Can The Use of Electronic Journal Systems Replace Human Intervention By The Medicine Reconciliation Process?

Master thesis in Pharmacy

André Huy Gia Luong

Centre for Pharmacy and

Department of Clinical Science

University of Bergen

Submitted in May 2016

Abstract

Can the use of electronic journal systems replace human intervention by the medicine reconciliation process?

By André Luong

Keywords: Medicine/medication reconciliation, electronic journal systems/records, pharmacist service, medication discrepancies, care transition

Background: The introduction of the national electronic journal systems is considered a solution to provide effective and correct up to date medication information for healthcare professionals and contribute to minimize the potential of error. Medicine Reconciliation (MR) is the process of obtaining and maintaining and accurate, detailed list of all medicines taken by a patient and using this list anywhere within the health care system to ensure that the patient receives correct medicines. This thesis aimed to determine whether the electronic records provide a sufficient accurate patient medication record to negate the need for human mediated MR.

Method: MR were conducted on patients at a Cardiologic bed ward from October 2015 until January 2016. MR were conducted by the IMM-method and documented medicine lists and discrepancies found between the hospital journal, electronic journals and a patient medication history interview. An expert panel consisting of two senior doctors and two pharmacists were asked to score the severity of the discrepancies using a validated scale.

Results: 36 patients were included in the study where the study population had a mean (SD) age of 69.8(9.7) and 36.1% were female. The mean (SD) number of drugs the patients used were 6.97(3.03). In this study, discrepancies were found in 72,2% for both the hospital journal and electronic journal systems. 30 (83,3%) of the patients had at least one discrepancy in either the hospital journal or electronic journal systems. For the hospital journals the mean number of discrepancies per list were 2,58, and 2,73 for the electronic journal systems.

Conclusion: There was no evidence of the impact of electronic journal systems on the medicine lists to negate the need for human intervention, and the existing process of care transition communication at the healthcare interface is not optimum. Evidence to support the MR intervention and IMM method is needed to conclude on the benefit of the service.

Table of contents

List of Tables

List of Figures

List of Commentary Boxes

Abbreviations

ATC:	Anatomical Therapeutic Chemical
IMM:	Integrated Medicines Management
PS:	Prescription Supplier
SCR:	Summary Care Record
MR:	Medicine Reconciliation
GP:	General Practitioner
NICE:	National Institute for Health and Care Excellence
NPC:	National Prescribing Centre
SD:	Standard Deviation
US/USA:	United States of America
UK:	United Kingdom
IT:	Information Technology

Glossary terms used in this thesis

GP:	The doctor who practice in a primary care environment (primary care practice)
ATC-system:	Classification system of drugs that categorise in all drugs in groups of five levels from which organ they affect (level 1) to their active substance (level 5)
PRN-drugs:	Drugs that the patient only use when needed
Compliance:	The degree to which a patient correctly follows medical advice
Adherence:	The extent to which a patient continues an agreed-on mode of treatment without close supervision
Intervention:	An act to change or improve
Medical curve:	List of the drugs/medication that the patient receives at the hospital, including an overview of drugs at admission
Primary Care:	The team of GPs and staff such as practice nurse, practice pharmacists, and receptionist who provide primary health care
Secondary Care:	The health service provided by medical specialists who generally do not have first contact with patients and usually delivered in hospitals

Acknowledgements

I would like to start with acknowledging the support and help of my supervisors Professor David Wright and Nina Carstens. I wish to thank them for guidance, encouragement, good discussions and great feedback throughout my whole thesis. Your excellent advice were only surpassed by your brilliant sense of humour. Without your contribution, this thesis would not appeared as it have today.

I would like to thank the staff at the Cardiologic bed ward 1 & 2 in Haukeland University Hospital for their warmest welcomes and helping me throughout my period at your ward. Of those, I wish to show my sincere thanks to the head of ward nurses for your guidance.

I would also give a special thanks to everybody that has contributed in connection to my thesis, from feedback to help with my applications.

I wish to thank all my friends inside and outside the University of Bergen (UiB) for five great years and the time of my life. Thank you for the great times and all your support throughout my student years. An especially big thanks to the pharmacy class of 2011, without you I would not enjoyed my time at UiB half as much as I have.

I am also thankful to all the staff at the Pharmacy Programme at UiB and UEA for the great learning and teaching experience that enhanced my academic life.

Finally, my gratitude is for my family for your unconditionally love, compassion, support and patience. You are the reason I am where I am today and without you, none of this would be possible. I love you dearly.

Bergen, May 2016

1. Introduction

1.1 Medication errors and consequences

Medication usage in Norway has increased by 15% the last 10 years and is the primary healthcare intervention used in western society(1). The total sale of medication in Norway increased in 2014 with 8,9 % from 2013, while 43 % of the population in 2012 got medicines on blue prescription(1). Medication therapy is an essential part of today's healthcare. According to the Norwegian Institute of Public Health, 69% of the population in Norway collected at least one drug on prescription in 2013(1). Even though drugs may improve health and reduce morbidity, it may also arise complications in connection to drug use. This is commonly referred to as medication errors or adverse drug events, and may be of harm to the patient and a threat to the patient safety.

The American US Food and Drug administration defines medication errors as "*Any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in control of the health care professional, patient or consumer. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing; order communication; product labeling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use."(2).* This definition is broad and includes errors from when the drug is produced until it is taken by the patient. Adverse drug events (ADEs) are defined as *"an injury resulting from the use of a drug. Under this definition, the term ADE includes harm caused by the drug (adverse drug reactions and overdoses) and harm from the use of the drug (including dose reductions and discontinuations and overdoses)"(3).* So even though ADEs results from the use of drugs, it does not have to be a result of medication errors.

A study in Norwegian Hospitals identified that 80 % of all patients had an average of 2,1 relevant adverse drug problems, and therefore managing the way that medicines are prescribed and administered to patient is of concern to patient safety(4).

Between 2008-2011, the Norwegian Board of Health Supervision registered 7756 reports about unwanted events, whereas 14% of these was related to adverse drug use(5). Adverse drug use are the cause of 12% of all patient harm and it was reported that at least 1000 patients die every year caused and related to side effects and adverse drug use(6). Noting that

the Centre for reporting relies on health personnel reporting errors, it is likely that the numbers are potentially underestimated and therefore poses a larger health challenge.

In Norway, the Directorate of Health reported that 5 % of acute hospitalizations is caused by side effects and adverse medicine use, and that half of these events and hospitalizations could have been avoided if the medicines management was improved(7). It is estimated that adverse or unfortunate medicine use increases 490 000 additional bed-days and 2 billion NOK every year(8).

Every seventh elderly patient are rehospitalised in Norwegian Hospitals within 30 days, and the Health Departments statistics show that total number of hospitalisations in Norway increased by 260 % from 2011-2014 from 23 969 to 84 269 hospital stays for discharge ready patients(9). These are patients that can either be taken care of the Municipal Health Care System or have received therapy and treatment that can be continued by the primary health care. The average length of stay for discharge ready patients has since 2011 been halved from 14,1 days to 7,6 in 2014, and the increased transition of patients between primary and secondary care provides an increased opportunity for medication errors(9).

As a result of the increased use of medicines, number of hospitalizations and number of medication errors it has become necessary to minimize errors when patients transfer between healthcare settings.

1.2 Definition of medicine reconciliation

In response to concerns about patient safety at health transitions medicine reconciliation (MR) was proposed as a solution from the Institute for Healthcare Improvement(10). The definition of MR varies among health professionals, but the Joint Commission, which is an USA based non-profit organization that accredits health care organizations, defines the MR as the process of comparing the patients' medication orders to all of the medicines that the patient has been taking. The process should be performed at every transition of care which includes changes in setting, service, practitioner or level of care. According to the Joint Commission the MR process involves five steps. The first is to develop a list of current medicines, then develop a list of medicines to be prescribed, compare the two lists, make clinical decisions based on the comparison and lastly communicate the new list to the next care provider and to the patient.

BOX 1.1 MR Steps defined by the institute of healthcare improvement

- Verification
  The first step involves collection of medication histories
- Clarification
  Secondly, ensure that medicines and doses are appropriate
- Reconciliation
  Thirdly, document all changes in inpatient medicine orders or charts

  The process starts when the patient is admitted to the hospital, continues whenever the patient is transferred to a different level of care, and occurs again when the patient is discharged from the hospital.

The Institute of Healthcare Improvement describes three steps for the MR process as summarised in BOX 1.1, verification, clarification and reconciliation.

The UK National Prescribing Centre (NPC) developed a similar definition and describes MR in two stages, whereas the main steps are collecting, checking and communication. The MR process as described by the the NPC is presented in BOX 1.2.

The NPC adopts the 3C approach including the two stages in three steps: collecting, checking and communication. The collecting step involves taking a medication history and collecting other relevant information about the patients' medicines that can be collected from a range of different sources. The medication history should be collected from the most recent and reliable source. Where it is possible, the information should be verified and cross-checked with multiple sources. Where there appears to be discrepancy between what the patient is currently prescribed and what the patient is actually taking, it should be recorded, and where they can be established, the reasons for any variation. The checking step involves ensuring that the medicines and doses that are now prescribed for the patient are correct, and lastly the step to communicate where any changes that have been made to the patients' prescription are documented to the next care provider.

BOX 1.2 NPC Medicines Reconciliation Process

- **Basic Reconciliation (stage 1)**
  Basic reconciliation involves the collection and accurate identification of a patient current list of medicines. An example would include medication history-taking in secondary care upon admission)
- **Full Reconciliation (stage 2)**
  Full reconciliation involves taking the basic reconciliation information and comparing it to the list of medicines that was most recently available for the patient. In addition to that, it involves identifying any discrepancies between the lists and then acting on that information accordingly.

In 2011 the Norwegian Ministry of Health and Care Services initiated a national patient safety program "In Safe Hands 24/7" that would implement intervention on certain areas in the specialist- and primary health care(11). The purpose of the intervention in the campaign is to point at specific areas where there is improvement potential to reduce patient harm in the health care, build a long lasting structure for patient safety and to develop a respectable patient safety culture in the health care(11). Medicine Reconciliation is one of these intervention areas, and the campaign has developed a Norwegian definition of MR based on the definition of the World Health Organization (WHO) whereas it states that "Medicines

Reconciliation is a method that health personnel in cooperation with the patient shall secure transfer of correct information about the patients actual medicine use”(12).

Pharmacy led MR has been implemented at different point of care, including admission MR(13-15) or discharge MR alone(16-18). In fewer number of studies full MR process was implemented as in both admission and discharge(19-21). MR was mostly led by a pharmacist with clinical training; however, less frequently MR was implemented by pharmacy technicians(22, 23) or pharmacy students(24-26).

1.3 Integrated medicines management

The Hospital Pharmacies in Norway implemented the Integrated Medicines Management (IMM) method in 2013 with the expectation of good and secure drug therapy for hospitalized patients and correct transfer of information of the patients medicine use when changing level of care. The Integrated Medicines Management (IMM) is a method of standardising the MR approach and consists of three phases, the first one being medicines reconciliation, then medication review and lastly consultation and documentation of changes. The process entails comprehensive pharmacy teams involved at admission, inpatient stay and at discharge, incorporating communication at the transitions where most medicine-related problems occur. Scullin et al. sets evidence to supports its use and describes the method thoroughly in the article "An innovative approach to integrated medicines management"(27).

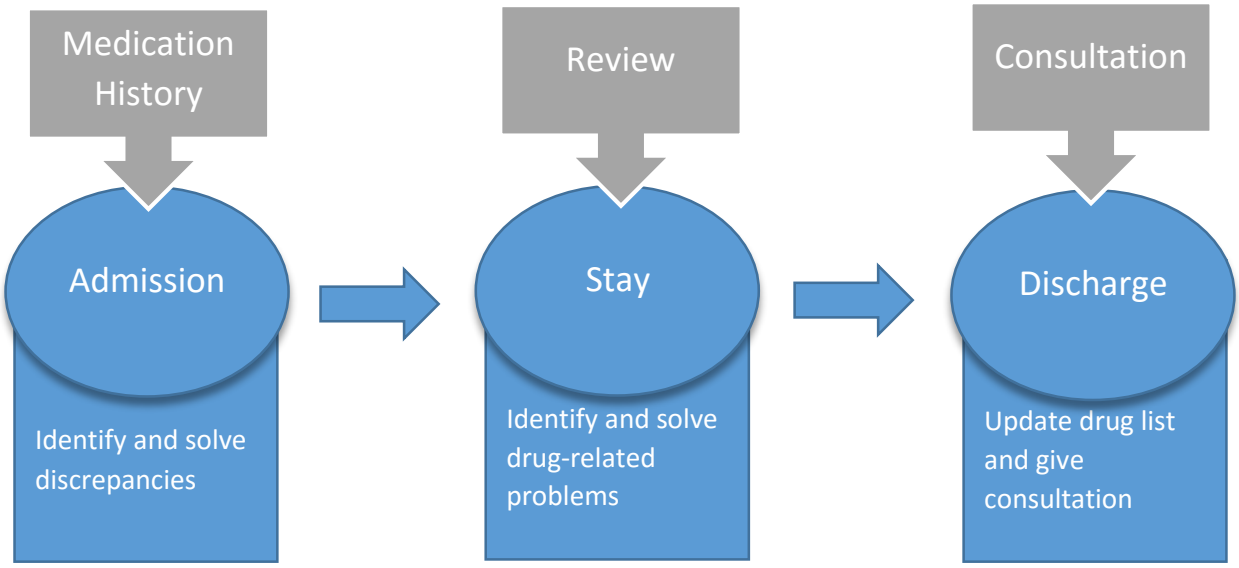


Figure 1-1 The pharmacists work process using Integrated Medicines Management (IMM) in hospitals

1.3.1 Medication history at admission

The first part of the IMM-method is gathering of the patients accurate medication history shortly after admission by the pharmacist. Firstly, collection of a drug list from the hospital is used as a starting point and afterwards, an interview with the patient where information on conditions and drug use is collected. The construction of an accurate and precise as possible drug list is then accomplished using several sources, for example the pharmacy, GP, outpatient notes and other records. Information on side effects, allergies and compliance is

also registered. Discrepancies and details on the patients drug use is then compared to the drugs prescribed in hospital and discussed with responsible doctor.

1.3.2 Medication review under hospital stay and consultation at discharge

The second part of the IMM-method is a pharmacist review of the patients drug list and assessing if the treatment is optimised. The pharmacist evaluate if the conditions are properly treated and also in consideration of laboratory tests. The evaluation of the treatment is then discussed with the responsible doctor. Before the patient is discharged from the hospital, the pharmacist undertakes a consultation with the patient giving information on new drugs if any and the changes in treatment that has been done. The patient also receives information material on their drugs and the updated drug list. The list is also sent to the GP and the pharmacy.

In Sweden, this model is further developed to the LIMM-method (Lund Integrated Medicines Management) and adapted to Swedish conditions. LIMM has its own procedures and tools to perform the MR, whilst in Norway The Hospital Pharmacies of Mid-Norway has implemented “IMM in Mid-Norway” and is still under development of procedures and tools. The aim of these methods is to increase the quality and flow of drug information between different settings of care.

1.4 Medicine Reconciliation in Norway

Successive reports from the Norwegian government in 2005 and 2012 have identified that adverse drug events, whereby medicines have been used incorrectly or found to be ineffective are the cause for 5-10% of all hospitalizations in medical wards. This can be extrapolated nationally to 5 billion NOK every year(6, 28). In addition to this, in 2013 19% of all reports sent in regarding considerable patient harm from the secondary care were related to medicine use. A government report from 2014-2015 states that the main reason for adverse drug events (ADE) is a lacking overview of the patients' medicine use, incorrect prescribing by the doctor or that patients does not receive adequate supervision and guidance on their medicine use(6). The government report states that medicines related harm can often be explained by insufficient training of health care personnel, inadequate routines, imprecise distribution of responsibility and poor transfer of information when patients transfer between care settings(28). Because of the amount of ADEs, incorrect use of medicines and number of hospitalizations and errors, it has become necessary to identify areas for improvement in the current practice of pharmaceutical care.

There are two main transfer points where errors can be introduced, one is on admission to hospital and the other is upon discharge from secondary care to primary care. Traditionally, nurses or junior doctors who both have limited experience and knowledge of medicines obtain information upon admission and are responsible for collecting the patients' medication history (13, 29). Moreover, patients access emergency departments with injuries or illnesses frequently out of hours, making the amount and quality of information less predictable(30). The quality of discharge information can depend on the quality of admission information, meaning if errors were introduced at the admission stage they are likely to follow upon discharge(31, 32).

Several numbers of studies and reports highlight that information on admission and discharge is often incomplete and inaccurate.

