Betwixt and Between

Literature review about the economic burden of pharmaceutical interface management within the European Union

Student:	**Julia Wichers Hoeth**
Studentnr:	**0436364**
Master:	**Epidemiology, Utrecht University**
Supervisor:	**dr. A.K. Mantel-Teeuwisse**
Second reviewer:	**prof. dr. A.C.G. Egberts**
Department:	**Pharmacoepidemiology & Clinical Pharmacology**
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Executive Summary

In 2010 Pharmaceutical Health Information System indicated that in many European countries there was a need of improvement in interface management. This literature review focuses on the cost-effectiveness of sufficient interface management and the substitution of generics at the point of transition from the in-patient to the out-patient sector. There are three main ways in which insufficient interface management could cause a burden on national health care funds, patients or insurance companies. These are the prescription of unjustified medication, the occurrence of Adverse drug events and the unnecessary take-over of expensive medication instead of switching to generics. In all of these area's research showed that improved interface management can be cost-effective, however the studies found were limited and often small scaled. There has not been a great focus on the economical part of interface management, this is therefore one the main recommendations of further research; a comparative cost-effectiveness study of interface management interventions. Another field where insight is lacking is the way health care providers in one sector are influenced in the prescription of medication by what was previously described in another sector. It is therefore important to look into what influences prescribers and what is the most effective way to give incent on prescribing generics.

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1 Introduction

1.1 Motivation

The European countries encounter a rapid increase in the costs of healthcare, driven by new technologies and an ageing population. This is a challenge that industrialized societies are facing globally (AARP European Leadership Study, 2006). European pharmaceutical expenditure has increased steeply in recent years, rising between 4% and approximately 13% year on year and by now it is one of the largest cost components of healthcare costs across a number of European countries (Godman, et al., 2010). Therefore reducing pharmaceutical costs is an important way to reduce overall healthcare costs. In this review we consider one part of pharmaceutical care and its potential on lowering pharmaceutical costs; In 2010 The *Pharmaceutical Health Information System* (PHIS) project published a report comparing pharmaceutical policies in the European Union member states, in the in-patient as well as the out-patient sector. They identified a need in the improvement of interface management (Pharmaceutical Health Information System, 2010).

1.2 Aims and objectives

This literature review focuses therefore on the potential economic burden of insufficient interface management in the field of pharmaceuticals.

1.3 Research problem

There is a constant transition of patients between different healthcare settings, and interface management is defined as the cooperation between these different sectors. Problems with interface management can range from practical level; lack of communication, to health system levels where different policies stand in the way of good cooperation. There are good practice examples for interface management like similar drug formularies for the out-patient and in-patient sector (Gustafsson, et al., 2011), educational activities for raising awareness and institutionalized cooperation. Another example is the participation of Social Health Insurance funds representatives, who are in charge of the out-patient reimbursement, in the hospitals' Drugs and Therapeutics Committees (Vogler, et al., 2011). Another problem with patients transitioning between health care settings is that the prescriptions in one sector might influence what is prescribed in another sector, without considering less expensive options. Important questions therefore are if and how these good practices of interface management can play a part in reducing the large pharmaceutical expenditure that European countries are facing, and if there is evidence that policies in one sector can negatively influence the economic burden of another sector.

1.4 Research questions

The questions are:

How and where do things go wrong when patients transition between health care settings?

What is the possible economic burden of insufficient interface management?

1.5 Chapter review

The first part considers different kind of policies within the EU, and addresses the different health systems that have an impact on the pharmaceutical prescribing both in the in-patient as the out-patient sector. Secondly this review addresses the transition between health care settings, shows how interface management can be implemented and how successful it can be. In the final chapter the possible economic burden of prescription policies and problems in interface management are discussed. The literature was mainly found via search engines as Pubmed and Embase. To find *grey literature*, I used the University of Utrecht Library catalogue, and some simple Google searches, to find news articles and European Union (EU) or World Health Organization (WHO) rapports.

First we will look at prescribing policies in Europe in the in-patient as well as the out-patient sector.

2 Prescribing policies in Europe

Most countries in the EU have introduced prescribing policies to promote appropriate and economic prescribing of pharmaceuticals. However, these guidelines are indicative and often refer only to the out-patient sector. In this chapter we look at the prescription policies both in the in-patient as well as in the out-patient sector, and at what kind of policies different government and reimbursement companies have taken to have an influence on the burden of the costs of pharmaceuticals in the health care systems and on individual patients.

