommunikation efterlystes.

I studie 4 undersöktes förekomsten av läkemedelsavvikelser och vilka faktorer som påverkar dessa i utskrivningsinformationer för 933 äldre patienter med många läkemedel. Läkemedelsavvikelser noterades i utskrivningsinformationerna för drygt en tredjedel av patienterna. Felaktigt tillagt läkemedel var den vanligaste avvikelsen, varav merparten var felaktigt tillagda ordinationer från tidigare vårdtillfällen. Läkemedelsavvikelserna påverkade framförallt smärtstillande läkemedel, laxantia, neuroleptika, lugnande och sömnmedel. Risken för förekomsten av en läkemedelsavvikelse i utskrivningsinformationen ökade för patienter med många eller dosdispenserande läkemedel samt vid utskrivning från kirurgisk avdelning, medan risken minskade för varje genomförd läkemedelsförändring under vårdtiden.

Slutsats och patientnytta

Studierna fokuserar på övergången mellan sjukhus till primärvården. Det är i primärvården som äldre patienter till största delen tas om hand. För ett gott omhändertagande i den sköra period som utskrivning från sjukhus innebär för dessa patienter, krävs optimal information. Dock identifierades brister avseende informationsöverföring med utskrivningsinformation både vad gäller dess kvalitet, överförande och användning, även om en korrekt och välskriven utskrivningsinformation upplevdes vara till stor nytta för Allmänläkarna. Dessutom hade många patienter fortfarande smärtlindring 12 veckor efter utskrivning från ortopedisk vård och plan för uppföljning av behandlingen var inte särskilt vanligt förekommande.

Resultaten bidrar till ett ökat kunskapsunderlag som kan möjliggöra riktade åtgärder för att förbättra informationsöverföring och uppföljning, vilket kan leda till en ökad läkemedelssäkerhet för äldre patienter i vårdövergångar. I förlängningen kan det bidra till minskade samhällskostnader och lidande för patienterna.

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Appendices (1-3)

Appendix 1. Survey on discharge procedures within primary care

1. The guidelines from the department of Medicines Management and Informatics primarily focus on inpatient care but the guidelines are also relevant for primary care.

Are these guidelines known within your workplace?

o Yes o Partly o No

2. How do you think the transfer of discharge information works in practice? The question concerns the discharge summaries transferred to the primary care unit. Estimate the extent to which the following statements are consistent with your experience.

A. The discharge summary is transferred on the day the patient is discharged.

o Always o Often o Seldom o Never

B. The discharge summary is transferred but not on the day the patient is discharged.

o Always o Often o Seldom o Never

C. The discharge summary is not transferred but the medical report is instead incorporated into the medical case history.

o Always o Often o Seldom o Never

D. The information in the medical report of the discharge summary is clearly written.

o Always o Often o Seldom o Never

E. The information in the medical report of the discharge summary is, as far as I can assess, reliable.

o Always o Often o Seldom o Never

F. The reason for any drug change is indicated in the medication report of the discharge summary.

o Always o Often o Seldom o Never

G. The information in the medication list is, as far as I can assess, reliable.

o Always o Often o Seldom o Never

H. Drug indication/specified use is indicated in the medication list.

o Always o Often o Seldom o Never

Comments:

3. To ensure the discharge summary is properly taken care of, routines to describe how the receiving staff should use it are important. How do you work within your unit?

A. The doctors have discussed and reached consensus on how to handle the transferred discharge summary.

o Yes o No

A. We have prepared local written instructions within our unit on how to handle the transferred discharge summary.

o Yes o No

Comments:

4. How does the use of transferred discharge summaries to the primary care unit work in practice?

A. The doctor in charge checks the medication list and the medical report, when the discharge summary is transferred to the primary care unit, to urgently detect any uncertainties/errors.

o Always o Often o Seldom o Never

A. If any uncertainty/error is detected, it is followed up by the doctor in charge for example by a telephone call to the hospital, the patient or the district nurse.

o Always o Often o Seldom o Never

B. The medication list is updated in the primary care electronic medical journal, and changes documented as journal entries when the discharge summary is transferred.

o Always o Often o Seldom o Never

C. The medication list is not updated in the primary care electronic medical journal, nor changes documented as journal entries until the patients next planned contact with the primary care unit.

o Always o Often o Seldom o Never

D. After drug changes during hospitalization, treatment is followed up by the doctor in charge if needed, for example by telephone contact with the patient or an extra visit at the primary care unit.

o Always o Often o Seldom o Never

E. The discharge summary is of great help for follow-up of the patient's medication treatment after the hospital stay.

o Always o Often o Seldom o Never

Comments:

Appendix 2. Interview guide paper III

Semi-structured interview guide

Overall topics:

Tell us about the discharge summary (DS), and how you use the discharge summary in your daily work?

Tell us about your opinions of the medication report and list; how can it be of use and how do you use it?

Check-list

Timeliness of the DS
Potential for improvement of the DS
Current routines for and opinions on how the DS should be received and used

Reliability and usability of the medication report and list
Medication information details (area of use, drug changes)
Information regarding any medication review
Potential for improvement of the medication report/list
Medication list update and medication follow-up in primary care (referral?)

Additions after focus group 1-3:
Knowing what the patient knows
The patient's perspective
Hospital electronic medical records
Content of different discharge documents

Appendix 3. Included departments paper IV.

Main department	Also including
Surgery	Urology, Breast surgery, Surgical emergency, Surgical gastrointestinal, Plastic surgery, Vascular surgery, Ear nose and throat, Gynaecology
Orthopaedics	Hand surgery
Internal Medicine	Internal Medicine emergency, Endocrinology, Renal, Rheumathology, Medical gastrointestinal, Hematology, Pulmonary medicine
Cardiology	
Infection Medicine	
Neurology	Stroke, Rehabilitation
Psychiatry	
Oncology	
Geriatrics	