A national supervision report from the Norwegian Board of Health Supervision in 2016 found insufficiencies in the care when the patient was discharged from the hospital(33). The report revealed that patients were given too little information about the treatment, but also presented severe errors in information transfer between the hospital and community care. Transfer of information was the area that the report found most errors and areas for improvement, in both

Author	Location	Year	Study Design	Sample Size	% DRPs
Blix HS	Oslo, Norway	2004	Prospective	827	81 %
Viktil	Oslo, Norway	2006	Prospective	96	4.4 DRP per patient
Davidsson	Oslo, Norway	2011	Prospective	93	88 %
Willoch	Oslo, Norway	2012	Randomized controlled	77	4.3 DRP per patient

Author	Location	Year	Study Design	Sample Size	Discrepancies (%)	Discrepancies (Per list)
Holmestad	4 hospitals, Northern, Norway	2015	Prospective	249	59%	2,4
Halbostad	Namsos, Norway	2014	Prospective	32	53,1%	1,9
Aag	Tromsø, Norway	2014	Randomized controlled	201	84%	2,2
Engnes	General medicine ward, Oslo	2015	Prospective	120	94,2%	4,1
Wilhelm	Surgical and ortopedic ward, Førde	2013	Prospective	40	70%	1,5
Bjerknes	Psychiatric ward, Vestre Viken	2013	Prospective	36	47%	1,9
Lao	Infection disease ward, Oslo	2012	Prospective	55	60,4%	2,7
Wendelbo	General medicine ward, Oslo	2012	Prospective	53	90,6%	3,0
Lea	General medicine ward, Oslo	2012	Observational	56	76,8%	3,1
Gløersen	Acute Geriatric ward, vestfold	2012	Prospective	50	86 %	2,7
Nilsson	Kidney medical ward, Akershus	2012	Prospective	50	84 %	3,5

Table 1.1 Overview of some MR studies in Norway

content and process of delivering information. In one of the hospitals, the board found that 18 of 19 journals was not sent epicrisis/discharge notes to the GP or homecare.

In 2012 Lao et al. undertook a prospective observational study in an infection medical ward in Norway whereas the objective was to research to which extent the patients' medicine list at admission is accurate compared to what the patient was actually using(34). The study used a part of the Integrated Medicines Management model to record medication history and the pharmacist performed a standardized retrieval of medicine information of patients who before admission managed their own medicine. Clinical relevance of the discrepancies were also assessed, but the method was not validated and was prepared by a project group consisting of a physician and pharmacist. 53 patients were included, whereas 87 discrepancies were recorded, 2.7 per patient of the ones that had discrepancies. The most common discrepancies were recorded as "missing in medication list" and "error in dosage". Additionally, 28% of the discrepancies were considered as moderate, very or particularly clinical relevant.

In 2011 Frydenberg et al. concluded after a study at a medical ward in Gjøvik, Norway that information on patient medicines are often inaccurate in transitions between care settings and that the majority of errors were made when the patients were admitted to hospital. 50 discrepancies were found among 30 patients and it was found frequent discrepancies between what is actually taken and documented on the hospital journals and records(35).

Engnes et al. reviewed 120 patients medical charts in a general medical ward at Ullevaal University Hospital, Norway documenting at least one discrepancy in 94,2% of the patients(36). 208 medicines were identified as regular medicines used by the patient, but not documented on the patient admission list. Similar, a study at the University Hospital of Northern Norway highlighted the need for better medication histories as 84% of the medication charts they reviewed contained a discrepancy(37). These findings from Norwegian studies are of note and suggests that there is a need for improved medicines related processes at transfer of information; however they are mostly of small size with methodological limitations. There are no large scale evalutations of the quality of information transferred at the health interfaces.

In 2011 the Ministry of Health and Care Services completed the previously mentioned patient safety campaign as a result of the evidence on increased adverse events leading to patient harm, including adverse drug events and the aim were "*to reduce patient harm, build permanent structures for patient safety and improve the patient safety culture in the health*

care". The campaign was extended in 2013 to a patient safety *program* with the same name, a five-year project that through various actions had the same purpose in strengthening the patient safety(38). The program selecteded a few special areas of priority to improve where the program would introduce concrete new care. Areas were chosen on the basis that they have a real potential for improvement, documentation for positive effects and the ability to measure the impact of new care(38, 39).

Medicines Reconciliation(MR), which is defined as the process of securing transfer of correct information about the patients actual medicine use, was chosen because of the challenges in accurate use of medicines(40). The patient safety program highlights the increasing amount of adverse drug events related to medicine use leading to patient harm as the main concern, and also states that incomplete medication information leads to inadequate and incorrect care for the patient. The program has facilitated for implementing MR by producing a package that intend to lead to enhanced procedures mainly aimed at hospitals and GPs. The actions consist of

1) GPs must reconcile, update and dispense a medicine list to all patients
2) In hospitals, medication history must be obtained, recorded and monitored at admission
3) A updated and reconciled medicine list must be included in the discharge letter
4) The patient must obtain a reconciled and updated list at discharge from hospital and in outpatient consultations where treatment is changed

Apart from this, the program does not propose a clear guidance to how MR at the hospitals should be accomplished. The regional health authorities must therefore implement their own procedures for MR at their hospitals. In addition to the program, the need for mapping of reconciliation with optimized quality was further enhanced by the changes in law regulations from the 1st of January 2015 regarding medicines management(41). The law require the health region departments to "*ensure that the internal control systems has procedures that assure the quality of the information about the patients medicine use on admission, discharge and when transitioning internal at the hospitals*".

In response to the patient safety program and change in law regulations, there has been growing evidence on MR processes in Norway. In 2012, Willoch et al. researched in a rehabilitation ward at a general hospital whether the inclusion of pharmacists in the team reduced the number of drug-related problems (DRPs) in the ward and whether an intervention

affected the drug use after discharge(42). DRPs are defined as an event or circumstance that are connected with drug therapy and can actually or potentially interfere with wanted health effect. Potentially interfering meaning as in circumstances that might cause drug related morbidity or death if not acted upon, while an actually problem is defined as an adverse drug event already establishing with symptoms. 40 patients were randomized into an intervention group (IG) and 37 to a usual care group (CG). A clinical pharmacist reviewed their drug therapies using information available from medical records and interviews, and followed the patients in the IG group prospectively during their hospital stay. Drug-related problems were, if established by the clinical pharmacist, discussed with multidisciplinary teams led by physicians, and additionally the pharmacist also provided patient counselling before discharge. In the intervention arm, a clinical pharmacist was part of the multidisciplinary team, whilst usual care patients received their service from a team where a clinical pharmacist were not part of the treatment teams. At admission 4.4 drug related problems (DRPs) per patient were recorded in the IG and 4.2 DRPs per patient in the CG group. Significantly more DRPs were acted upon and resolved in the IG; at discharge, the IG had 1.2 DRPs per patient compared to 4.0 per patient in the CG ($P < 0.01$). The study suggests, even though it had a small sample size, that the involvement of pharmacists in drug therapy management improved the identification and resolution of drug related problems. However, DRPs are an outcome measure that does not define the end results for the patient and may over emphasize the effectiveness of the intervention as many DRPs may be more theoretical than actual, and many of those which are not theoretical may have limited clinical impact. The study does also not describe benefits for the patient on readmissions, length of hospitalization or hospital visits.

In 2012 the Surgical Ward at Ålesund Hospital in Norway, implemented medicines reconciliation at bed units as intervention towards reducing medication errors and discrepancies. A prospective controlled study which aimed to research the effect of this implementation was performed(43). Nurses, who were also assisted by a pharmacist with feedback performed the medicine reconciliation, and were ultimately responsible for gathering medication history from patients and other relevant information sources such as discharge letter, pharmacy etc. 191 patients were recruited to the study, 77 in the control group and 114 in the intervention group. For the control group there was found 93 discrepancies among the 77 patients (1.21 per patient) and 51 discrepancies in the 114 patients in the intervention group (0.45 per patient). The amount of patients with at least 1 discrepancy

were reduced from 52,0% to 25.4%. It was though only possible to complete a medication history interview with 60 patients (77,9%) in the control and 74 patients (64,9%) in the intervention group. For patients who did not go through an interview, the medication history were supplemented with written information from GP, home care service, multidose list and/or interview with next of kin/relative. These are all information sources that does not provide the information the same quality in what the patients actual medicine use is, and the amount of discrepancies may have been further reduced according to the trend if an increased amount of patients went through an interview.

The nurses in the study at Ålesund Hospital received 1 hour of training, which is of limited amount of time and may have led to inadequate reconciliations. A qualitative study at the same hospital also showed that nurses believe that pharmacists are better qualified at performing medicines reconciliation(44). This agrees with a prospective cohort study in the UK that compared inpatient medication histories across disciplines, as pharmacists were showed to correct significantly more discrepancies and result in more accurate medication histories and reconciliation(45). A randomized controlled study in the University Hospital of Northern Norway (UNN) 2012 showed though no significant difference in the amount of discrepancies recorded by pharmacists and nurse, but showed that pharmacists used 30% less time than nurses and treating doctor also agreed significantly more often with the pharmacist in discrepancies recorded(46). This suggests that in clinical situations, discrepancies recorded from a pharmacist are considered more clinically relevant.

A similar study to Holler et al. at Ålesund Hospital was conducted at the hospitals of Helse Nord HF (The Regional Health Department in North) by Holmestad et al. Helse Nord was allocated financing in 2013 to implement a medicines reconciliation process intervention to increase the quality of medicines information and the patient safety. Holmestad et al. performed a study to measure character discrepancies at four hospitals in Helse Nord, research what factors that leads to discrepancies, and additionally study the relationship between MR and discrepancies identified(47). 249 patients were included in the study, where 54% of the patients included went through a MR process by pharmacists, that were trained in the Integrated Medicines Management(IMM) method beforehand performing the study. Holmestad et al. identified that 59% of the patients had a discrepancy in their medicine list, mean discrepancy on 2.4 per patient, a result that is lower than the study at UNN by Aag et al. A trend for reduced discrepancies in medicine lists that had documented MR was observed, but the result was not significant, as reconciled lists after the procedure did not seem to affect

the amount of discrepancies. This is in contrast to the results from Viktil et al. that included 720 patients in four hospitals in Norway 2006(48). Clinical pharmacists assessed drug related problems (DRPs) by reviewing medical records and conducting interviews and by participating in multidisciplinary team discussions. 96 patients were randomly included for intervention as significantly more DRPs in the interview group, a mean 4.4 DRPs vs 2.4 DRPs in the non-interview group, was found. Of a total 431 DRPs recorded, 168 were disclosed through the interviews. The low number of patients in the intervention group might suggest that there are practical barriers in implementing an MR process.

To improve implementation and intervention, enhanced strategies than those in Holler et al., Holmestad et al. and Viktil et al. might lead to improvements in medication history recording. Lea et al. in 2015 investigated the effect of teaching and checklist implementation on accuracy of medication history recording at admission(49). The study involved two periods, where the first period P1 comprised non-mandatory teaching lessons for physicians and nurses at the ward and the emergency department. A medically responsible physician and a clinical pharmacist held the teaching lessons, whereas the focus lay on results of medicine reconciliation and possible consequences of an inaccurate medication history recording. In the second period P2, a checklist was implemented beforehand at the emergency department to facilitate the registration of medication information during admission and transition. Two clinical pharmacists performed the medication history interview. 56 patients and 119 patients were included respectively in P1 and P2. 133 discrepancies were revealed in P1 and 221 in P2, but there was not found any statistical significant difference in proportions of patients with a minimum of one discrepancy. For 60 of 119 patients (50.4%) in P2, the checklist was used, however, only in 8 patients (6.7%) were the checklist used during the whole stay. The checklist were exclusively used for 40% of the patients at the emergency admission and exclusively for 5% at the ward. The lacking effect and little impact may have several explanations, but an obvious reason was the very restricted use of the checklist. As the teaching lessons were non-mandatory, the participation rate and therefore knowledge of the intervention was limited.

Damlien et al. conducted another study aiming to develop a prioritizing model for conducting MR at a fast-paced workflow emergency department (ED) and implementing an efficient working model for MR in 2015(50). The study included a total of 276 patients at Diakonhjemmet Hospital, Norway, as medication discrepancies between hospital admission records and information on prehospital medication use were recorded. A multidisciplinary

panel assessed clinically relevant medication discrepancies (crMDs) as a survey among the physicians made up the basis for the model of conducting MR. Clinical pharmacists or trained nurses performed MR, and the results showed that 62% of the patients had at least one crMD. The model developed from the study presented risk factors as sex (woman), age (>60), one or more admissions to hospital in the last 12 months and admission causes as surgical, malfunction or cancer were suitable for prioritization. The model classified 76.1% of the patients as high risk patients for having a crMD.

The literature presented displays that MR is a developing place for evidence and suggests that it might improve care transition and patient outcomes. A mini review by Viktil et al. also emphasizes the increasing evidence of clinical pharmacists, but also highlights the need for studies with larger populations, including patients from multiple sites(51). Evidence is needed to draw conclusions as studies in Norway are of very limited number, non-randomization, small sample size, based on less rigorous designs and varied very in intervention and outcome. Additionally, none of the studies seems to describe and measure the benefits for the patients and therefore there is no clarity about the true effects of pharmacy led MR on ADEs and clinically significant errors. DRPs are a common outcome measure used in Norwegian studies, but the measure is a proxy and does not describe the end benefits for the patient, or how the intervention actually affects the quality of life and their health outcomes. It would be better to measure actual patient outcomes as DRPs includes the potential circumstances that might cause harm and varies in extent and consequences. In other words, it means that it does not define the patients' health status, and therefore using DRPs as a measure might inflate the issues of drug therapy problems and process measure of potential harm rather than measure of actual clinical harm. The recommendations are also of limited generalizability due to differences between the studies and there are no studies describing the cost-effectiveness of interventions or the effect on adverse drug use and health resource use.

The Hospital Pharmacies are ultimately responsible in teaching and training their pharmacists in the Integrated Medicines Management (IMM) method through courses and lessons. Nurses are in Norway though considered an integral part of the MR process by means of that they are in close to patient care and naturally in a position to collect medication history. However, it seems that healthcare professionals may resist in existing practice, due to time and/or workload concern and importantly insufficient training or education of the process. Additionally, there is no clear agreement about the profession responsible for implementing MR across settings. As the government and Parliamentary Reports focuses on MR and

pharmacist intervention as a potential service to improve patient safety and is one of the focused areas in the patient safety program, this highlights the need for further relevant evidence in Norway on the effect, cost-effectiveness, implementation process and education.

1.5 International studies; Benefits, effects and outcome of medicine reconciliation

MR has been evaluated across various settings such as ambulatory care(52, 53), emergency department(54-56), surgical pre-admission clinic(20, 57) and outpatient(58). The MR process has also been supplemented with other clinical activities such as discharge counselling(23, 59-61), patient education(24, 56, 62), medication review(23, 27, 56, 63, 64), participation with ward rounds(13, 65), adherence aids(18) and telephone follow up(21, 24, 26, 62). A number of studies have evaluated the pharmacist role in medication history taking and shown improvement in the accuracy of medication histories, inpatient charts, discharge prescription and allergy information. Some of these studies are however, of small size, uncontrolled observational and of before and after design(13, 54, 65-68). Therefore, conclusions have most likely been biased in favour of the pharmacist intervention.

A USA study in 2012 consisted of 102 patients who received pharmacy led MR compared to 116 patients who received MR by the doctor. The MR pharmacist enhanced completeness of medication history and reduced adverse drug events attributed to admission errors(69). This agrees with a previous USA study in which a pharmacist or pharmacy student led the reconciliation who obtained medication histories(70). These two studies used a non-random selection of patients admitted to general medical units, and the findings are consistent with a Canadian study across surgical pre-admission assessment, which adopted a randomized control design. The study had 227 patients randomized into the intervention group and 237 in the control group, and compared pharmacy led MR with nurse-conducted medication histories plus surgeon-generated discharge summaries. In the intervention group, 20,3% had at least one postoperative error related to home medications, compared to 40,2% of the control group. In addition, 29,9% of the patients in the control group had at least one medication discrepancy postoperative which had the potential to cause possible harm compared to 12,9% in the intervention group(57).

A study in Northern Ireland, Scullin et al. 2007, included 371 patients in the intervention group and 391 in the control group. The intervention significantly lowered readmission rates over 12 months by 10%, and also delayed the time of readmission as intervention patients

took on average 20 days longer to be readmitted than patients in the control group(27). A recent Swedish study conducted by Gillespie et al. evaluated readmissions and emergency department visits combined for 199 patients randomized in the intervention group and 201 patients to the control group. The patients in the intervention group showed a significant reduction in readmissions and emergency department visits compared to control patients(71). Both of these two randomized controlled studies showed significantly fewer readmissions and emergency department visits for patients receiving pharmacy led MR compared to standard care, and evaluated the effect of full MR process at both admission and discharge compared to absence of MR at the control group. Scullin et al. also showed a significant reduction in stay.

French studies, Leguelinel-Blache et al. showed that MR, where a clinical pharmacist obtained a correct list of medications before the doctor prescribed medicines on the hospital reduced the number of lists with discrepancies from 46% to 2%(72). Curatolo et al. examined the impact of implementing and sustaining a MR process at admission in two surgery units on unintended medication discrepancies with close-collaboration between pharmacy and surgery units. Before implementation mean unintended medication discrepancies (UMDs) per patient was 0,65 at admission. After two cycles of optimization of the procedure, UMDs per patient was reduced to 0,15(73).

Two recent systematic reviews of hospital based MR conducted by Mueller et al.(74) and Kwan et al.(75) identified that the most successful interventions relied on pharmacists and outlined that MR appears to be a potentially promising intervention to improve transition. Both reviews on hospital based MR supported pharmacy led interventions. Mueller et al. found a consistent reduction in medication discrepancies, meanwhile Kwan et al. found no effect of MR on reducing discrepancies, which were considered clinically significant, but a significant reduction in emergency department visits and readmissions were identified at post discharge. Kwan et al. presumed the observed difference resulted from methodological differences between the two reviews, mainly in the selection criteria.

In the UK medicines reconciliation is required as a service delivery in the medicines management process. The NICE guidance in 2007 implemented a recommended pharmacist involvement in MR at admission based on findings from one randomized controlled trial, two before and after and five observational studies presented in a systematic review conducted by the university of Sheffield(76). This described the effect and cost-effectiveness of interventions aimed at preventing errors upon admission. Pharmacy led MR appeared to be beneficial in reducing medication discrepancies and additionally provided evidence that some

form of intervention to improve medicines reconciliation is a cost effective use of resources. The guidelines recommend that MR is carried out by a trained and competent health professional – ideally a pharmacist, pharmacy technician, nurse or doctor with necessary knowledge, skills and expertise within 24 hours or sooner in an acute setting if clinically necessary, when the patient moves between changing settings of care.