2.1 In-patient sector

Hospitals most often have Drug and Therapeutic Committees (DTCs) in place to decide which medicine are procured and prescribed. The DTC draws up the so-called hospital drug formulary (HDF), the selected drugs on this formulary should be the best choice based on efficacy, safety and costs. Physicians must comply with the HDF unless they can justify the prescription of another product in specific cases. (Fijn, et al., 1999) (Plet, et al., 2013) (Gallini, et al., 2011)

A complicating element to research how and why DTC's decide their formularies, is that, across Europe, the actual negotiated prices of hospital pharmacists are not made public. European countries try to control the prices of medicines used in hospitals. The problem is that this price regulation targets only the official pricelist, while pharmaceutical companies offer a wide range of price reductions that are not considered. The majority of countries reported on discounts of 25% to 40%., however it is thought that discounts can even go up to 100% (Vogler, et al., 2013) (European Observatory on Health Systems and Policies Series, 2004). As the prescription of medication in the hospital might influence the prescription of medication outside the hospital, the promotion of expensive medication by pharmaceutical companies might become an economic problem, which will be discussed in chapter 4.

2.2 Outpatient sector

In the past, a community pharmacist would dispense prescription medicines and sell over-the-counter products. However pharmacists are highly educated professionals and can be very important in controlling pharmaceutical expenditure by deciding on generic and therapeutic substitution. (Tonna, et al., 2007) There is much variation between the regulatory patterns related to pharmacists in EU member states. These include controlling community pharmacy ownership and location, setting allowable profit margins, and influencing drug distribution patterns and product selection through different incentives and remuneration methods (European Observatory on Health Systems and Policies Series, 2004).

European countries differ in the way pharmacists are reimbursed for dispensed medication. In countries such as Ireland, the Netherlands, Sweden and the UK, pharmacists receive a fixed fee per item dispensed. Most other countries (Austria, Belgium, Germany, Greece, Italy and Portugal) pay pharmacists with scaled margins. (European Observatory on Health Systems and Policies Series, 2004). As an example in the Netherlands, hospital drug formularies are often different from community drug formularies. Generally speaking, in the Netherlands, original brands are used more frequently inside the hospital because of the price discounts on these products given by pharmaceutical companies to promote the use of their drugs in the hospital. However, in the out-patient setting, generic prescribing and dispensing are encouraged or sometimes even obliged by government policy (Fijn, et al., 1999). As of 2007 there is a drug preference policy, where only the lowest priced medication is reimbursed by the insurance companies. This gives patients the incentive to choose generics over expensive brand medication (Maarse, 2009).

3 Medication Treatment at Transition of Care

To create more understanding about the process of interface management it is important to first look at why and how these transition problems can occur. The following chapter therefore gives an overview of how and where the transition between settings can be the reason for intentional and/or unintentional changes in medical treatment and what kind of problems might occur. It will then continue to explain prerequisites for good interface management and give some examples.

3.1 Transitional care

The transition between healthcare settings is often related to a transition in the healthcare status of the patient. Most often the changes in prescribed medication are therefore intentional and related to the patient's health status. In addition it may be determined that the used drug is in fact not necessary or ineffective, or even may be the cause of a toxic or adverse reaction. Another rationale behind changes in drug therapy, are the hospitals or local drug formularies, as discussed in chapter 2, this could for instance be a reason why we see a switch from a brand name to a generic drug (Chhabra, et al., 2012) (Stuffken, 2011).

Most studies look at either hospitalization or discharge, not considering transition between wards. Even less studies focus on differences in type of discharge or compare the different transition stages (Stuffken, 2011). In a study following 44 patients across three different transition stages (hospital admission, hospital discharge into a nursing facility, and discharge from nursing facility) all subjects were found to have at least one change in drug treatment, and 86% experienced at least one unintentional change in their prescribed medication. This study did not find a significant difference for intentional versus non-intentional discrepancies between transition states. The transition between health care institutes showed the lowest number of discrepancies (Sinvani, et al., 2013).