1.6 Impact of e-records and systems

1.6.1 IT based information transfer initiatives

Implementing computerized IT is considered a solution to ensure effective and correct communication at health interfaces. It is well accepted that employing an electronic pro-forma has enhanced legibility of discharge summaries(18, 77). However, the risk of user selection and human errors is increasingly being reported(78, 79). In addition to IT based solutions and transfer of information, the use of IT applications to integrate MR with medicine entry orders and medicine management software might hold potential for further enhancing patient safety as healthcare decision makers should not rely solely in technology to improve patient care.

In Canada in 2007 a web-based application implemented enabled general practitioners (GPs) to see information regarding their patients' emergency department visits for 2022 visits. The feedback was that GPs found the information more useful, they could manage patients better and initiated actions more often following the information. Even though those points could point to the benefit on ensuring accurate and continued care, they were not reflected in a reduction in GP visits after discharge(80). Similarly, the use of a computerized MR tool integrating medicines list from several electronical sources enabled health personnel to review medicines reported to decrease unintentional discrepancies which were considered of potential harm. The benefits were nevertheless not apparent on readmissions and emergency department visits.

In the US, Platte et al. in 2010 undertook a study to determine the accuracy of patients' electronical medical records (EMR) drug profiles. The study evaluated the EMR of 200 patients, whereas only 56% had accurate drug profiles and discovered that infrastructure improvements by themselves are fallible, and should be complemented with improvements such as a MR program(81). Ekedahl et al. studied discrepancies between data in the medication list (ML) in the EMR and data in the prescription list (PL) stored in the national prescription repository in Sweden, to determine current, noncurrent, duplicate and missing prescriptions. 66 patients were included in the study and more than 80% of the patients had at least one discrepancy, a noncurrent, duplicate or a missing prescription in the ML and PL(82). The overall congruence for unique prescriptions on current treatment between the ML and PL was estimated to only 55%.

In 2007 the UK patient safety advisory committee observed that the evidence is insufficient to make recommendations on the use of IT based applications(83). Since then, multiple new and

developing solutions and applications have appeared to have benefits on reducing medicine errors and improving accuracy and usefulness of communication(80, 84). It is, however not established if these improve healthcare resources, and IT application features and the advances with the technology would widely vary between settings. This would make it hard to apply their applicability on implementations on a wider scale.

1.6.2 Electronical records and IT initiatives in Norway

The Norwegian Parliamentary Report nr. 47 from 2008-2009 describes a common real-time overview across clinicians and settings of care as a solution to information challenges(85). The aim is to make health information available to health professionals when they have an official need regardless of where the patient was previously treated. In addition, the government wishes for citizens to have access to their own data and that data should be available for quality improvement, health analysis, management and research. A better and more complete overview gives a better knowledge and decision making basis for health care professionals and patients for further treatment.

In February 2013 the Prescription Supplier (PS), an electronic database for prescriptions was implemented nationally for GPs, private specialists and emergency hospitals(86). This means that medicines prescribed by the doctor are saved in a central database whereas pharmacies all over the country can open and dispatch the prescriptions. The expectations for the supplier were that it would provide an accurate and up to date medication list for access by all healthcare professionals and contribute to minimize the potential of error as it reduces the risk of medication errors caused by a lack of overview.

The Summary Care Record(SCR), another national electronic database was introduced in 2014-2015 and the record gathers selected important and critical information on patients' health, including drugs prescribed by a doctor and dispatched drugs from the pharmacy and makes them available for health care personnel and the patient themselves(87). The SCR is a service in addition to the medical records held by the GPs, out-of-hours services and hospitals. The current solutions for e-prescription has contributed to better communication between physicians and pharmacy and moreover, also gives the patient a better overview over valid prescriptions.

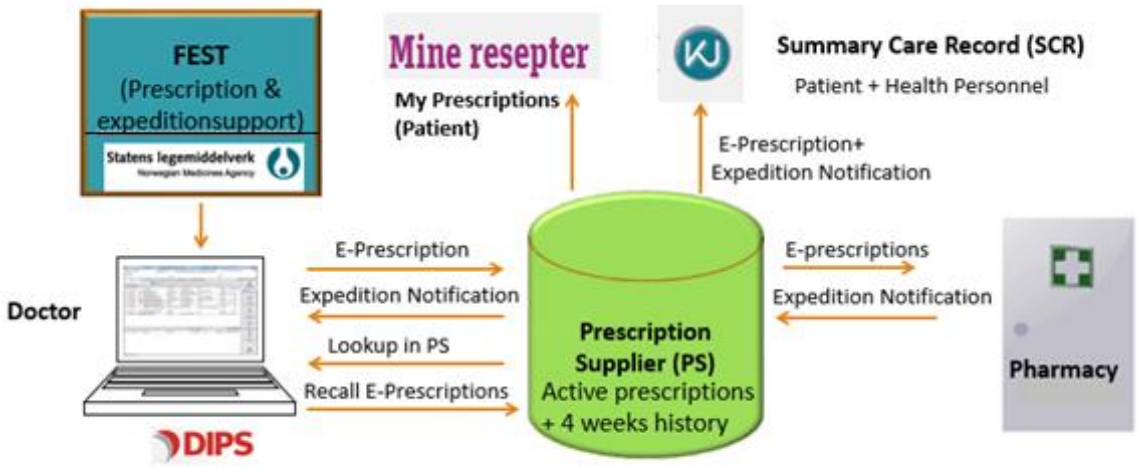


Figure 1.2 *Diagram of chain of electronic information transfer*

The SCR and PR are linked and therefore synchronized with each other (figure 1.1) The PS are also linked to the electronic systems to the pharmacies and to My Prescriptions which is a website for the patients containing information on their e-prescriptions. Whenever a prescription is dispatched from the pharmacy, a notification is sent to the PS, which again synchronizes with the SCR and My Prescription. In addition to this, the doctors' systems can also look into the PS, recall and set new prescriptions for the patient.

The evidence presented earlier (impact of e-records and systems) suggests though that electronic records has its limitations by involving a risk of human errors and user selection. Additionally, changes may be made which don't translate onto the electronic record and the records/databases does not provide direct information about the patients' actual medicine use, it only provides information of which medicines that has been dispatched to the patient without giving information on adherence. There is also a limit to historical data on the records as it does not provide information about non-valid prescriptions that may have been called back because of side effects, allergies or for other reasons and additionally there is no information on drugs bought over the counter (OTC). Thus, IT based solutions holding a potential to improve patient safety, should not be used as solely intervention to enhance patient safety.

2. Thesis purpose

Most of the studies on MR in Norway are conducted before or in between the transition from paper to electronic journals. The implementation of the e-records is a process and health care professionals must adapt to new practice, thus most studies is performed without the aspect of new IT based solutions.

The increased use of medicines, hospitalizations and errors previously mentioned shows the necessity of intervention for improvement and the evidence from international studies supports the impact of a MR intervention in cost-effectiveness and reducing stay, errors and possible harm. There is also evidence for improvements in Norwegian studies implementing an MR process as the number of discrepancies and the extensive problem has been investigated, but there is no report on the impact of electronical records and the quality of information following the transition from paper to electronic journals. Considering the limitations of the electronical records, it becomes necessary to measure the effect of electronical records on the medicine lists.

The aim of this master thesis is to determine whether the electronic records provide a sufficient accurate patient medication record to negate the need for additional human mediated medicines reconciliation. We will do this by comparing the information collected from the electronical records, the Prescription Supplier and Summary Care Records, with the information collected after the Integrated Medicines Management method, including a standardized interview with the patient and the hospital journals/medical curves, which is the hospitals list for medication that are prescribed for the patient at the ward. This will give an overview and estimation on the impact of electronical records. The discrepancies will also be categorized and their potential adverse drug events severity will be determined if they had not been identified and therefore give us an idea on the clinical relevance of the discrepancies.

BOX 1.3 Thesis aims

The aims of this study is to

- Determine wether electronic records provide a sufficient accurate patient medication record to negate the need for additional human mediated medicines reconciliation
- Review the IMM-methodology to determine which elements are required and which could be further optimised

Furthermore, the IMM-methodology will be reviewed to determine which elements are required and which could be further optimized.

3. Method

3.1 Study location, inclusion and exclusion

The trial was undertaken at the cardiology ward bed unit 1 & 2 at Haukeland University Hospital Helse Vest HF in Bergen in the period from October 2015 to January 2016. Patients hospitalized at these wards in this period could be included if they fit the criteria. The patient criteria were:

- 18 years or older
- Prescribed at least one medicine prior to admission
- Consent competent patients who have given written consent for the project pharmacist to gain insight into relevant information.
- Prescribed at least one medicine on admission

Patients believed it would be difficult to complete a medicines reconciliation was excluded. The exclusion criteria were:

- Unable to provide consent
- Already received medicines reconciliation when identified
- Already participating in another trial

3.1.2 Haukeland University Hospital

Haukeland University Hospital is responsible for secondary care services in Bergen and 22 other neighbour counties and delivers care to almost 600 000 patients every year.

3.2 Sample size justification

We estimated that within the time period available we would be able to recruit approximately 40 patients to enable the pharmacy student to perform medicines reconciliation. Once this target were reached, we terminated this part of the study. We would like the expert panel members to review all discrepancies and therefore 40 patients seems a reasonable and pragmatic number for the purposes of this study.

3.3 Data Collection

The project pharmacy student from the University of Bergen completed data collection at the hospital. The student visited the ward and completed medication history gathering after the IMM-method.

From the hospitals journal systems including DIPS, following information was gathered:

- Age
- Gender
- Diagnosis
- Information from former journalnotes or epicrisis' that can be relevant to the patients medicine use
- Medicine list from last out-patient clinic note and date for data gathering.

Patients taken out for the study will complete a medicine interview with the gathering of following information:

- Medicines list from the patient or multidose list
- If the patients administer the medicine themselves or if it is relatives, homecare or multidose involved.
- Information about swallowing or management problems and allergies will be gathered from the interview and from the journals.
- Information on adverse drug reactions

The interview forms were anonymized and given reference number.

3.3.1 The medicine reconciliation

The pharmacy student that undertook the data collection had gone through medication history method training at University of East Anglia in fall 2014. A clinical pharmacist from The Hospital Pharmacies West also briefly trained the pharmacy student in the IMM-methodology. The medicine reconciliation interview was undertaken with the first part of the IMM-methodology, which is described by the Hospital Pharmacy West HF's quality system (**Attachement 1**), and with standardised forms that is used by the Hospital Pharmacy West and based on the IMM-method (**attachment 2**).

Recruited patients received medicines reconciliation, meaning all patients were reviewed by the pharmacy student using a Standard Operating Procedure (figure 3.3). The pharmacy

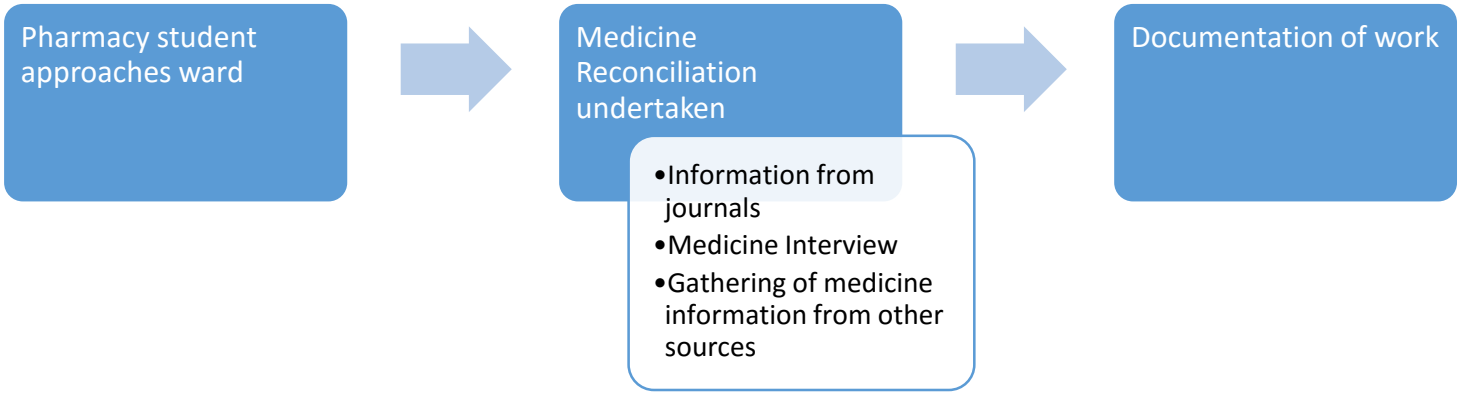


Figure 3.1 Flow diagram of medicines reconciliation process

student gathered information on medication from the Prescription Supplier, Summary CareRecords, the hospitals electronic and paper journal systems on ward. The findings and discrepancies was identified and documented.

From the medicines reconciliation interview following information were strived to be clear:

- Establish regular medication, for which diagnosis/symptom, and in which dosage
- Establish medicines taken when needed, for which diagnosis/symptom, and in which dosage
- Establish name, strength dose/frequency of any non-oral preparations
- Establish use of over the counter medicines, herbal or homeopathic medication
- Check ability to adhere, both intentional and un-intentional
- Establish history of adverse drug reactions or side effects to any medication
- Determine if patient has discontinued medication, and establish reason
- Establish if there is any medication prescribed for a limited amount of time

3.4 Classification and management of discrepancies

The pharmacy student classified the identified discrepancies into 6 different categories outlined in table 3.1.

Classification	Description
1. Incorrect drug name	Incorrect drug listed in the records/journals than what the patient reports Example: • Record: Simvastatin – Patient: Atorvastatin
2. Patient uses different administration form	The drug is listed with different administration form in the records/journals than what the patient report
3. Patient uses different dose	The drug is listed with different dosage in the records/journals than what the patient report
4. Patient does not use drug	The drug is listed in the records/journals, but the patient reports not using it
5. Drug Omission	The drug is not listed in the records/journals, but the patient reports using it
6. Other	If the discrepancy is about something else than the classifications mentioned above Examples: • Not listed day/time for a drug used weekly/monthly/irregularly • No information on area of use • Incorrect allergy information

Table 3.1 *Classification of discrepancies identified at medicines reconciliation*

3.5 Data processing

The information on the standardised forms were registered in a Microsoft Excel database.

In regards to the registration of information, some complications arose that needed to be taken into account. **Table 3.2** shows the assumptions that are made at registration.

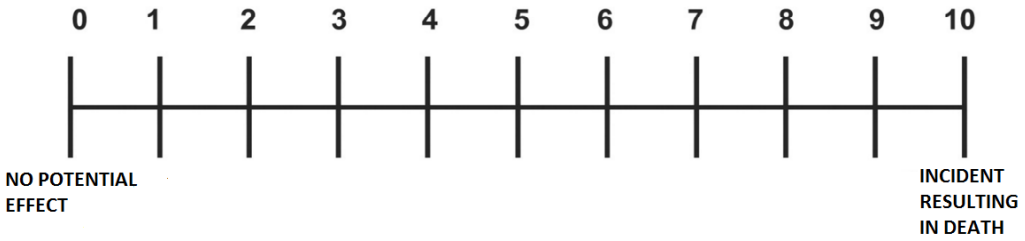
Complication	**Assumption/Management**
The date of reconciliation was not properly specified on the forms	Admission date of patient hospitalisation was registered
Some of the discrepancies identified concerns “medication” that is not defined as drugs, i.e. dietary and nutritional supplements	Everything that was documented from the interview was recorded. Those that were not relevant were removed from the analysis afterwards.
Information in the hospital journal and medical curve were different	Information from the electronic hospital journal was several times outdated, and was supplemented with information from the medical curve and vice versa when needed. The end result would be an overview of what the hospital had of medication history at admission.

Table 3.2 *Complications and assumptions made in data processing*

3.6 Expert panel

An expert panel consisting of two clinical pharmacists and two doctors were asked to independently rate the severity of the discrepancies using a validated scale devised by Dean and Barber et al. The Dean and Barber et al. scale(88) developed a validated method of scoring the severity of medication errors that did not require knowledge of patient outcomes. The severity of errors is scored on each error on a scale from 0 to 10 where 0 is an incident with no potential effect on the patient, whereas 10 represents an incident that would result in death. Additionally to the scale, the expert panel were asked to state the best and worst case scenario regarding each discrepancy using free text (figure 3.2).

Patient number	Patient			Hospital journal			Electronic records			Discrepancy/ error
	Drug	Strength	Dose	Drug	Strength	Dose	Drug	Strength	Dose	
X	Metoprolol dep.	200mg	1x1	Metoprolol dep.	200mg	1x1	Metoprolol dep.	100mg	1,5x2	Dose



Best case scenario	
Worst case scenario	
Other comments	

Figure 3.2 *Example on discrepancy presented to expert panel for rating on discrepancies*

3.7 Data analysis

Data analysis or errors will be largely descriptive. Relationship between errors and patient type/prescription type and number as explored, but are unlikely to show anything due to the small sample sizes.

The scores from the expert panel was averaged as per published methodology. The free text responses will be analysed using content analysis to describe the potential consequences which panel membeers believed may have occurred in the absence of the medicines reconciliation intervention.

3.7.1 Exclusion of data in the analysis

Discrepancies regarding medicines that are not defined as drugs (Nutritional supplements and herbal medicine) was excluded from the analysis.