For all transition states and types of drug changes it is important to look at unintended medication discontinuities. Research suggested that preventable adverse drug events (ADE's) at transition stages account for around 50% of all medication errors. In general, the clinical and therapeutic monitoring of patients after discharge significantly declines. In view of the increasing trend for earlier discharge, the need to ensure continuity of care is likely to have significant impact on quality health outcomes (Stuffken, 2011).

Changes to medication prescription at the transition between health care stages can be divided into four main subgroups, duplications, product changes, a therapeutic switch and stop/go moments (Stuffken, 2011). This paragraph discusses these changes and gives an example to why they might occur. To start, duplications are the substitution of a different brand of the same medication, for instance, the switch between a generic and a brand-name product. These duplications will not always

be classified or recognized as a change in drug therapy. Once the patient is discharged from a hospital setting, the community pharmacist therefore may replace a brand drug prescribed in the hospital with a generic drug, in some cases this might even be a generic drug that was used before admission, causing two discrepancies. In a study in the Netherlands there was a 20% generic substitution of the last clinical medication upon hospital discharge (Stuffken, 2011).

Secondly, there is the possibility of a change in the dosage or strength of a drug. The medication contains the same active substance, for instance a 20 mg tablet instead of a 10 mg or a different way of administering the drug, like oral to intravenous. Thirdly the prescription can change to another active substance within the same therapeutic group, a therapeutic switch. Both the product as the therapeutic changes can be the result of therapeutic considerations or might be due to hospital drug formulary implementations. These formularies differ not only with respect to the choice of type of brand for the same active substance, but also with respect to the choice of the active substances. Situations in which drugs are stopped and replaced with similar medications can also indicate that hospital physicians believe that better alternatives are available (Stuffken, 2011).

The most radical medication change is that the medication is being started or stopped at admission or discharge. This is often due to the change in healthcare status of the patients, but might also be attributed to the fact that some medications are not intended for chronic use like for example antibiotics. Several studies show that either to completely quit or start a new drug is among the most frequent discrepancies in moving between stages, 30%-55% of all changes (Sinvani, et al., 2013) (Stuffken, 2011), followed by dosing changes (8%-12%), therapeutic changes (5%-7%) and lastly duplications (1%-5%). The amount of discrepancies ranges from around 20% to as high as 85% (Sinvani, et al., 2013). A systemic review from 2007 showed that most studies show a discrepancy of around 50% -60% at hospitalization or discharge (Glintborg, et al., 2007).

Several countries have expressed the need of implementing interface management that is defined as the mechanism of cooperation between the in-patient and the out-patient sector. Some countries have not yet implemented specific initiatives yet, while in other countries (in particular in the Nordic countries) several initiatives have been launched.

3.2 Interface management

Already years ago research showed that there was a wish to have a good transition structure for patients transferring between healthcare settings. In 1997 Munday *et al.* held a research in Glasgow among out-patient health care providers. Of the respondents, approximately 95% indicated that they thought it was important to receive information on the reasons for drug therapy changes, in the in-patient sector. However the majority did not receive this information. (Munday, et al., 1997). Since

then several programs have been developed in different countries to implement interface management programs to better coordinate and improve the continuity of pharmaceutical care between different healthcare settings.

Continuity of care and good interface management can be described as the degree to which one or a series of healthcare transitions is experienced, by the patient as well as by the care takers. Haggerty et al. have identified three distinct means of providing continuity; informational continuity, management continuity and relational continuity. The first relates to the information on past events and personal circumstances of the patient and ensures the transfer of this information in order to make appropriate care available. Good management continuity exists when there is a consistent and coherent approach to the management of a patient and would include a good overall strategy transcending healthcare facilities and ensures the ability of this strategy to adhere to changes in a patient's individual needs. For the latter there should be an ongoing therapeutic relationship between a patient and its healthcare providers, it should give the patient a feeling of trust, predictability and coherence (Haggerty, et al., 2013).

The perception of continuity of care is important for both patients and healthcare. For patients, the experience of continuity is the feeling that their health care providers know what their status and care was previous and that there is an overall management plan of which all the different healthcare settings are aware. For care providers, the experience of continuity is their perception of having sufficient knowledge and information about their patients to provide the best applicable care and that they ensure that other providers will know their input and decisions. Especially in the continuity of pharmaceutical care, information about actual and past use of medicines is crucial in assessing the impact of medicines, to avoid ADE's, in assisting in future decisions about care and in enabling safe transfer of care to another healthcare provider. The changes in medication that occur before, during and after a hospital stay can often become a point of confusion for not only the patients, but maybe even more important for the physicians and pharmacists (Haggerty, et al., 2013).

There are several threads to the informational continuity of pharmaceutical care. During hospitalisation medication is changed regularly. The patient and the healthcare providers are often not informed on reasons for these changes and whether they should be maintained or not. It is estimated that 46% of all medication errors occur during the patient's admission or discharge from a clinical unit (Pronovost, et al., 2003). Poor communication and documentation of medical information has been cited as the main cause for these medication errors. A study at 6 hospitals in Norway showed that of 105 discharge letters only 68 contained complete drug lists, and only 24 of the discharge letters were received by the out-patient care takers within one week (Viktil, et al.,

2012). Most healthcare systems are not equipped with an overseeing healthcare professional that holds responsibility for the coordination of care across health care settings.

3.3 Good examples of interface management

A tool that helps to provide accurate informational continuity for pharmaceutical care is medication reconciliation. It is defined as the process of creating the most accurate and up-to-date overview possible of all medicines a patient is taking — including drug name, dosage, frequency, and route — and comparing that overview with the clinician's admission, transfer, and/or discharge orders. The goal of medication reconciliation is to avoid any medication errors and confusion for the patient at all transition points (Mueller, et al., 2012). There have been several studies and implementations of medication reconciliation, usually focussing on one certain transition points between healthcare settings. Following we will discuss some examples.

A recent study by Galvin et al. focused on medication reconciliation on admission to hospital in Ireland. Adults admitted via the accident and emergency department, from a non-acute setting, reporting the use of at least three regular prescription medications, were eligible for inclusion. Medication reconciliation was provided by clinical pharmacists to randomly selected patients within 24-hours of admission. In total, 134 patients, involving 1,556 medications, were included in the survey. Over 97 % of patients (involving 59 % of medications) experienced a medication change on admission. Over 90 % of patients (involving 29 % of medications) warranted clinical pharmacy input to determine whether such changes were intentional or unintentional. There were 447 interventions by the clinical pharmacist regarding apparently unintentional discrepancies, a mean of 3.3 per patient. In total, 227 (50 %) interventions were accepted and discrepancies resolved. At 48-hours under half (46 %) of patients remained affected by an unintentional unresolved discrepancy (60 % related to omissions). Verbally communicated discrepancies were more likely to be resolved than those not communicated verbally. Under half of unintentional unresolved discrepancies (46 %) had the potential to cause minor harm compared to 70 % of the resolved unintentional discrepancies. None had the potential to result in severe harm. It therefore concluded that clinical pharmacists contribute positively to admission medication reconciliation and should be engaged to deliver this service in Ireland. This article shows how good medication reconciliation can work at admission to the hospital (Galvin, et al., 2013).

To study the effects of medication reconciliation at the point of discharge from the hospital Karapinar *at al*. started the COACH program (Continuity of Appropriate pharmacotherapy, patient Counselling and information transfer in Healthcare). In this study the effect of the COACH program is compared with usual care using a pre-post study design. The intervention consisted of medication

reconciliation, patient counselling and communication between the in-patient and out-patient healthcare providers. In the before-period 27.3% of patients had an unplanned rehospitalisation, whereas this became 33.2% in the after-period. The introduction of the COACH program led to a non-significant increase of unplanned rehospitalisation (Karapinar-Carkit, et al., 2010). A similar result was found in a study focussing on the impact of pharmacy facilitated discharge program. Medication discrepancies at discharge were identified in 33.5% of intervention patients and 59.6% of control patients. Although all discrepancies were resolved in the intervention group prior to discharge, readmission rates did not differ significantly between groups at 14 days and 30 days, nor did emergency department visits (Walker, et al., 2009). Although these researches show no results in re-hospitalization, they do show a significant number of discrepancies at hospital discharge, which might have an impact on the economic burden of the patients due the intake of unjustified medication.

Another example to enhance appropriate prescription in in-patient and out-patient sectors is “The Wise List” which was implemented in Stockholm in 2001. It is an example of a so-called positive drug list to which all health care institutions adhere. In this list there are also recommendations to switch to generic drugs where possible in the out-patient sector. In 2009 the adherence to the recommendations from The Wise List was 77% (Gustafsson, et al., 2011).