3.8 Statistics

The data were analysed in Microsoft Home Office Excel and IBM SPSS Statistics 23.

3.9 Ethics

The project were approved by the Regional Ethical Committee for Medical and Health Research Ethics and the data gathered were anonymised on the hospital by the project pharmacy student. No patient-identity information has been available in the analysis and registering of data.

Written (**attachment 3)** and oral information were given to patients who met the inclusion criteria and their written consent were then if accepted gathered. The patient could withdraw from the study without reason if they wished to.

Figure 3.3 *Standard Operating Procedure (SOP)*

- Gather information about patient from medical curve from the patient journal at the ward
- Patient interviewed to confirm allergy status and medicines being taken
- GP journalnotes reviewed to confirm allergy status and medicines prescribed
- Medical notes reviewed to confirm any intentional medication changes due to clinical status of patient
- Other sources of information may have been used depending on availability and relevance to current admission by virtue of the date, and included
    - previous electronic discharge letter
    - clinic letter
    - patient's own drugs (PODs)
    - patients relative or carer
    - nursing home record
    - Multidose system
    - Prescription Supplier and Summary Care Records
- An accurate medication list was documented in the medical notes by the intervention pharmacist

Results

4.1 Study population

38 patients were included in the study at Haukeland University Hospital in the period from 16th of November 2015 to 22nd of January 2016. Two of the included patients was excluded as it was not possible to complete a medicines interview and reconciliation with both of the patients after receiving consent. 36 patients were therefore included in the further analysis.

Table 4-1 shows an overview of the patient demographics. A total of 23 (63,9%) that were included were men, and 13 (36,1%) were female. The mean (SD) age for the patients were 69.8 (9.7), all patients administered their medication themselves and used a mean (SD) of 6.97(3.03) drugs.

Table 4-1 Patient demographics

	Measure	**Study population (n=36)**
Age	Mean (SD)	69.8 (9.7)
Female	N (%)	13 (36.1)
Self management of medications	N (%)	36 (100%)
Number of drugs	Mean (SD)	6.97 (3,03)

Most of the included patients used a total amount of 9 medicines (27,8%), while 13,9 % used 5 or 6 drugs. Maximum amount of drugs were 12 drugs (5,6%) , while the fewest amount of drugs were 1 in total (5,6%).

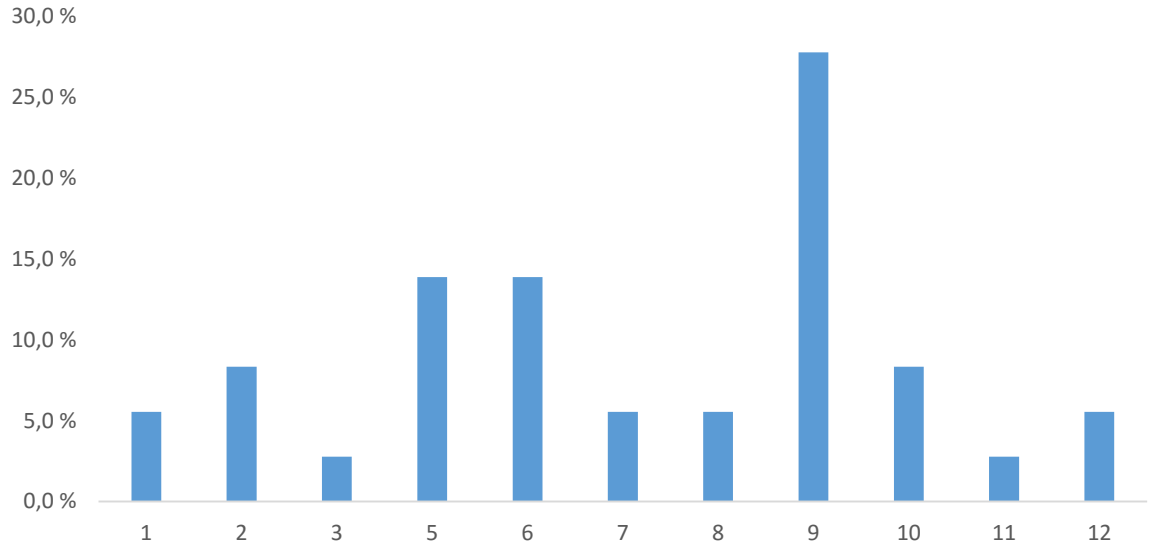


Figure 4-1 *Distribution of total amount of medicines patients used*

4.2 Discrepanies identified

Figure 4 presents a flowchart overview over the inclusion and exclusion of data. The project pharmacist identified a total of 138 discrepancies in the 36 included patients and their medicine lists in the hospital journal and electronical journal. Discrepancies involving non-drug pharmaceuticals, for example vitamins, unknown herbal remedy or medical equipment, such as saltwater nosespray.

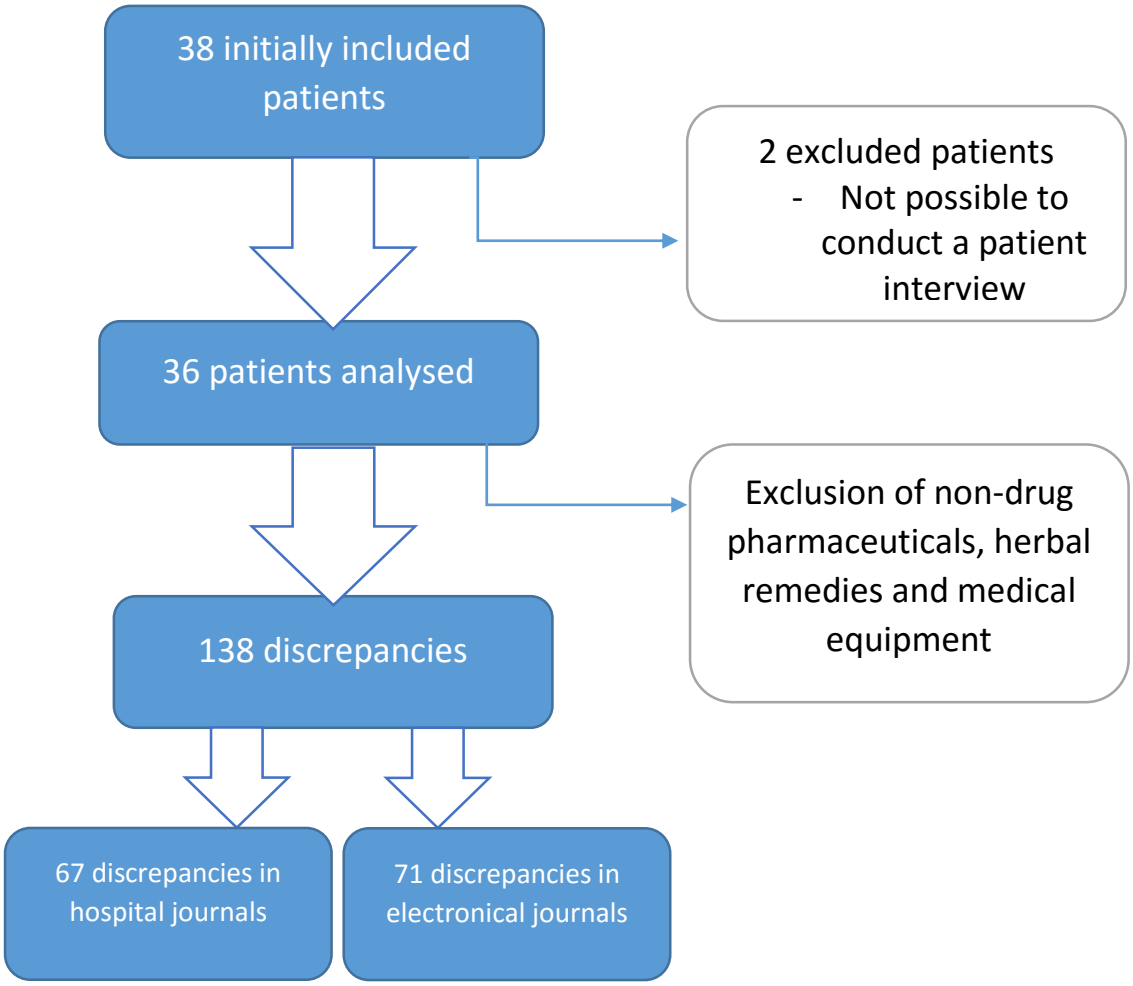


Figure 4-2 *Chart of inclusion and exclusion of data and discrepancies for analysis*

Table 4-2 presents the numbers of discrepancies identified at MR in the hospital journals and electronical records. The electronical record medicine lists had the exact same amount of lists with discrepancies identified with MR (72,2%) as the medical curve/hospital journals, and there were in total 30 patients that had a list with discrepancy (83,3%). Although, the electronical records had a higher total amount of discrepancies (53 vs. 57) and therefore also a higher mean number of discrepancies per list with at least 1 discrepancy than the medical

curve/hospital journal (2,58 vs. 2,73). At most we found 8 discrepancies in the electronical records and 6 in the hospital journals. For one patient, we found 11 discrepancies in the electronic and hospital records in total.

	Hospital Journal / medical curve	Electronical Records	Both
Total discrepancies, n	53	57	14
Lists with discrepancies, n (%)	26 (72,2)	26 (72,2)	30 (83,3)
Lowest/Highest amount of discrepancies	0/6	0/8	0/11
Mean number of discrepancies per patient	1,86	1,97	3,83
Mean number of discrepancies per list with at least one discrepancy	2,58	2,73	4,53

Table 4-2 *Discrepancies identified at MR in the hospital journals and electronical records.*

4.3 Categories of discrepancies/errors identified in total

Table 4-3 presents an overview of the categories of errors and the distribution among them. The three most common errors were categories into “Patient uses different dosage” (20,97%), “Patient does not use drug” (35,48%) and “Drug Omission” (37,90%).

Error type	Amount of errors	Amount of errors %
Incorrect drug	5	3,62 %
Incorrect dose	30	21,74 %
Patient does not use drug	52	37,68 %
Drug Omission	49	35,51 %
Other	2	1,45 %
Total	138	100,00 %

Table 4-3 Distribution of categories of discrepancies and errors identified.

Figure 4-3 displays the distribution of the medicines' ATC-groups identified at MR. Cardiovascular medicines (29,5%) were the most common drug involved in the discrepancies, followed by drugs for the nervous system (15,6%), respiratory system(14,8%) and alimentary tract and metabolism drugs (13,1%).

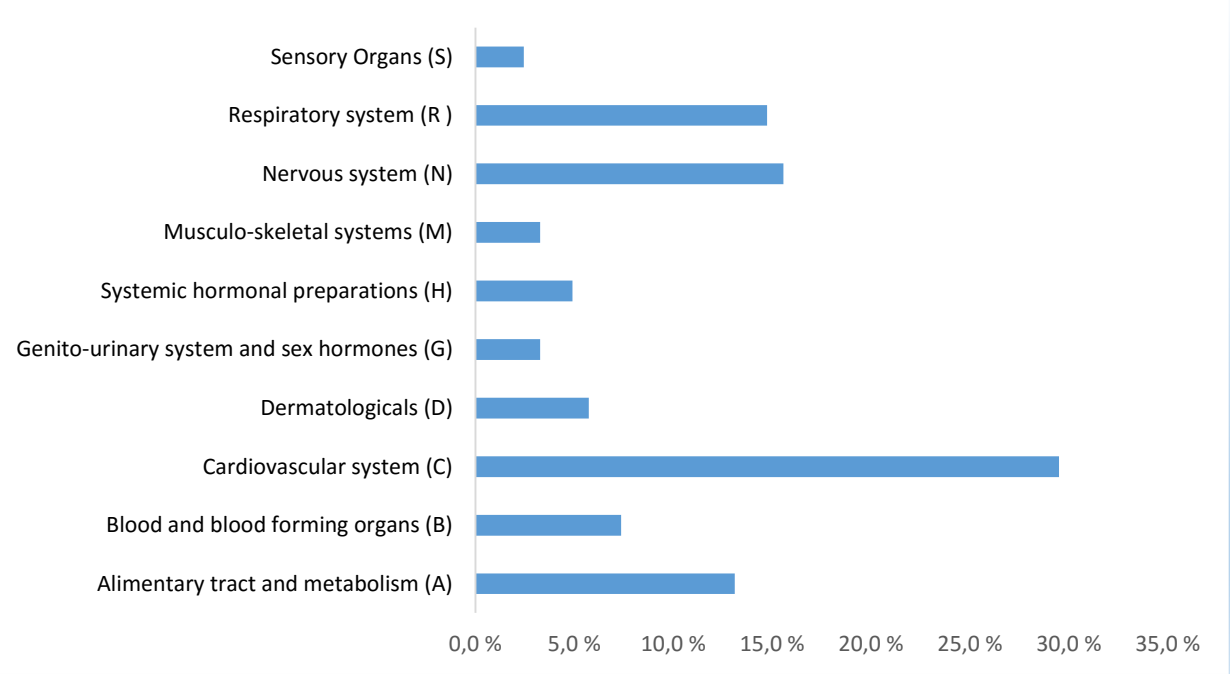


Figure 4-3 *Distribution of ATC-code of the drugs identified as discrepancies at MR.*

In **Table 4-4**, the medicines involved in the discrepancy category "Incorrect medicine" is displayed. 8 drugs were involved, whereas Pantoprazol and Esomeprazol were both involved twice.

Incorrect medicine	Correct medicine
Pantoprazol	Esomeprazol
Olmetesartan	Olmesartan Hydrochlorthiazid
Atorvastatin	Simvastatin
Esomeprazol	Pantoprazol
Spironolactone	Eplerenone

Table 4-4 *Overview of medicines involved in the category "Incorrect medicine"*

Table 4-5 presents the medicines that were involved in the discrepancies with incorrect dose. Ramipril and Levothyroxin were the most common drugs in this category with four discrepancies each, followed by Metoprolol depot and Bumetanid. There was most frequently drugs from the ATC-group C, Cardiovascular with 14 of 30 (46,7%) discrepancies.

Drug	ATC	Amount of discrepancies	Too high dose	Too low dose
Alimentary Tract and Metabolism				
Metformin	A10	1	0	1
Calcigran Forte	A12	1	0	1
Blood and bloodforming organs				
Rivaroksaban	B01	1	0	1
Acetylsalicylic acid	B01	1	1	0
Cardiovascular system				
Ramipril	C09	4	3	1
Metoprolol dep.	C07	3	2	1
Bumetanid	C03	3	3	0
Bisoprolol	C07	1	1	0
Hydrochlorthiazid	C03	1	0	1
Karvedilol	C09	1	1	0
Atorvastatin	C10	1	0	1
Systemic Hormonal preparations				
Levothyroxin	H03	4		
Prednisolon	H02	1	1	0
Nervous System				
Levodopa/Karbidopa	N04	1	0	1
Pramipexol	N04	1	0	1
Olanzapin	N05	1	0	1
Respiratory System (R)				
Budesonid/formoterol inhalation	R03	2	1	1
Tiotropiumbromid inhalation	R03	2	2	0
Terbutalin inhalation	R03	1	0	1
Sensory Organs (S)				
Timolol/dorzolamid	S01	1	1	0

Table 4-5 *Overview of the drugs involved in the category "Incorrect dose".*

Table 4-6 presents the medicines and ATC-groups involved in the discrepancies in the category "Patient does not use drug. Furosemid (4), Amiodarone (3) and Pantoprazol (3) were the most frequent drug involved in this category.

Table 4-7 shows the medicines and their ATC-groups for drugs missing from either the electronical record, hospital journal/curve or both. The most frequent medicine missing were Salbutamole inhalation and Diclofenac. Drugs in the ATC-group Nervous System were most frequent with 10 of the 49 discrepancies (20%)

Drug	ATC	Total errors
Alimentary Tract and Metabolism		
Pantoprazol	A02	3
Natriumfluorid suspension	A01	1
Metformin/Vildagliptin	A10	1
Loperamid	A07	1
Blood and bloodforming organs		
Acetylsalicylic acid	B01	2
Tranexamic acid	B01	1
Rivaroksaban	B01	1
Cardiovascular system		
Furosemid	C03	4
Amiodarone	C01	3
Ramipril	C09	2
Simvastatin	C10	2
Ezetimib	C10	2
Rosuvastatin	C10	2
Bumetanid	C03	1
Atorvastatin	C10	1
Nitroglycerin	C01	1
Lerkanidipin	C08	1
Dermatologicals		
Betametason/kalsipotriol topical	D07	2
Mometasonfuroat topical	D07	2
Betnovat w/ chinoform topical	D07	1
Betnovat liniment	D07	1
Mikonazol/Hydrocortison	D01	1
Genito-urinary system and sex hormones		
Dutasterid/tamsulosin	G04	1
Musculo-skeletal systems		
Denosumab injection	M05	1
Nervous system		
Mirtazapin	N06	2
Escitalopram	N06	1
Levomepromazin	N05	1
Oxazepam	N05	1
Levetiracetam	N03	1
Paracetamol	N02	1
Respiratory System		
Fexofenadin	R06	1
Desloratadin	R06	1
Etylmorphin	R05	1
Indakaterol inhalation	R03	1
Tiotropiumbromid/Olodaterol inhalation	R03	1
Terbutalin inhalation	R03	1

Table 4-6 *Overview of the drugs involved in the category "Patient does not use drug"*

Drug	ATC-group	Total errors
Alimentary tract and metabolism		
Sennaglycoside	A06	2
Insulin Aspart	A10	1
Triobe	A11	1
Calcigran Forte	A12	1
Esomeprazol	A02	1
Pantoprazol	A02	1
Blood and blood forming organs (B)		
Acetylsalicylic acid	B01	3
Vitamin B12 Depot injection	B03	1
Cardiovascular system		
Glyceroltrinitrate	C01	1
Amiodarone	C01	1
Pravastatin	C10	1
Ezetimib	C10	1
Atorvastatin	C10	1
Metoprolol depot	C07	1
Valsartan Hydrochlorthiazid	C09	1
Dermatologicals		
Mikonazol/Hydrocortison	D01	1
Genito-urinary system and sex hormones		
Vardenafil	G04	1
Tadalafil	G04	1
Estradiol Vaginals	G03	1
Systemic Hormonal preparations		
Prednisolon	H02	1
Musculo-skeletal systems		
Diclofenac	M01	4
Nervous system		
Zopiclone	N05	3
Paracetamoll/Codeine	N02	3
Klozapine	N05	1
Oxazepam	N05	1
Olanzapine	N05	1
Paracetamol	N02	1
Respiratory System		
Salbutamole inhalation	R03	4
Etylmorphin	R05	1
Fluticasone/Salmeterol inhalation	R03	1
Budesonid/formoterol inhalation	R03	1
Terbutalin inhalation	R03	1
Fluticasone furoate/vilanterol inhalation	R03	1
Sensory Organs (S)		
Timolol/dorzolamide	S01	1
Tafluprost	S01	1

Table 4-7 *Overview of drugs connected to discrepancies in the Category "Drug Omission"*

In **table 4-8** we find the distribution of second level of ATC-groups in the different categories. Betablocking agents were most common in incorrect dose, Dermatological Corticosteroids for "Patient does not use" and drugs for Psycholeptics in "Drug Omission".

	ATC-Code	Count	%
Incorrect drug			
Drugs for acid related disorders	A02	2	40,0
Diuretics	C03	1	20,0
Agents acting on the renin-angiotensin system	C09	1	20,0
Lipid modifying agents	C10	1	20,0
Incorrect dose			
Beta blocking agents	C07	5	19,2
Drugs for obstructive airway diseases	R03	4	15,4
Diuretics	C03	3	11,5
Agents acting on the renin-angiotensin system	C09	3	11,5
Antithrombotic agents	B01	2	7,7
Thyroid therapy	H03	2	7,7
Anti-Parkinson drugs	N04	2	7,7
Drugs used in diabetes	A10	1	3,8
Mineral supplements	A12	1	3,8
Lipid modifying agents	C10	1	3,8
Corticosteroids for systemic use	H02	1	3,8
Patient does not use			
Corticosteroids, dermatological preparations	D07	5	11,4
Cardiac therapy	C01	4	9,1
Diuretics	C03	4	9,1
Lipid modifying agents	C10	4	9,1
Drugs for acid related disorders	A02	3	6,8
Drugs for obstructive airway diseases	R03	3	6,8
Antithrombotic agents	B01	2	4,5
Antifungals for dermatological use	D01	2	4,5
Psycholeptics	N05	2	4,5
Psychoanaleptics	N06	2	4,5
Drug Omission			
Psycholeptics	N05	7	14,9
Drugs for obstructive airway diseases	R03	7	14,9
Analgesics	N02	4	8,5
Antithrombotic agents	B01	3	6,4
Lipid modifying agents	C10	3	6,4
Anti-inflammatory and antirheumatic products	M01	3	6,4
Drugs for acid related disorders	A02	2	4,3
Cardiac therapy	C01	2	4,3
Urologicals	G04	2	4,3
Thyroid therapy	H03	2	4,3
Ophthalmologicals	S01	2	4,3

Table 4-8 *Distribution of the most commonly ATC-groups involved in the different error categories identified at MR.*

4.4 Clinical relevance score

The expert panel scored all the discrepancies found in our study, and **table 4-9** displays the lowest/highest mean score of one discrepancy, the lowest/highest individual score* of one discrepancy and the total mean score of all the discrepancies in the specific categories. The "other" category, consisting of two allergy information discrepancies between the records were scored the highest mean score with 8,25, followed by a score of 2,96 for incorrect doses.

Discrepancy Category	Lowest score of discrepancy	Highest score of discrepancy	Lowest/Highest individual score*	Total mean score
Incorrect drug	0,25	3,75	0/7	2,00
Incorrect dose	1,25	5,00	0/10	2,96
Patient does not use drug	0,50	6,00	0/10	2,43
Drug Omission	0,75	6,00	1/10	2,53
Other	8,25	8,25	7/10	8,25

Table 4-9 *Clinical relevance score of each discrepancy category*

***Lowest/highest score of individual in expert panel**

5. Discussion

5.1 Main data

Electronic records were introduced to reduce errors and improve communication between healthcare professionals and settings, and hence reduce the opportunity for error. The results from this small scale study suggests that this assumption is incorrect. With at least one error identified in around one third of the patients the potential for harm due to miscommunication remains. In addition to that, we found that there were around four discrepancies per patient when looking at their hospital and electronic records.

The most common error was found to be that there were drugs that the patient did not use even though the records stated so. Which means that the potential implication is patients receiving drugs that they do not have any need for and presents the potential harm. The other frequent discrepancy that we observed were incorrect doses and drugs omitted

When considering the types of medication, we find that the most common drugs were found to be Ramipril and Albyl-E. The severity of errors was on average found to be 3,6 using the Dean scale, however there were discrepancies that were rated over 8 by an individual in the expert panel 23 times, which means that there were multiple errors in our study that the health professionals considered to be potentially deadly.

5.2 Method discussion

5.2.1 Strengths of the study

We asked an expert panel of 2 pharmacists and 2 senior doctors to assess the discrepancies found between the 3 sources of information that were available. The expert panel used a validated scale devised by Dean and Barber that were found appropriate to assess errors without requiring knowledge of patient outcomes(88). In the scoring sheet we saw variances that were largely seen between the two professions that were asked to score the clinical significance. Previous studies have concluded that judges of different professions differ in their assessment of errors, which is also seen here(89, 90). On the contrary, we can also find studies that also show differences among individuals where multiple health personnel from the same profession has participated(88). We found it appropriate to ask 4 judges from two

different professions that has clinical experience to score the medication errors. Patient were also consecutively included and there were few exclusion criteria's.

5.2.2 The limitations of the study

The study setting and location is set at one hospital at one ward in Western Norway. The results of the study will therefore be of limited generalisability to other hospitals and wards and ideally, the study would be performed at several wards in several hospitals in the country to increase generalisability. The patients selected for recruiting into the study where performed by both the project pharmacist and head nurses at the ward. The nurses were not always available and free when the project pharmacist was at ward, so the selection would have to be done by the project pharmacist with the consent of the nurse, which would potentially introduce bias favouring selection that would benefit the intervention.

The recruiting of patients were also performed occasionally in times of less busy parts of the day because the nurses have a hectic schedule. This would present patients that would be more friendly and positive to intervention and also patients that would have a social desirability and therefore prone to self-selection. Patients not interested in participating may do so because of fatigue and the consequence is a less variated study population and inclusion of patients that may not be the ones in need of the service. Ideally, there would be an independent recruiter for the study and the patients that were not able to participate would create more difficulties for anyone performing MR and therefore would produce different results. The study population is small in this study and we would have more power in our identified findings if we had a larger sample size.

The results in this study has not differentiated between intentional and unintentional discrepancies found between the different sources. In those cases that an intentional change in the patients medication at admission has been done, but not documented properly in the medical curve or patient journal, the change has been registered as an discrepancy. Consequently the number of discrepancies is potentially overestimated. The project pharmacist would also have more time to perform MR than an individual providing care and again therefore may not reflect the number of errors which may be detected in practice.

5.2.3 Project Pharmacist

In this study, the student, who is not a trained clinical pharmacist is conducting the interviews and is also the one doing the medicine reconciliation, and therefore it would not be improbable that a more trained and experienced pharmacist would identify additional errors and discrepancies, and gotten better results. The student pharmacist were introduced to the IMM-method and its procedures by his supervisor and underwent briefly training in the procedure before conducting the interviews with the patient because of shortage of time. In addition to that, the project pharmacist underwent further training by the supervisor a little bit later into the inclusion period from December, meaning that the project pharmacist improved his reconciliation and interview skills and, therefore given some of the patients included in the study enhanced reconciliation to some patients than other. If the student underwent more training at the beginning and also had the opportunity to practice and refine method skills to a larger extent before interviewing all the patients, the intervention might have been improved throughout the study. A study conducted an educational campaign targeting junior doctors and included teaching, posters and placing reminders in the hospital notes. They included 580 patients and the discrepancy rate per patient on discharge summaries significantly reduced from 2.6 in the pre-educational intervention, to 1.0 by the end of the study. The decline also remained significant when only clinically important discrepancies were included(91). This supports that teaching activities could improve medicines reconciliation performance to an extent.

5.3 Integrated Medicines Management and Standardised Reconciliation Document

The study shows that the IMM method used for a medicines reconciliation process might be appropriate to record discrepancies in the medicine list between the different sources in a cardiologic ward setting. The study population in our study was relatively old compared to other studies in Norway and were also diagnosed before admission according to the hospital journals and therefore already used a number of drugs, which is expected from a cardiologic ward. The inclusion criterias in the IMM-method from Northern Ireland were one of the following; use at least 4 regular drugs at admission, use one high risk drug, takes antidepressants, is 65 years old and/or has been hospitalised the last 6 months(27). The LIMM-model from Sweden included patients over 65 years and atleast one regular drug on prescription(64). The inclusion criterias resemble the patients included in our study as the

mean age was 69.8 years and all patient had at least one regular drug. Past studies in other wards in Norway display that there is an appropriate method to use in other wards and in patient groups with lower age, but nonetheless also shows that high age and higher amount of drugs at admissions are risk factors for discrepancies. The IMM-method can therefore be appropriate for other wards in other hospitals in Norway.

The integrated medicines management method and use of standardised MR forms to ensure optimum implementation could contribute to better communication of information. There is limited evidence on the impact of electronical records, but those reported has shown a significant reduction in both discharge summary omissions and medication errors with the potential to decrease health resource utilisation(92, 93).

The standardised forms used for conducting the medicine reconciliation from the IMM-method in Norway contains the gathering of essential key points that is relevant for a reconciliation. That includes patient identity, information on medication, checking their ability to adhere, adverse drug reactions and drug allergy. The form is designed so that the information from the medical curves goes in as the main information, and then discrepancies from other sources is recorded under "*dosage**". At times the information on the medical curve will not contain information on what drugs the patient used before admission, and therefore it should be stated where the main information is collected from, whether it is the curve/cardex or other sources. It is also not clear where information on drugs that are not documented in the medical curve should be recorded on the form. The procedure assume that the hospital medical curve or journal contains all the drugs that the patient use, which is more often not the truth.

The procedure of the IMM-method also contains a checklist on drug groups that is expected of the pharmacist to check through in the interview. The checklist provides an overview of all the groups that might be relevant to ask for further information, but it is often not appropriate to ask all of them. The procedure might be impracticable time wise and removes porfessonial decision making and discretion. In other words, a good professional will tailor their MR process accordingly, to some extent individually and identify all of the main issues efficiently without needing a tick box. Furthermore, the checklist designates and causes the interview to consist of closed questions and this might lead the interview to be experienced more as an interrogation from the patients perspective. An interview with more open questions is preferable as the interviewer might pick up information that is relevant in a two-way dialogue where the patient can speak more freely instead of answering yes or no questions.

The standardised forms that the Hospital Pharmacies use from the IMM-method is also developed before the introduction of the electronical Summary Care Record that makes it easier to collect and record all the prescriptions that the patient has. Furthermore, Haukeland University Hospital implemented electronic medical curves that the cardiologic ward now use. The electronical curves directly downloaded the information from the Prescription Supplier/Summary Care Record so that information on all prescriptions now is directly set into the hospital curve. From the results it is evidence that there is an amount of discrepancies between the Summary Care Record and what the patient real drug use is. The standardised forms should take into consideration the synchronization between the medical curve and electronical records and an intervention aiming to reduce the discrepancies between the two different sources.

Developing and incorporating a standardised form is not free of challenges. Underutilisation and unfamiliarity of the staff with form might be problematic and be perceived as confusing and time consuming and thus contribute to reduced quality in care transition(93). However, experience with the form would build up and thus form completion might improve and become more effective.

5.4 Result discussion

5.4.1 Impact of electronical records

The numbers for the percentage of lists with discrepancies (83%) was found similar to other studies. Our results agrees with a previous Norwegian study that looked at discrepancies in medicine lists with atleast one discrepancy from Tromsø (84%) and summarized data from 5 studies in Oslo (79%)(37, 94-98). Another study from Oslo found a rate of 70%, while three others found a lower rate of 53% and 47% at different hospital settings(99-101). In international studies, it has been observed that medicine lists discrepancy rate varies from 16,8% to 85%(31, 32, 92, 102-113). This is confirmed by multiple reviews including Tam et al. (67%) and Lehnbom et al. that showed a variation between 3,4 – 98,2% in a review from 2014. The big differences and variation can be explained from different study designs and different study population,

The mean number of discrepancies per list were found comparable and agreeable to the past studies. Norwegian numbers has shown mean numbers of 3,2 discrepancies per list(37, 94-96, 98, 100, 101), while international studies has shown an average up to 2,3 discrepancies(73, 102, 105, 107, 108, 110). The data is though not directly comparable since the international studies is conducted in countries with very different health systems and structures. The studies also differ in patient demographics, in their presentation of outcome measure, as some present per list with at least one discrepancies and others as just per list, they vary in what type of data that is included or excluded and differ in study setting. It would be more appropriate to compare our numbers with the Norwegian studies that has used the same methods as ours. Our study shows that our numbers concur with or is slightly higher than studies that uses the same IMM-method, but those studies are without the use of electronic records. Our proportion of discrepancies is higher than multiple studies, and this might be explained by the high age average, high mean amount of drugs and the higher amount of men in the study(94-98).

There is though no big difference between our study and the one summarized study from Oslo in regard to amount of lists with discrepancies (79% vs. 83%). The patient demographics did not differ very much in age (73 vs 69,8) or amount of drugs (6,0 vs. 7,0), but mean average of discrepancies showed a very higher amount in our study (3.0 vs. 4.53). There is no evidence on a great impact of electronical records compared to the other studies in Norway (table 1.1) as our study seems to either contain around the same amount of lists with discrepancies and the same or higher rate of discrepancies per list.

The electronical records containing invalid or old prescription lines of medications that the patient does not use more, from the GP or other doctors might explain this. GPs, hospital doctors and other secondary care doctors all have the possibility to prescribe medicines into the electronical record database, but is it not clear who have the responsibility to clean up and delete invalid or old prescriptions. The GP law regulations states that the main responsibility lies within the GP to coordinate the patients drug therapy(114), but a Danish study from 2015 concludes that GPs does not know enough about when and how to discontinue medication, and moreover that they lack the support to do so(115). This includes that the GPs does not always have a clear picture of when the treatment is no longer needed. The study also states that the doctors lack the government support to discontinue medicine, thus a solution to this is to develop guidelines for doctors to stop medication. For example, the Norwegian government has adapted the START (Screening Tool to Alert doctors to Right Treatment) and STOPP (Screening Tool of Older People's potentially inappropriate Prescriptions) tools, Europe's most used assessment tool to Norwegian conditions(116). The tools' purpose is to reduce unfortunate drug use in elderly patients, and feedback states that the tools is useful as an aid to decision-making in clinical practice. Implementation of these and similar tools or guidelines for younger patients may contribute to medicine lists that is more accurate.

The consequence of not discontinuing is that the GPs continue to prescribe medications, their own and other secondary care doctors medications even though there is no more benefit for the patients in continuing their medication. This might be a problem with the introduction of the Norwegian electronical records, and the GPs might have a little too much respect to take action against what specialists prescribe considering . However, discharge summaries is often written by junior doctors with limited experience and a senior doctors signature is no guarantee of quality due to time pressure. Discontinuing medication might be a way to prevent patient harm caused by side effects and the research therefore shows that the doctors are motivated to stop the medications, but abstains from doing so because they are perplexed about how they should address it.

Another problem might be that the GPs, hospitals and pharmacies use different computer systems to prescribe, recall and dispense medication. Therefore it may be difficult to communicate when the different care settings does not have each others perspective on how the medicine lists actually look like. The pharmacies use a common system, the GPs does not. Feedback from some of the GPs is that their system does not automatically show for instance,

when there is a double prescription on the same drug. A common system among the GPs that communicates well with the systems in the hospital and pharmacies should be aimed for.

The consequences of no one organizing or cleaning up the patients' prescription lines is a potential inaccurate overview of what the patient really uses. Hospital doctors then might have to use time and resources to research and find out what the patient actually use at admission to the hospital or even worse, that they base their decisions on further therapy on information that is wrong. Another consequence that could happen is when the pharmacy dispense medication to the patient, that they have several alternatives on the same drug because no one deleted the old prescription. The different drugs might also have different dosage and the pharmacy can assume that the newest prescription is the right one, but they do not know. Pharmacy staff might also have the belief that they should dispense and use up the old prescriptions first, as many GPs automatically renew their patients. This leads to the assertion that multiple prescription lines on the same drug increases the risk for medication errors.

The hospitals in Norway will gradually transfer to electronic medical curves and lists, which had already started happening at the ward where this study was conducted. The e-curves will gather all information on medication use and transfer it automatically to their system, including the data from the electronical Summary Care Record and Prescription Supplier. Therefore, old, unused and invalid prescriptions will also be automatically transferred to the e-curves and the hospital system. The errors will follow from record to record, which the staff have to correct. It is also a tendency that the easier it is to transfer data to the electronical curves at admission the easier it is to accept that the list that is transferred in from the electronical records is correct as they are, and therefore accepted without reconciliation. The consequence is far more errors in the medicine lists than what has previously been the case before.