4. Economic Burden of Insufficient Interface Management

There are several ways in which insufficient interface management can create an economic burden on patients, insurance companies and society. A 2011 review showed that there is little research done on this topic; only 8 relevant researches were found which all suffered methodological limitations and therefore this study could not make any conclusions on the cost-effectiveness of interface management (Simoens, et al., 2011). A 2013 review also showed similar poor results on the cost-benefits of health information technology (O'Reilly, et al., 2012). The three different ways this chapter reviews are the costs made by unjustified medication, costs created by ADE’s and the financial burden of expensive medicine from the hospital being prescribed in the out-patient setting, when there might be generic, cheaper, medicines available.

4.1 Unjustified medication

Few studies have analyzed the occurrence of unjustified and omitted discharge medications, and there are even fewer reports focused on the economic burden of unjustified discharge prescriptions. Drugs prescribed and consumed without proper reason may cause direct unnecessary costs. Although not considering the economic burden two researchers showed that just over 50% of the

prescription of proton pump inhibitors and acid suppression therapy were in fact unjustified (Ahrens, et al., 2010) (Gupta, et al., 2013) (Gupta, et al., 2013). In a 2009 prospective, observational study performed at the General Internal Medicine Department of a Suisse Hospital, Perren *et al*. researched the economic burden of unjustified medication. The discharge records of 577 patients were screened for the presence of unjustified medications. In 318 of 577 reviewed discharge summaries, at least one unjustified medication was found. In fact results found that 619 out of 3691 prescriptions (16.8%) were unjustified (Perren, et al., 2009). The mean monthly costs of unjustified discharge medications were estimated to be 32 Euro. For this study sample, monthly extra costs due to unjustified medications were therefore 18585 Euro. They concluded that there was a considerable financial burden imposed by unjustified medications at hospital discharge (Perren, et al., 2009). In 2012 Karapinar-Çarkıt *et al.* performed a study to see whether potential savings by better interface management would outweigh the extra costs medication reconciliation. They compared these potential costs and savings of optimal pharmaceutical prescription (without unjustified or omitted medications) to the labor costs of medication reconciliation. Optimizing pharmacotherapy saved 20.13 euro per patient in medication costs at 1 month and 86.86 euro at 6 months. The associated labor costs for performing medication reconciliation were 41.04 euro patient. For long term medication intake, good interface management therefore showed to be a cost-effective intervention (Karapinar-Carkit, et al., 2012).

4.2 Adverse drug events

In a study by Boockvar *et al.* it was shown that 4.8% of discrepancies in medication caused adverse drug events. Estimates of costs per adverse drug event range from 900 to 1800 euro's. For the previously mentioned study by Karapinar-Çarkıt *et al.* this would mean an additional cost savings of 18,000-36,000 euro's as they eliminated 409 discrepancies, of which 20 would theoretically (by Boockvar *et al.* estimations) cause an adverse drug event (Karapinar-Carkit, *et al.*, 2012). To reduce potential labor costs of medication reconciliation Schnipper *et al.* researched the potential of an electronic application and found that this computerized medication reconciliation tool was associated with a decrease in unintentional medication discrepancies with the potential of ADE's (Schnipper, *et al*., 2009). In 2008 Karnon *et al.* performed a model-based cost-effectiveness analysis of interventions aimed at preventing medication error at hospital admission. The aim of the study was to assess the costs and effects, measured as quality adjusted life years (QALYs), of interface management interventions for which a systematic review had found evidence of effectiveness to prevent ADE's at hospital admission exists. The model showed that all five interventions, that were taken into consideration, were to be cost-effective compared to no interface management.

Pharmacist-led reconciliation intervention even had a probability higher than 60% of being cost-effective of over 60% by a QALY value of £10 000 (Karnon, *et al*., 2009).

4.3 Prescribing generics

It is thought that the starting treatment in hospitals, often with expensive medicines, has a major impact on the out-patient sector as it often influences the further choice of medicines prescribed after discharge of the patient. A research in France showed that an increase of 1 day of treatment with one brand of drugs in the in-patient sector was associated with a significant increase of 21.8 days of treatment with the same brand in the out-patient sector (Gallini, et al., 2012). In the United States a study from 2005 showed that if a generic had been substituted (at that time only 61% was substituted) for all corresponding brand-name out-patient drugs in 2000, the national savings would have been $5.9 billion (for adults younger than 65 years of age) and $2.9 billion (for adults at least 65 years of age), representing approximately 11% of the pharmaceutical healthcare costs (Haas, et al., 2005). The previous mentioned study by Karapinar-Çarkıt *et al.* also studied the cost-effectiveness of the correction of hospital formulary–induced medication choice. Correcting hospital formulary-induced changes saved 1.63 euro per patient in medication costs at 1 month after discharge and 9.79 euro at 6 months. As the associated labor costs for performing medication reconciliation were estimated to be 41.04 euro per patient, medication cost savings from correcting hospital formulary–induced changes only by medication reconciliation, would not be cost-effective (Karapinar-Carkit, et al., 2012). However the subscription of generics on medical forms at discharge could result in substantial savings for health care as showed in a study set in France by Chu *et al.* In this study prescriptions from 85 patients were analyzed. On admission, 68 patients (80%) received 413 drugs of which 141 were substitutable brand-name drugs and 23 (16%), which were directly prescribed as generics. At discharge, 488 drugs were prescribed to the 85 patients of which 180 were substitutable drugs but only 5 (2.8%) were written as generics on prescription pads, a decrease of 78% compared to admission. In average, generics were 18% less expensive than brand-name drugs. Potential savings from a total substitution policy at discharge were estimated to be €1512 per 1000 patients per week; for lifetime drugs, savings amounted to €18,960 per 1000 patients per year (Chu, et al., 2011).

A 2012 study by Lapointe-Shaw *et al.* showed the potential savings of harmonizing hospital and community formularies for chronic disease medications initiated in the hospital in Canada. Hospitals in Canada manage their formularies independently, yet many inpatients are discharged on medications, which will be then purchased through publicly funded programs. The goal was to determine how much public money could be saved on chronic medications if hospitals promoted the initiation of agents with the lowest outpatient formulary prices. The cost for filling all proton pump

inhibitors (PPI), angiotensin-converting enzyme (ACE) inhibitor and angiotensin receptor blocker (ARB) prescriptions was $ 2.48 million, $968 thousand and $325 thousand respectively. Substituting the least expensive agent could have saved $1.16 million (47%) for PPIs, $162 thousand (17%) for ACE inhibitors and $14 thousand (4%) for ARBs over the year following discharge. They therefore concluded that in a setting where outpatient prescriptions are publicly funded, harmonizing outpatient formularies with inpatient therapeutic substitution resulted in modest cost savings and may be one way to control rising pharmaceutical costs (Lapointe-Shaw, et al., 2012).

5. Discussion

In most countries in Europe there is a great difference between medications prescribed in the in-patient and the out-patient sector. Because of these differences the point of transition between health care states is often a point of discrepancies in patients prescribed medications. The 2010 PHIS report gave some reasons for difficulties at the interface between the out- and in-patient sectors with regard to medicines management (Pharmaceutical Health Information System, 2010):

- Different funding schemes & mechanisms and sometimes even different payers for the out-patient and in-patient sector.
- Different reimbursement formularies applied in the different sectors.
- Little knowledge of representatives of one sector about the other sector and no exchange of information and cooperation.
- Incentives by the “system” to be responsible only for the one sector which officials and staff represent, but not for the whole system.

Most of the research in this field is focused on discharge as after discharge the patient are usually not under strict guidance and it important that community pharmacies and GP’s are aware of what reasons for prescriptions were so they can continue with a good adherent care management plan (Haggerty, et al., 2013). Medication reconciliation has been proven to be a good instrument for sufficient interface management, as have the introduction of so called positive lists, like in Sweden. However, not much focus has been on the economical aspect of insufficient interface management (Simoens, et al., 2011).

This review discusses three main ways in which insufficient interface management could cause a burden on national health care funds, patients or reimbursement. The first are unjustified medication, although the research discussed showed that unjustified medication is a common problem, only one research found also discussed the economic burden of unjustified medication

(Perren, et al., 2009). The second economic reason for interface management was the prevention of ADE's. Many studies discussed showed that good medication reconciliation can prevent ADE's, and the costs of ADE's can be estimated as well, however only one of the model-based research really focused on the cost-effectiveness of the prevention of ADE's by medication reconciliation. In this research it proved to be really effective (Karnon, et al., 2009).