The implementation of electronical records show that medicine information transfer more effectively and safer between different settings of care, but this has also introduced new challenges and barriers that must be solved. The patients will still be the ones that has the complete and true information on what they actually use of their prescriptions. Moreover, they also hold information on herbal medicines, over the counter medicines, supplements and other drugs that the electronical record does not collect. Our results showing that 83% of the patients had a discrepancy in their hospital journals/curves or electronical record is a number that should aimed to be reduced. The medicine list is a part of the foundation for diagnosis

and further treatment at the hospital, thus it is important that they contain correct information. If an error has occurred, there is a possibility that the error continues to persist in other systems. In that way further treatment may be decided on the wrong basis and in worst case may be the source of an adverse drug event. As our results show no great reduction or improvement in the amount of discrepancies compared to the studies without the use of electronic records, it seems that there would be a need for human intervention to secure accurate medicine lists at the hospital.

5.4.2 Types of discrepancies, drugs involved and their clinical relevance

The most frequent discrepancy that we observed in the category "Patient does not use drug" (38%) is slightly higher than some other studies in Norway(36, 95-98, 101, 117). Additionally, we found that "Drug Omission" (36%), and "Incorrect dose" (20%) were observations that agrees with previous national and international studies(37, 72, 95-98, 101, 103, 107, 109, 112, 117). The fact that we observed a higher rate of drugs that the patient did not use may be due to the effect of the electronical record that gather all information on all the patients' prescriptions and interprets them all as drugs in use. That adds up to errors that has previously been discussed because no personnel takes responsibility in clearing up prescriptions in the records. For drug omission, we can observe that drugs involved in this category can be categorised as PRN drugs, medication that is taken when needed. We also observe that some of the drugs that are involved can be categorised as "Over The Counter" (OTC) drugs which you can buy at the pharmacy without prescription, for example Diclofenac and Sennaglycoside which is two more frequently involved drugs. Since the electronic records only display drugs on prescription in their database, this category of drugs will not be picked up at admission unless there is human intervention. There is also no way for the hospital journals to automatically pick these types of drugs up in their systems. The drugs in this category might arguably be of little importance to the patient since most of them are considered PRN drugs and the patients would tell the staff at the ward if they would have a need for them. However, one possible implication is in circumstances, for example acute situations where there is no opportunity to communicate directly with the patient and that leads to the hospital possibly not having an accurate and complete medicine list when making their decisions. One solution to reduce the amount of drugs omitted and reduce the amount of errors of drugs that the patient does not use is to communicate directly with the patient where

there is possible, for example in a MR process. Only the patients have the complete truth about their medications, adherence and recent changes that might not be in the journals.

Our distribution of the drugs among the ATC-groups agrees with previous studies, where they have found that the most frequent drugs involved in the discrepancies has belonged in the ATC-groups A, C and N(34, 37, 72, 92, 94, 96-98, 101, 105, 106, 109-112). ATC-group A (Alimentary Tract and metabolism) is the fourth most common ATC-group in our study, so this also agrees well with the other studies. That ATC-group C is our most frequent discrepancy group is expected since our study takes place in a cardiologic ward, and our study additionally has similarities to previous ones, including a high mean age. The fact that drugs in group N, R and A is among the other most frequent is likewise not very surprising since those three groups is among the most dispensed drug groups nationally. From the Institute of Public Health drug statistics, drug group N (13,31%), R (12,51%) and A (9,09%) were three of the five highest used drug groups in Norway in 2015(118). The other two groups are C (10,38%) and J (Antiinfectives for systemic use)(11,95%).

In the second level of distribution among ATC-groups, Psycholeptics (N05), drugs for obstructive airway diseases (R03) and analgesics (N02) are the most frequent discrepancies in "drug omission". This agrees with the results from Holmestad et al. in 2015 and Hellström et al. from 2012(64, 117). These types of drugs are typical PRN drugs. This agrees with our earlier notion since Salbutamol, Paralgin Forte and Diclofenac is the drugs most frequent in this category. Our and previous results therefore indicates that these are typical drugs that does not get picked up at admission. Since they are drugs that might not be part of the patients daily routine, the patients might forget to mention them, and the doctors might forget asking about them and therefore not register them in the discharge summaries.

For the category "patient does not use", the most frequent groups were in Dermatological corticosteroids (D07), Cardiac Therapy (C01), Diuretics (C03) and Lipid modifying agents (C10). This does not completely with the other studies, which had frequently drugs in the ATC-group A(117), but may again be a result of the study setting. Dermatological Corticosteroids is a typical as needed drug and might be used temporary or as a cure, and that the prescriptions or drug information has not been updated, deleted or completed might be the cause for the frequent discrepancy. This also includes diuretics that might be used temporary for water retention, such as Furosemide which is the most frequent drug involved in this discrepancy category. For Cardiac Therapy drugs that were involved, we observed that Cordarone were three out of four discrepancies. The doctor may have discontinued the

Cardiac Therapy drugs and Lipid modifying drugs and so the prescription might linger from previous time. It may have occurred so because of adverse drug events, as Cordarone and lipid modifying agents such as statins are commonly associated with side effects, though we do not have enough data to conclude on this.

The same reasons might also be applied for discrepancies in the "incorrect dose" category, where beta blocking agents, such as Metoprolol depot and Bisoprolol, and drugs for obstructive airway diseases are the most common. In the case for beta blocking agents being involved, the general rule is "start low, go slow" with these types of drugs and other blood pressure medicines, where you usually start with a low dose, and gradually increase until you reach lowest effective dose. The dose will therefore frequently change until you reach the right dose and might explain why we find several discrepancies with incorrect dose for this ATC-group and Ramipril which is frequently involved. The same explanation can be applied to why Levothyroxin (Levaxin) is the most common drug involved in this category, since the dose is individual set and controlled by TSH-values. The initial dose is likewise low and then gradually increasing every 4^{th}- 6^{th} week until you reach a maintenance dose(119). In the case for drugs in ATC-group R03, drugs for obstructive airways, several types are typical PRN drugs and may therefore also vary in dosing. It is consequently not surprising that we find them in the category "incorrect dose". The possible implications is that the patient receives a wrong dose and that they are under or over treated because the records is not updated or just contains an input error. The same solution for the frequently errors in drugs that the patient does not use may be applied here, that there is a need for a health personnel that has the responsibility to coordinate the prescriptions in the record, such as the GP which regularly communicates with the patient.

On the active substance level numerous drugs is repeatedly recurrent in past studies looking at the most frequent ones, though most studies vary in what their most common drugs. In the Norwegian studies from 2012 paracetamol, glyserolnitrate, zopiclone, diazepam and paracetamol/codeine is observed most frequent(94, 96-98, 101). Holmestad et al. found paracetamol, zopiclone, oksazepam, salbutamol and paracetamol/codeine as theirs(117), whilst a study in Northern Norway found ibuprofen, paracetamol, zopiclone, oksazepam and salbutamol as their most frequent(37). In our study, we find Ramipril and Albyl-E as our most frequent drugs which again may be a result of conducting the study at a cardiological ward. When we look at drugs not among the ATC-group C, we observe that Somac, Salbutamol and Zopiclone are among the most frequent, agreeable to an extent with previous studies and

which again also strengthens the theory that typical PRN drugs does not get picked up at admission.

In the clinical relevance score for each of the discrepancy type, we see that the 2 discrepancies in the category “Other” have the highest mean score with 8,25 out of 10 from the expert panel. The two discrepancies in this category were related to incorrect information on the patients drug allergies. One of the individuals in the expert panel commented that the discrepancy in the electronical record on the error in the allergy information might be deadly if the patient is admitted to another hospital and does not find the correct information in the electronical record. In the category “incorrect drug” the mean score were 2,00 and suggests that the discrepancies in this category is of little potential effect to the patient. Even though the medicine lists contains the wrong drug name or a drug of the same kind, the patient is still getting treatment for their diagnosis and this reflects the low score for clinical significance for this type of discrepancy.

We find that “Incorrect dose” has the highest mean score of all the categories with a score of 2,96, while “Patient does not use drug” and “Drug Omission” was respectively scored 2,43 and 2,53. The scores indicates that the errors is generally of little to moderate significance, with a low potential for effect on the patient. This supports the note that a relative amount of discrepancies is caused by PRN medicines and therefore, the panel would not find it of high significance if the patient does not take it or the hospital does not record it. However, there are discrepancies of high significance, displayed by that some of the discrepancies were scored 10 by individuals in the panel, meaning there were errors among the discrepancies that were scored potentially deadly for the patient. In our study, 23 discrepancies where rated 8 or higher by an individual in the expert panel, meaning that there were multiple discrepancies in the study that some in the expert panel found to be of potential severe harm to the patient. For example we found a discrepancy where the electronic journal systems stated that the patient used Amiodarone, which was not the case. With the new electronic curve system that automatically download the information from the electronic records, there would be an potential of error where the patient was given Amiodarone unnecessary and be potentially of harm. However, the highest score for an individual discrepancy by the four health professionals in the panel were 6.00, if you excluded the two allergy discrepancies. Even though there were 23 discrepancies with an individual rating of 8 or higher, but no higher total score of 6.00 is evidence that the expert panel differed highly in severity scoring.

5.5 Improvement suggestions and research needs

Our studies results put forward that even with the introduction of electronical records that there is a need for human intervention along with new digital solutions that aim to improve communication between care settings. Comparisons between our study and similar studies without the use of electronical records show no great difference and seem to be showing the same results. Our study is the first one to research the impact of the e-records after their introduction in Norway, and to conclude certainly on this there will be a need for bigger and generalizable studies. Our observations might also be a result of health personnel not being entirely acquainted to a new system and time might be needed for the fully effects of the e-records to take place in an everyday with already a lack of time. Health personnel might also need time to get used to and implement the new digital tools into their daily routine. In this study, we experienced that the staff on the ward minimally used the Summary Care Record (SCR), and with time and experience the effects might progress.

Though, the introduction of e-curves presents a new challenge where the information from the electronical records are automatically downloaded to the hospitals, and therefore all prescriptions is set into the hospital records and medical curves. Our study shows that the electronical records often contain discrepancies because no one organizes the old prescriptions the patient is using, and therefore the information in the e-records are often false. A solution to clean up and organize the prescsription list in the e-records must be established. The natural solution is to guide the GPs to do this task since they have the patients' full medical history and know the patients best themselves. The studies show that one of the barriers that obstructs GPs to discontinue medication is the lack of government support to do so. Thus, guidelines to support GPs to organize their patients' prescription lines might be a solution to more accurate electronical records.

Implementing medicine reconciliation and including pharmacist service might be a good initiative to securing accurate medicine lists, and the Patient Safety Program started by the government is setting a nationwide focus on this. Studies show that the IMM-model can contribute to increase the quality of drug therapy(100). Additionally, several countries has implemented medicine reconciliation as a patient service, though they are countries with different health systems and we do not know if their studies also apply to the Norwegian care settings. The studies in Norway are moreover of less robust design and are not of appropriate outcome measures to fully conclude on the benefit of medicine reconciliation for the patients.

Moreover, the IMM-method should be adapted to Norwegian conditions, as the Swedish has done with the LIMM-method.

Multiple hospitals in Norway have already implemented medicine reconciliation as a service, and there is a need for more studies to show if MR is a good enough initiative to reduce the amount of errors and justify the additional resources invested in this. Holmestad et al.'s study from 2015 did not find a significant difference in errors between lists with MR vs. lists without(117) and inadequate implementation and training of the pharmacists to conduct MR might be a factor to why there was found no difference. Nevertheless, future studies of the MR process in hospital settings should aim to measure the effects that is relevant to the patient, i.e. adverse drug events, life quality or QALY (Quality-adjusted life years) which is what the British NHS uses to accept studies. Such outcome measures would be more appropriate to see if MR is a suitable intervention. Studies counting DRPs or errors does not measure the services advantages', or what benefits there actually is to the patient. We cannot assume better clinical outcomes for the patients in reducing errors or discrepancies in the medicine lists. Research should also aim to measure the cost-benefit of the MR process to identify if it is an appropriate and economic method to spend health resources.

Since our study shows that there is no evidence on an impact of electronic journal systems and records to disprove the need for human intervention, there will still be a need to find evidence for health services to reduce the amount of errors.

Conclusion

Our study shows that there was no evidence of the impact of electronical journal systems on the medicine lists to negate the need for human intervention, and the existing process of care transition communication at the healthcare interface is not optimum. Evidence to support the MR intervention and the IMM-method is needed to conclude on the benefit of the service.

Literature list

1. Folkehelseinstituttet. Statistikk fra Reseptregisteret. 2015.
2. The American U.S. Food and Drug Administration. Medication Errors Related to Drugs. 02.05.2016.
3. Nebeker JR, Barach P, Samore MH. Clarifying adverse drug events: a clinician's guide to terminology, documentation, and reporting. Annals of internal medicine. 2004;140(10):795-801.
4. Helse- og Omsorgsdepartementet. Legemiddelmeldingen - Riktig bruk - bedre helse. 2014-2015.
5. Norwegian Board of Health Supervision. Meldesentralen - Summary Report 2008-2011. 2012.
6. Helse- og Omsorgsdepartementet. Stortingsmelding nr. 10 God kvalitet - trygge tjenester. 2012-2013. p. 7, 32-3, 83.
7. Helse- og Omsorgsdepartementet. Høringsuttalelse til revidert fastlegeforskrift. 2012.
8. Hjort PF. Uheldige hendelser i helsetjenesten: Gyldendal; 2007.
9. Helsedirektoratet. Samhandlingsstatistikk 2014-2015. 2015.
10. Preventing Adverse Drug Event Through Medicines Reconciliation24.11.2015. Available from: http://www.ihi.org/knowledge/Pages/Tools/HowtoGuidePreventAdverseDrugEvents.aspx.
11. Finckenhagen M. I Trygge Hender 24/7. Evaluering av Pilot, Samstemming av legemiddellister. 2011.
12. Norsk definisjon for samstemming av legemiddellister28.11.2015. Available from: www.pasientsikkerhetsprogrammet.no.
13. Fertleman M, Barnett N, Patel T. Improving medication management for patients: the effect of a pharmacist on post-admission ward rounds. Quality & safety in health care. 2005;14(3):207-11.
14. Slee Ann FK, Hughes Don, Constable Simon. Optimising medical treatment - how pharmacist-acquired medication histories have a positive impact on patient care. Pharmaceutical Journal. 2006(277):737-9.
15. Strunk LB, Matson AW, Steinke D. Impact of a pharmacist on medication reconciliation on patient admission to a Veterans Affairs Medical Center. Hosp Pharm. 2008;43:643-9.
16. Boockvar KS, Carlson LaCorte H, Giambanco V, Fridman B, Siu A. Medication reconciliation for reducing drug-discrepancy adverse events. The American journal of geriatric pharmacotherapy. 2006;4(3):236-43.
17. Crotty M, Rowett D, Spurling L, Giles LC, Phillips PA. Does the addition of a pharmacist transition coordinator improve evidence-based medication management and health outcomes in older adults moving from the hospital to a long-term care facility? Results of a randomized, controlled trial. The American journal of geriatric pharmacotherapy. 2004;2(4):257-64.
18. Kripalani S, LeFevre F, Phillips CO, Williams MV, Basaviah P, Baker DW. Deficits in communication and information transfer between hospital-based and primary care physicians: implications for patient safety and continuity of care. Jama. 2007;297(8):831-41.
19. Bergkvist A, Midlov P, Hoglund P, Larsson L, Bondesson A, Eriksson T. Improved quality in the hospital discharge summary reduces medication errors--LIMM: Landskrona Integrated Medicines Management. European journal of clinical pharmacology. 2009;65(10):1037-46.
20. George LJW, Senturk-Raif R, Hodgkinson MR, Emmerton M, Larmour I. Impact of a Surgical Preadmission Clinic Pharmacist on the Quality of Medication Management from Preadmission to Discharge: a Randomised Controlled Study. Journal of Pharmacy Practice and Research. 2011;41(3):212-6.
21. Koehler BE, Richter KM, Youngblood L, Cohen BA, Prengler ID, Cheng D, et al. Reduction of 30-day postdischarge hospital readmission or emergency department (ED) visit rates in high-risk elderly medical patients through delivery of a targeted care bundle. Journal of hospital medicine. 2009;4(4):211-8.

22. De Winter S, Vanbrabant P, Spriet I, Desruelles D, Indevuyst C, Knockaert D, et al. A simple tool to improve medication reconciliation at the emergency department. European journal of internal medicine. 2011;22(4):382-5.
23. Karapinar-Carkit F, Borgsteede SD, Zoer J, Egberts TC, van den Bemt PM, van Tulder M. Effect of medication reconciliation on medication costs after hospital discharge in relation to hospital pharmacy labor costs. The Annals of pharmacotherapy. 2012;46(3):329-38.
24. Kripalani S, Roumie CL, Dalal AK, Cawthon C, Businger A, Eden SK, et al. Effect of a pharmacist intervention on clinically important medication errors after hospital discharge: a randomized trial. Annals of internal medicine. 2012;157(1):1-10.
25. Murphy EM, Oxencis CJ, Klauck JA, Meyer DA, Zimmerman JM. Medication reconciliation at an academic medical center: implementation of a comprehensive program from admission to discharge. American journal of health-system pharmacy : AJHP : official journal of the American Society of Health-System Pharmacists. 2009;66(23):2126-31.
26. Walker PC, Tucker Jones JN, Mason NA. An advanced pharmacy practice experience in transitional care. American journal of pharmaceutical education. 2010;74(2):20.
27. Scullin C, Scott MG, Hogg A, McElnay JC. An innovative approach to integrated medicines management. Journal of evaluation in clinical practice. 2007;13(5):781-8.
28. Helse- og Omsorgsdepartementet. Stortingsmelding nr. 18: Rett kurs mot riktigere legemiddelbruk. 2004-2005. p. p. 25, 30.
29. Dornan T. AD, Heathfield H.,. An In depth investigation into causes of prescribing errors by foundation trainees in relation to their medical education - EQUIP study. General Medical Council. 2013.
30. Heath & Social Care Information Centre. Hospital Episode Statistics: Admitted Patient Care Summary Report. 2011-2012.
31. Cornu P, Steurbaut S, Leysen T, De Baere E, Ligneel C, Mets T, et al. Effect of medication reconciliation at hospital admission on medication discrepancies during hospitalization and at discharge for geriatric patients. The Annals of pharmacotherapy. 2012;46(4):484-94.
32. Hellstrom LM, Bondesson A, Hoglund P, Eriksson T. Errors in medication history at hospital admission: prevalence and predicting factors. BMC clinical pharmacology. 2012;12:9.
33. Statens Helsetilsyn. Informasjonen var mangelfull og kom ofte for sent.

Oppsummering av landsomfattende tilsyn i 2015 med samhandling om utskrivning av pasienter fra spesialisthelsetjenesten til kommunen
https://www.helsetilsynet.no/upload/Publikasjoner/rapporter2016/helsetilsynetrapport1_2016.pdf: 2015.
34. Elisabeth Yvonne Lao KV, Anne Maagaard. Legemiddelsamstemming ved innleggelse på infeksjonsmedisinsk avdeling,Oslo universitetssykehus, Ullevål. 2012.
35. Frydenberg K, Brekke M. Poor communication on patients' medication across health care levels leads to potentially harmful medication errors. Scandinavian journal of primary health care. 2012;30(4):234-40.
36. Anette Engnes ML, Espen Molden. Uoverensstemmelser og legemiddelrelaterte problemer blant pasienter med kompleks behandling innlagt på en generell indremedisinsk post, Universitetet i Oslo. 2015.
37. Aag TI GB. Is there differences between discrepancies identified by pharmacist and nurse? Norsk Farmaceutisk Tidsskrift. 2014;1/2014.
38. Sekretariatet for nasjonalt sikkerhetsprogram. Om programmet: I trygge hender 24/72010 15.02.2016. Available from: http://www.pasientsikkerhetsprogrammet.no/no/I+trygge+hender/L%C3%A6r+om+programmet/I+trygge+hender+24-7.51.cms.
39. Sekretariatet for nasjonalt pasientsikkerhetsprogram. Valg av innsatsområder15.02.2016 15.02.2016]. Available from:

http://www.pasientsikkerhetsprogrammet.no/no/I+trygge+hender/L%C3%A6r+om+programmet/Valg+av+innsatsomr%C3%A5der.204.cms.
40. Sekretariatet for nasjonalt pasientsikkerhetsprogram. Tiltakspakke for Samstemming av legemiddellister15.02.2016]. Available from: http://www.pasientsikkerhetsprogrammet.no/no/I+trygge+hender/Innsatsomr%C3%A5der/_attachment/2014?_ts=1499974bc5a.
41. Forskrift om endring i forskrift om legemiddelhåndtering for virksomheter og helsepersonell som yter helsehjelp, (2015).
42. Willoch K, Blix HS, Pedersen-Bjergaard AM, Eek AK, Reikvam A. Handling drug-related problems in rehabilitation patients: a randomized study. International journal of clinical pharmacy. 2012;34(2):382-8.
43. Holler JG HK, Aarset M, Major AL. Legemiddelsamstemming: Et tiltak som virker. Sykepleien. 2012.
44. T. K. Legemiddelanamnese og legemiddelsamstemming ved Ålesund Sjukehus, Universitetet i Bergen. 2013.
45. Kramer JS, Stewart MR, Fogg SM, Schminke BC, Zackula RE, Nester TM, et al. A quantitative evaluation of medication histories and reconciliation by discipline. Hosp Pharm. 2014;49(9):826-38.
46. T A. Legemiddelsamstemming ved innleggelse på hjertemedisinsk sengepost: Universitetet i Oslo. 2013.
47. B H. Fører bruk av en ny prosedyre for legemiddelsamstemming til mer nøyaktige legemiddellister: Universitetet i Tromsø. 2015.
48. Viktil KK, Blix HS, Moger TA, Reikvam A. Interview of patients by pharmacists contributes significantly to the identification of drug-related problems (DRPs). Pharmacoepidemiology and drug safety. 2006;15(9):667-74.
49. Lea M BI, Mathiesen L, Mowe M, Molden E. Effect of teaching and checklist implementation on accuracy of medication history recording at hospital admission. International journal of clinical pharmacy. 2016;Feb(38(1)):20.
50. Damlien L DN, Nilsen M, Godø A, Moger TA, Viktil KK. Drug safety at admission to emergency department: an innovative model for PRIOritizing patients for MEdication Reconciliation (PRIOMER). Eur J Clin Emerg Med. 2015;Dec(11).
51. Viktil KK, Blix HS. The impact of clinical pharmacists on drug-related problems and clinical outcomes. Basic & clinical pharmacology & toxicology. 2008;102(3):275-80.
52. Persell SD, Osborn CY, Richard R, Skripkauskas S, Wolf MS. Limited health literacy is a barrier to medication reconciliation in ambulatory care. J Gen Intern Med. 2007;22(11):1523-6.
53. Ruder AD, Smith DL, Madsen MT, Kass FH, 3rd. Is there a benefit to having a clinical oncology pharmacist on staff at a community oncology clinic? Journal of oncology pharmacy practice : official publication of the International Society of Oncology Pharmacy Practitioners. 2011;17(4):425-32.
54. Cavin A SB. Improving medication history recording and the identification of drug related problems in an A&E department. Hopsital Pharmacist. 2005;12(109-112).
55. Galvin M, Jago-Byrne MC, Fitzsimons M, Grimes T. Clinical pharmacist's contribution to medication reconciliation on admission to hospital in Ireland. International journal of clinical pharmacy. 2013;35(1):14-21.
56. Mortimer C, Emmerton L, Lum E. The impact of an aged care pharmacist in a department of emergency medicine. Journal of evaluation in clinical practice. 2011;17(3):478-85.
57. Kwan Y, Fernandes OA, Nagge JJ, Wong GG, Huh JH, Hurn DA, et al. Pharmacist medication assessments in a surgical preadmission clinic. Archives of internal medicine. 2007;167(10):1034-40.
58. Varkey P, Cunningham J, Bisping DS. Improving medication reconciliation in the outpatient setting. Joint Commission journal on quality and patient safety / Joint Commission Resources. 2007;33(5):286-92.

59. Rabi SM, Dahdal WY. Implementation of a pharmacist resident medication reconciliation program. Pharmacy Education. 2015;7.
60. Spinewine A, Swine C, Dhillon S, Lambert P, Nachega JB, Wilmotte L, et al. Effect of a collaborative approach on the quality of prescribing for geriatric inpatients: a randomized, controlled trial. Journal of the American Geriatrics Society. 2007;55(5):658-65.
61. Walker PC, Bernstein SJ, Jones JN, Piersma J, Kim HW, Regal RE, et al. Impact of a pharmacist-facilitated hospital discharge program: a quasi-experimental study. Archives of internal medicine. 2009;169(21):2003-10.
62. Jack BW, Chetty VK, Anthony D, Greenwald JL, Sanchez GM, Johnson AE, et al. A Reengineered Hospital Discharge Program to Decrease Rehospitalization: A Randomized Trial. Annals of internal medicine. 2009;150(3):178-87.
63. Bruce Bayley K, Savitz LA, Maddalone T, Stoner SE, Hunt JS, Wells R. Evaluation of patient care interventions and recommendations by a transitional care pharmacist. Therapeutics and Clinical Risk Management. 2007;3(4):695-703.
64. Hellstrom LM, Bondesson A, Hoglund P, Midlov P, Holmdahl L, Rickhag E, et al. Impact of the Lund Integrated Medicines Management (LIMM) model on medication appropriateness and drug-related hospital revisits. European journal of clinical pharmacology. 2011;67(7):741-52.
65. Brady D, Franklin BD. An evaluation of the contribution of the medical admissions pharmacist at a London teaching hospital. International Journal of Pharmacy Practice. 2004;12(1):1-6.
66. Dutton K, Hedger N, Wills S, Davies P. Prevent medication errors on admission. Clinical Governance: An International Journal. 2003;8(2):128-37.
67. Ismail ZF, Ismail TF, Wilson AJ. Improving safety for patients with allergies: an intervention for improving allergy documentation. Clinical Governance: An International Journal. 2008;13(2):86-94.
68. McFaedzan E. IC, Moffat J. Is there a role for a prescribing pharmacist in preventing prescribing errors in am edical admission unit. Pharmaceutical Journal. 2003;270:896-9.
69. Mergenhagen KA, Blum SS, Kugler A, Livote EE, Nebeker JR, Ott MC, et al. Pharmacist- versus physician-initiated admission medication reconciliation: impact on adverse drug events. The American journal of geriatric pharmacotherapy. 2012;10(4):242-50.
70. Gleason KM, Groszek JM, Sullivan C, Rooney D, Barnard C, Noskin GA. Reconciliation of discrepancies in medication histories and admission orders of newly hospitalized patients. American journal of health-system pharmacy : AJHP : official journal of the American Society of Health-System Pharmacists. 2004;61(16):1689-95.
71. Gillespie U, Alassaad A, Henrohn D, Garmo H, Hammarlund-Udenaes M, Toss H, et al. A comprehensive pharmacist intervention to reduce morbidity in patients 80 years or older: a randomized controlled trial. Archives of internal medicine. 2009;169(9):894-900.
72. Leguelinel-Blache G, Arnaud F, Bouvet S, Dubois F, Castelli C, Roux-Marson C, et al. Impact of admission medication reconciliation performed by clinical pharmacists on medication safety. European journal of internal medicine. 2014;25(9):808-14.
73. Curatolo N, Gutermann L, Devaquet N, Roy S, Rieutord A. Reducing medication errors at admission: 3 cycles to implement, improve and sustain medication reconciliation. International journal of clinical pharmacy. 2015;37(1):113-20.
74. Mueller SK, Sponsler KC, Kripalani S, Schnipper JL. Hospital-based medication reconciliation practices: a systematic review. Archives of internal medicine. 2012;172(14):1057-69.
75. Kwan JL, Lo L, Sampson M, Shojania KG. Medication reconciliation during transitions of care as a patient safety strategy: a systematic review. Annals of internal medicine. 2013;158(5 Pt 2):397-403.
76. Karnon J, Campbell F, Czoski-Murray C. Model-based cost-effectiveness analysis of interventions aimed at preventing medication error at hospital admission (medicines reconciliation). Journal of evaluation in clinical practice. 2009;15(2):299-306.

77. van Walraven C, Laupacis A, Seth R, Wells G. Dictated versus database-generated discharge summaries: a randomized clinical trial. CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne. 1999;160(3):319-26.
78. Jansen JO, Grant IC. Communication with general practitioners after accident and emergency attendance: computer generated letters are often deficient. Emergency medicine journal : EMJ. 2003;20(3):256-7.
79. Pillai A, Thomas SS, Garg M. The electronic immediate discharge document: experience from the South West of Scotland. Informatics in primary care. 2004;12(2):67-73.
80. Afilalo M, Lang E, Leger R, Xue X, Colacone A, Soucy N, et al. Impact of a standardized communication system on continuity of care between family physicians and the emergency department. Cjem. 2007;9(2):79-86.
81. Platte B, Akinci F, Guc Y. Assessing the accuracy of drug profiles in an electronic medical record system of a Washington state hospital. The American journal of managed care. 2010;16(10):e245-50.
82. Ekedahl A, Brosius H, Jonsson J, Karlsson H, Yngvesson M. Discrepancies between the electronic medical record, the prescriptions in the Swedish national prescription repository and the current medication reported by patients. Pharmacoepidemiology and drug safety. 2011;20(11):1177-83.
83. Technical patient safety solutions for medicines reconciliation on admission of adults to hopsital. In: NPSA NIoCENPSAN, editor. 2007.
84. Schnipper JL, Hamann C, Ndumele CD, Liang CL, Carty MG, Karson AS, et al. Effect of an electronic medication reconciliation application and process redesign on potential adverse drug events: a cluster-randomized trial. Archives of internal medicine. 2009;169(8):771-80.
85. Helse- og Omsorgsdepartementet. Stortingsmelding nr. 47: Samhandlingsreformen. 2008-2009:22, 30.
86. Direktoratet for e-helse. E-resept: Om e-resept.
87. Direktoratet for e-helse. Kjernejournal.
88. Dean BS, Barber ND. A validated, reliable method of scoring the severity of medication errors. American journal of health-system pharmacy : AJHP : official journal of the American Society of Health-System Pharmacists. 1999;56(1):57-62.
89. Nixon P DS. Medication errors in paediatrics, Brighton UK. Paper presented at the UKCPA Symposium. 1996 Nov 15-17.
90. Williams E, Talley R. The use of failure mode effect and criticality analysis in a medication error subcommittee. Hosp Pharm. 1994;29(4):331-2, 4-6, 9.
91. Chan AH, Garratt E, Lawrence B, Turnbull N, Pratapsingh P, Black PN. Effect of education on the recording of medicines on admission to hospital. J Gen Intern Med. 2010;25(6):537-42.
92. Midlov P, Bergkvist A, Bondesson A, Eriksson T, Hoglund P. Medication errors when transferring elderly patients between primary health care and hospital care. Pharmacy world & science : PWS. 2005;27(2):116-20.
93. Bedard P TL, Ferland A, et al. A medication reconciliation form and its impact on the medical record in a paediatric hospital. Journal of evaluation in clinical practice. 2011.
94. Gløersen G VK. Medicine Reconciliation on an Acute Geriatric Ward at Vestfold Hospital 2012.
95. Lao YE VK, Maagard Anne. Medicine Reconciliation at Admission to Infection Medicine Ward at Oslo University Hospital (Legemiddelsamstemming ved innleggelse på infeksjonsmedisinsk avdeling, Oslo universitetssykehus, Ullevål). 2012:15. january 2012.
96. Lea M VK, Mowé M,. Medicine Reconciliation at Admission on a General Medicine Ward at Oslo University Hospital (Legemiddelsamstemming ved innleggelse på Generell Indremedisinsk sengepost). 2012.
97. Nilsson CN VK. Medicine Reconciliation at Admission on a Kidney Medical Ward at Akershus University Hospital. 2012.

98. Wendelbo K VK, Blix HS, Rui TO,. Medicine Reconciliation at Admission on a Geriatric Ward. 2012.
99. Bjerknes N BH, Nicolaysen B,. Medicine Reconciliation at Admission to a Psychiatric Bed Ward (Legemiddelsamstemming ved innleggelse i en psykiatrisk sengepost). 2013.
100. Halbostad Terje ME, Hagen H,. Implementation of a structured quality tool for identification and management of drug-related problems at a Geriatric Bed Ward (Implementering av et strukturert kvalitetssikringsverktøy for identifisering og håndtering av legemiddelrelaterte problemer ved geriatrisk sengepost). 2014.
101. Wilhelm S BS, Brenne H, Stavang E,. Medicine Reconciliation at Surgical Ward, Førde Central Hospital (Legemiddelsamstemming ved kirurgisk klinikk, Førde sentralsjukehus). 2013.
102. Allende Bandres MA, Arenere Mendoza M, Gutierrez Nicolas F, Calleja Hernandez MA, Ruiz La Iglesia F. Pharmacist-led medication reconciliation to reduce discrepancies in transitions of care in Spain. International journal of clinical pharmacy. 2013;35(6):1083-90.
103. Bondesson A, Holmdahl L, Midlov P, Hoglund P, Andersson E, Eriksson T. Acceptance and importance of clinical pharmacists' LIMM-based recommendations. International journal of clinical pharmacy. 2012;34(2):272-6.
104. Coffey M, Mack L, Streitenberger K, Bishara T, De Faveri L, Matlow A. Prevalence and clinical significance of medication discrepancies at pediatric hospital admission. Academic pediatrics. 2009;9(5):360-5.e1.
105. Cornish PL, Knowles SR, Marchesano R, Tam V, Shadowitz S, Juurlink DN, et al. Unintended medication discrepancies at the time of hospital admission. Archives of internal medicine. 2005;165(4):424-9.
106. Gleason KM MM, Feinglass J, Baker DW, Lindquist L, Liss D, et. al. Results of the Medications at Transitions and Clinical Handoffs (ATTCH) study: an analysis of medication reconciliation errors and risk factors at hospital admission. J Gen Intern Med. 2010(25).
107. Lessard S, DeYoung J, Vazzana N. Medication discrepancies affecting senior patients at hospital admission. American journal of health-system pharmacy : AJHP : official journal of the American Society of Health-System Pharmacists. 2006;63(8):740-3.
108. Magalhaes GF, Santos GN, Rosa MB, Noblat Lde A. Medication reconciliation in patients hospitalized in a cardiology unit. PloS one. 2014;9(12):e115491.
109. Pascual O, Real JM, Uriarte M, Larrode I, Alonso YM, Abad MR. Evaluation of medication reconcilliation in a Trauma Unit. Revista espanola de cirugia ortopedica y traumatologia. 2015;59(2):91-6.
110. Quelennec B, Beretz L, Paya D, Blickle JF, Gourieux B, Andres E, et al. Potential clinical impact of medication discrepancies at hospital admission. European journal of internal medicine. 2013;24(6):530-5.
111. Steurbaut S, Leemans L, Leysen T, De Baere E, Cornu P, Mets T, et al. Medication history reconciliation by clinical pharmacists in elderly inpatients admitted from home or a nursing home. The Annals of pharmacotherapy. 2010;44(10):1596-603.
112. Unroe KT, Pfeiffenberger T, Riegelhaupt S, Jastrzembski J, Lokhnygina Y, Colon-Emeric C. Inpatient medication reconciliation at admission and discharge: A retrospective cohort study of age and other risk factors for medication discrepancies. The American journal of geriatric pharmacotherapy. 2010;8(2):115-26.
113. Vira T, Colquhoun M, Etchells E. Reconcilable differences: correcting medication errors at hospital admission and discharge. Quality & safety in health care. 2006;15(2):122-6.
114. Forskrift om fastlegeordning i kommunene, (2012).
115. Nixon M. Organising medication discontinuation: An explorative study of GPs' decisions and practices when discontinuing statins. Center for Healthy Aging, University of Copenhagen2015.
116. Ranhoff AH BM, Granås AG, Langørgen A, Spigset O, Ruths S. Bedre legemiddelbehandling av eldre. Tidsskrift for den Norske laegeforening : tidsskrift for praktisk medicin, ny raekke. 2015.