The main reason to start this review was the economic burden of the takeover of expensive medication prescribed in the hospital by community pharmacists. Very little research has been done in this field, although a few countries have legislation to enhance generic prescribing of community pharmacists. The research done in this field identifies two ways of switching to generic drugs: A) they are either prescribed by the hospital in the discharge documents, or B) community pharmacists are responsible to switch to the most inexpensive (appropriate) drug available. In these countries it seems to be cost-effective. In addition it might be possible to have a computerized support system to enhance the efficiency of these changes. In a 2012 study on this subject a large majority, over 90%, of drug switches performed at the transition between the in-patient and out-patient sector can be handled automatically such a computerized system, which would mean that medication errors and the workload, and consequently the costs, of healthcare professionals can be sufficiently reduced (Pruszydlo, et al., 2012). However, a counterpoint is that switching to generic drugs might be negatively affecting the adherence of the patient. In Finland where generic substitution is obliged a research showed that price, familiarity and availability determine the choice of drug (Heikkilä, et al., 2011).

Due to the economic restrains of contemporary economics in Europe and the rising costs of healthcare and pharmaceutical expenses, the topic of this review is very relevant. In addition as the years progress more and more medicines will lose their patent and will become available as generics. Although there is much research done on the topic of continuity of care, hardly any address the economic value of good interface management. In my view good interface management can add value to health care in three ways; patient experience, less adverse drug events, no take-over of expensive drugs. The latter two can have economic benefits in quite obvious ways, however if you want to look at the cost-effectiveness of interface management we could also consider in what way more satisfied, happier patients might have an economic benefit on society. A problem with this review is that its two main conclusions of the economic benefit of interface management might contradict or at least harm each other. Continuity of care and switching from brand-name drugs to generics on hospital discharge have showed to be very cost-effective. One reason why continuity of care is effective is because patients do not get confused about the medications they are taking.

However switching to generics might just do that. This can cause non-adherence to prescription drugs. Therefore the education of patients is also a very important topic, which is hardly addressed in the research I found. Education will also cost money and could reduce the benefits of switching to generic drugs. In the field of interface management there are many stakeholders involved and within this review it was not possible to pay enough attention to all of them. Policies on the prescribing of medication will be influenced by the European Union, governments, local governments and local/hospital customs. However it is very hard to obtain information on pricing of pharmaceutical companies and hospitals. Not much research has been done on the cost effectiveness of interface management this review shows that this could be an important part of further research. European countries can learn from each other; however the many stakeholders and policies involved will pose a thread. In future research it is important to look at the whole scope of interface management, the true cost-effectiveness can only be proven considering all the costs and benefits whereas now most research is focused on just small parts of the interface management. The switch from brand-drugs to generics is an important research topic and can reduce health care budgets significantly in the future. However if we consider interface management to be the cooperation and communication between health care settings, this switch is not really part of interface management. It is a more a matter of health care system policies, the system in place should decide where this switch should happen and who is responsible for it. Therefore the question could be; is the take-over of expensive drugs really a flaw in interface management, and does good interface management always ensure the best cost-effective treatment for the patient? Recommendations for further research on the topic of this research can be divided into two main categories; interface management and substitution of generics. In the field of interface management especially cost-effectiveness studies are lacking. Three fields should be focused on, first the amount of ADE's and unjustified medication that is due to insufficient interface management. An extensive cost-effectiveness study taking into consideration on one hand the costs of interface management and on the other, the savings of less ADE's, unjustified medication and QALY's. In addition to that study, you could make a comparison not only whether interface management is cost-effective, but also what kind of interface management is most cost-effective.

In the substitution of brand medication by generics the cost-effectiveness seems to be more obvious, what research should focus on is what is the most effective way of influencing pharmacists and general practitioners to prescribe generics, and in addition a more extensive research on the effect of in-patient prescribing on prescribing in the out-patient sector. Within transitional care it is also important to look at the most effective way of prescribing generics, for instance prescribing by the hospital in discharge letters, or to give pharmacist the incentive to switch to generics when possible.

What is then also important to focus on is the way switching to generics influences the patients adherence to prescription medication. And to take this into consideration when a cost-effectiveness study is performed.

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