117. Holmestad B GB, Svendsen K, Elenjord R,. Does the use new procedure for medicine reconciliation lead to more accurate medicine lists? (Fører til bruk av en ny prosedyre for legemiddelsamstemming i sykehus til mer nøyaktige legemiddellister?). 2015.
118. Reseptregisteret [Internet]. 2015. Available from: http://www.reseptregisteret.no/Prevalens.aspx.
119. The European Medicines Agency (EMA). Summary of Product Characteristics (SPC) of Levaxin. Available from: http://slv.no/_layouts/Preparatomtaler/Spc/0000-02466.pdf.

Appendix 1 Integrated Medicines Management Procedure

PROSEDYRE

Legemiddelsamstemming etter IMM-metodikken

Versjonsnr.: {_UIVersionString}
Dok.status: {_ModerationStatus}

Prosessområde:	Selge og levere legemidler, apotekvarer og farmasifaglige tjenester
Prosess(er):	Utfør farmasifaglige tjenester
Dokumenteier:	Fagsjef AFT
Gjelder fra dato:	01.03.2015

Prosedyre utarbeidet av:	Rykken, Sidsel	11.12.2014
Prosedyre godkjent av:	[Godkjent av]	[Godkjent dato]

Versjonshistorikk med endringer er tilgjengelig på intranettet, SAVisa: http://savisa.sav.no/savvy

1. Hensikt

Kvalitetssikring av pasienters legemiddelliste ved innleggelse i sykehus.

2. Definisjoner

Klinisk farmasøyt: farmasøyt som har fått tilstrekkelig opplæring til å gjennomføre kliniske, pasientrettede tjenester.
Aktuell legemiddelliste/legemiddelintervju: en metode for å oppnå en oppdatert legemiddelliste som samstemmes med pasientens legemiddelbehandling i øyeblikket. Ved legemiddelintervju er det også mulig å identifisere pasientenes evner og potensielle problemer relatert til compliance, kunnskap og håndtering av legemidler.

3. Omfang og avgrensninger

Berører alle kliniske farmasøyter ved utføring av legemiddelsamstemming ved legemiddelintervju eller aktuell liste.

Legemiddelsamstemming utføres for å oppnå en så nøyaktig oversikt som mulig over legemidlene pasienten bruker. Ved skifte av omsorgsnivå er det risiko for feil og mangler i legemiddellisten og det er derfor viktig at samstemming utføres ved overgangene.

4. Ansvar

Avdelingsleder for AFT har ansvar for at medarbeidere har fått tilstrekkelig opplæring før legemiddelsamstemming kan gjennomføres.
Klinisk farmasøyt har ansvar for gjennomføring av legemiddelsamstemming i henhold til denne prosedyren.

5. Beskrivelse / utførelse

Generelt om føring av skjemaet
Understreket tekst angir hvordan skjemaet fylles ut.

Avhaking/avkryssing brukes gjennomgående i hele prosedyren som følgende:

- Hake (✓) betyr: Pasient er spurt, men ingen problemer funnet
- Kryss (x) betyr: Pasient er spurt og problem er funnet/kommentar gitt (husk dokumentasjon av problem/kommentar)
- Åpen rubrikk betyr: Pasient er ikke spurt

Se vedlegg 1 og vedlegg 2.

Forberedelse
Hent ut informasjon om pasientens sykdomshistorie fra pasientjournalen og opplysninger om ordinerte legemidler fra kurven.

Fyll ut avdeling, rom og sengenummer, pasientens navn og fødselsdato. Dokumenter også om pasienten håndterer legemidlene sine selv eller ikke. Hvis pasienten mottar legemidlene som multidose krysses av for dette og versjonsnummer dokumenteres.

Dokumenter på skjemaet under *"Annen info fra samtalen"* (til venstre) informasjon som du henter fra journalen angående innleggelses årsak og tidligere diagnoser. I høyre hjørne av

samme rubrikk dokumenteres sosial informasjon som for eksempel boform, livssituasjon, hørsel og annet som kan være av nytte for gjennomføring av intervjuet. Eventuelt kan disse opplysningene dokumenteres i skjema for legemiddelgjennomgang og medbringes ved intervjuet.

Fyll ut informasjon fra kurven inkludert legemiddelnavn, -form og styrke samt dosering. (Se vedlegg 1 for doseringskoder) Dokumenter alle legemidler som pasienten har hatt på avdelingen siden innleggelse, med unntak av de legemidlene som ble startet og seponert i tiden mellom innleggelse og intervjuet (f.eks. engangsdoser).

De legemidlene som pasienten stod på ved innleggelse markeres med en pil (→) i kolonnen *"Dat IN".* For legemidler som er startet under innleggelsen dokumenteres dato for oppstart i "*Dat IN*". Legemidler som har blitt nullet eller seponert merkes med henholdsvis 0 eller S i kolonnen "*Dosering*", tidligere dosering noteres i kommentarfeltet i parentes og dato for seponering skrives i kolonnen "*Dat UT*".

Utføring av *legemiddelintervju* med pasienten
For pasienter som håndterer egne legemidler utføres et legemiddelintervju. Ved behov kan man innhente supplerende opplysninger fra hjemmesykepleien, apoteket, fastlegen og/eller pårørende. Helsepersonell som yter helsehjelp har ikke plikt til å be om pasientens samtykke for å hente ut informasjon, men man bør ha grunn til å tro at pasienten ønsker opplysningene videreformidlet. Pasienten kan i enkelte tilfeller informeres før helseopplysningene utveksles av hensyn til personvernet[1,2].

Se egen arbeidsbeskrivelse for utføring av legemiddelintervju.

Informasjon som pasienten gir under intervjuet omkring legemiddelbruken dokumenteres i kolonnen under *"Dosering"*. Marker at informasjonen er gitt av pasienten ved å sette en "P" i første underkolonne. Utfyllende informasjon kan skrives i kommentarfeltet eller i rubrikken *"Annen info fra samtalen"*.

Informasjon innhentet fra andre kilder dokumenteres i de andre underkolonnene under *"Dosering"*. Marker hvor informasjonen kommer fra: P (pasient), PR (Pårørende), F (fastlege), M (multidose) FP (FarmaPro), KHT (kommunehelsetjenesten), J (EPJ – sykehusjournal). Dersom pårørende blir brukt som informasjonskilde noteres pårørendes relasjon til pasienten.

Når man har behov for å hente ut legemiddelinformasjon fra andre apotek, må pasienten etterspørres hvilket apotek han/hun bruker oftest. Noter navnet på apoteket i skjemaet nederst til venstre. Ved bruk av utskrift fra FarmaPro kan man notere dato for siste uthenting og mengde.

Etter utført intervju samstemmes sykehusets legemiddelkurve opp imot pasientens legemiddelliste og eventuell utfyllende informasjon. Ved uoverensstemmelser i legemiddelnavn, styrker og doseringer dokumenteres dette i de respektive kolonnene, eventuelt i kommentarfeltet. (Se siste avsnitt omkring uoverensstemmelser)

Signer og dater for utført legemiddelintervjuet i rubrikken "Utført". Kryss av for legemiddelintervju (LMI) utført i boksen "LMI" øverst i venstre hjørne. Det krysses av for LMI så lenge man har snakket med pasienten selv vedrørende hans/hennes legemidler og håndtering av disse (eventuelt snakket med pårørende).

Utføring av *aktuell legemiddelliste*

For pasienter som får hjelp til legemiddeladministrasjon av for eksempel hjemmesykepleier eller som bor på sykehjem, kontrolleres legemiddelkurven opp mot aktuell liste fra henholdsvis hjemmesykepleie, fastlege, apotek/multidoseapotek eller sykehjem. Be om å få listen faxet til avdelingen og legg en kopi i pasientens kurvemappe. Hvis det ikke er tilgang på fax, kan man utføre et intervju per telefon med sykepleier/fastlege. Hvis pasienten får hjelp av pårørende kan man intervjue denne så lenge pasienten tillater det. Husk å notere pårørendes relasjon til pasienten.

Fyll ut dosering av legemidlene i underrubrikken under *"Dosering"* og marker underkolonnen i henhold til hvor informasjonen kommer fra (se over for forkortelser). Kontroller den innhentede aktuelle legemiddellisten opp mot legemiddelkurven på avdelingen. Ved uoverensstemmelser i legemiddelnavn, styrker og doseringer dokumenteres dette i de respektive kolonnene, eventuelt i kommentarfeltet. (Se siste avsnitt omkring uoverensstemmelser) Signer og dater for utført aktuell liste og kryss av i boksen "AL" øverst til høyre.

Uoverensstemmelser
Ved uoverensstemmelser (avvik) mellom legemiddelkurven og informasjon fra pasient eller aktuell liste markeres avviket.

Uoverensstemmelser diskuteres med lege snarest og dokumenteres i skjema for legemiddelgjennomgang i kolonnen "*Avvik i legemiddelintervju/aktuell liste"*. Oppdaterte legemidler/doseringer etter diskusjon med lege dokumenteres i rubrikken "*Resultat*" i legemiddelgjennomgangsskjemaet.

6. Referanser

1. Helsepersonelloven: Lov 2. juli 1999 nr 64, §22 Samtykke til å gi informasjon; §25 Opplysninger til samarbeidende helsepersonell; §45 Utlevering og tilgang til journal og journalopplysninger.

2. Helsepersonells taushetsplikt. Vern av pasientens integritet i muntlig kommunikasjon mellom pasient og helsepersonell. Rundskriv, Helsedirektoratet IS-6/2010

7. Vedlegg

Vedlegg 1 Legemiddelintervju - Legemiddelsamstemming
Vedlegg 2 Dokumentasjonsskjema - Legemiddelsamstemming

8. Utskrifter forefinnes

Appendix 2 Standardised form for completion of medicine reconciliation

Avd	**Seng**	**Navn**	**Fødselsdato**	**Utført** (dato, sign)

Aktuell legemiddelliste (etter LMkurve) **Frikort** ○ Ja ○ Nei **Samstemt LMliste**

Pasient håndterer LM selv? ○ Ja ○ Nei			**Multidose?** ○ Nei ○ Ja, versjon _____		**Dosering***			**Håndtere LM selv#** Problem (x) Ikke p. (✓)	
Dat **IN**	**Legemiddel, beredningsform, styrke**	**Dosering**	**Kommentar**	Dat **UT**				Ind	EL

*Info fra: pasient (P), pårørende (PR), fastlege (F), kommunehelsetjeneste (KHT), multidose (M), FarmaPro (FP), sykehusjournal - EPJ (J) #Ind: Indikasjon; EL: etterlevelse

Annen info fra samtalen
Sosial info
Innleggelses årsak:
Tidligere diagnoser:

Tar du noen andre legemiddel? ☐ smerte ☐ hjerte ☐ mage ☐ diabetes ☐ skjelett ☐ søvn/uro ☐ nedstemthet ☐ allergi ☐ øye-/øredråper/nesespray ☐ inhalasjonslm ☐ injeksjoner ☐ krem/plaster ☐ stikkpiller/vagitorier ☐ prevensjon ☐ prostata/potens ☐ andre reseptfrie lm ☐ naturlm/helsekost ☐ lm som tas per uke/mnd/år ☐ avsluttet lm i forbindelse med innleggelse

Håndteringsproblem? ☐ svelge; knuse/dele/åpne ☐ få lm ut av pakningen ☐ inhalere ☐ etterlevelse (huske å ta lm)

Bivirkninger/Allergier?

Apoteket pasienten bruker oftest:

Appendix 3 Consent form for patients (Norwegian)

FORESPØRSEL OM DELTAKELSE I FORSKNINGSPROSJEKTET

Kan ELEKTRONISKE JOURNALSYSTEMER ERSTATTE MENNESKELIG INTERVENSJON VED LEGEMIDDELSAMSTEMMING?

Dette er et spørsmål til deg om å delta i en forskningsprosjekt for å undersøke om det finnes uoverensstemmelser mellom informasjon som blir hentet fra elektroniske journaler og systemer med informasjon som blir hentet på legemiddelintervju. Kvalitetssikring av en pasient sitt reelle legemiddelbruk er av stor betydning for pasientsikkerheten ved videre behandling både under og etter sykehusopphold og det er derfor avgjørende for helsepersonell på sykehuset for å få en korrekt oversikt over legemiddelbruken tidlig i pasientforløpet. Studien tar plass ved kardiologisk avdeling på Haukeland Universitetssykehus, og studien sikter på å ta med pasienter som er innlagt her og har fått utskrevet medisiner før og under innleggelse. Studiet er en del av en masteroppgave i Integrert Masterprogram i Farmasi ved Universitetet i Bergen.

HVA INNEBÆRER PROSJEKTET?

I prosjektet vil vi innhente og registrere opplysninger om deg. Fra sykehusets elektroniske journalsystem og legemiddelkurver vil vi innhente informasjon om alder, kjønn, diagnose, informasjon fra tidligere notater eller epikriser som kan være relevant for din medisinbruk og eventuelt medisinliste fra poliklinikker. Fra legemiddelintervjuet vil det bli innhentet informasjon om legemidlene og legemiddelbruken. Disse opplysningene vil deretter bli sammenlignet med din informasjon fra Reseptformidleren og Kjernejournal.

Rekrutterte deltakere vil få en legemiddelsamstemning som er prosessen med å samle og verifisere en korrekt liste av deltakerens legemidler og medisinbruk, inkludert navn, dosering og frekvens fra flere forskjellige kilder, og deretter sammenligne denne informasjon med utskrevne resepter og medisinene som deltakeren faktisk bruker ved å foreta et legemiddelintervju. Informasjonen som blir hentet vil bli dokumentert og deretter vurdert av 2 farmasøyter og 2 leger. Deltakelse i dette prosjektet vil ikke avvike fra ordinær behandling annet enn at deltakeren går gjennom et legemiddelintervju. Legemiddelintervjuet vil ta cirka 10-15 minutter.

MULIGE FORDELER OG ULEMPER

Dette er en studie som har som formål å bidra til økt kvalitet i legemiddelbehandlingen uten å inkludere belastende kliniske undersøkelser. Evaluering og forbedring av den enkelte pasients legemiddelbehandling har fordeler som bedre og riktigere legemiddelbruk. Dette forhindrer at du ikke får administrert noe de har fått før, det forhindrer legemiddelrelaterte problemer og fører potensielt til funn av viktig legemiddelopplysninger.

FRIVILLIG DELTAKELSE OG MULIGHET FOR Å TREKKE SITT SAMTYKKE

Det er frivillig å delta i prosjektet. Dersom du ønsker å delta, undertegner du samtykkeerklæringen på siste side. Du kan når som helst og uten å oppgi noen grunn trekke ditt samtykke. Dette vil ikke få konsekvenser for din videre behandling. Dersom du trekker deg fra prosjektet, kan du kreve å få slettet innsamlede prøver og opplysninger, med mindre opplysningene allerede er inngått i analyser eller brukt i vitenskapelige publikasjoner. Dersom du senere ønsker å trekke deg eller har spørsmål til prosjektet, kan du kontakte André Luong, på +47 941 69 492 eller andrehuy.92@gmail.com

HVA SKJER MED INFORMASJONEN OM DEG?

Informasjonen som registreres om deg skal kun brukes slik som beskrevet i hensikten med studien. Du har rett til innsyn i hvilke opplysninger som er registrert om deg og rett til å få korrigert eventuelle feil i de opplysningene som er registrert.

Alle opplysningene vil bli behandlet uten navn og fødselsnummer eller andre direkte gjenkjennende opplysninger. En kode knytter deg til dine opplysninger gjennom en navneliste

Prosjektleder har ansvar for den daglige driften av forskningsprosjektet og at opplysninger om deg blir behandlet på en sikker måte. Informasjon om deg vil bli anonymisert eller slettet etter prosjektslutt.

SAMTYKKE TIL DELTAKELSE I PROSJEKTET

JEG ER VILLIG TIL Å DELTA I PROSJEKTET

Sted og dato	Deltakers signatur
	Deltakers navn med trykte bokstaver

Jeg bekrefter å ha gitt informasjon om prosjektet

Sted og dato	Signatur
	Rolle i prosjektet