Department of Public Health and Community Medicine
The Sahlgrenska Academy at the University of Gothenburg
Gothenburg, Sweden

General Beliefs about Medicines among Pharmacy Clients, Healthcare Students and Professionals - Group Differences and Association with Adherence

by
Ann-Charlotte Mårdby
Gothenburg, 2008

UNIVERSITY OF GOTHENBURG

Ann-Charlotte Mårdby, 2008

Social Medicine
Department of Public Health and Community Medicine
Box 453
SE-405 30 Gothenburg
Sweden

ann-charlotte.mardby@socmed.gu.se

ISBN 978-91-628-7418-6

Printed by Intellecta DocuSys AB,
Västra Frölunda, Sweden, 2008

Abstract

Background: only about 50% of all medicines are used as the prescriber intended. If medicines are prescribed in an adequate way, an optimised adherence can decrease mortality and hospitalisation and improve health-related outcomes. Beliefs about medicines have been shown to be an important factor in adherence. Furthermore, beliefs can also bias the content of patient communication, which is central to patient-centred care. Research shows that it has been difficult to optimise adherence with existing knowledge. To increase the knowledge about pharmacy clients' and healthcare professionals' beliefs about medicines could be a new angle in adherence research.

Aims: to examine general beliefs about medicines among Swedish pharmacy clients, healthcare students and professionals. A further aim was to analyse the association between general beliefs about medicines and self-reported adherence in pharmacy clients.

Methods: the thesis is based on four quantitative, cross-sectional studies. Participants in the studies were pharmacy clients, healthcare students, doctors, nurses and pharmacy employees. The data collections were done through questionnaires including the general part of Beliefs about Medicines Questionnaire (BMQ), Medicine Adherence Report Scale (MARS) and background questions: sex, age, occupation, education, country of birth and own experience of medicines.

Results: differences in general beliefs about medicines were found between pharmacy clients and practising healthcare professionals. Pharmacy clients believed medicines to be more harmful than practising healthcare professionals did. Doctors, pharmacists and dispensing pharmacists had more beneficial and less harmful beliefs about medicines compared with nurses. Similar patterns were seen for medical, pharmacy and nursing students. Furthermore, third-year medical and pharmacy students were more positive about medicines than first-year students were in these educations. Education, origin and own medicine use were important factors in general beliefs about medicines. Furthermore, beliefs about medicines as something harmful were associated with self-reported non-adherence in pharmacy clients.

Conclusions: there were distinct differences in general beliefs about medicines between pharmacy clients and healthcare professionals. If these differences are not acknowledged there could be consequences for patient communication and the interrelationship between doctors, nurses and pharmacy employees. It is also important to increase knowledge about how general beliefs about medicines and adherence are associated. The results of this thesis can be used for future interventions and research aiming for improved adherence.

Keywords: general beliefs about medicines, BMQ, pharmacy clients, healthcare professionals, university students, adherence, patient communication, Sweden

ISBN: 978-91-628-7418-6

Svensk sammanfattning

Bakgrund: Följsamheten till läkemedelsordinationer är ungefär 50 %. Om läkemedel förskrivs på ett sätt som är anpassat till varje individ så kan en ökad följsamhet leda till minskad dödlighet, sjukhusinläggningar och ökade hälsoeffekter. Forskning visar att uppfattningar om läkemedel är en viktig faktor för följsamheten till läkemedel. Uppfattningar har också visat sig kunna påverka innehållet i patientkommunikationen, som är central för patientcentrerad vård. Det har tidigare visat sig svårt att påverka följsamheten utifrån existerande kunskap. Att öka kunskapen om apotekskunders och hälso- och sjukvårdspersonals uppfattningar om läkemedel är en ny infallsvinkel på följsamhetsforskningen.

Syften: Att undersöka generella uppfattningar om läkemedel bland apotekskunder, hälso- och sjukvårdspersonal samt universitetsstudenter som studerade på olika hälso- och sjukvårdsutbildningar i Sverige. Ytterligare ett syfte var att undersöka sambandet mellan generella uppfattningar om läkemedel och självskattad följsamhet hos apotekskunder.

Metod: Denna avhandling är baserad på fyra kvantitativa tvärsnittsstudier. De som deltog i studierna var apotekskunder, läkare, sjuksköterskor, apotekspersonal och universitetsstudenter som studerade på olika hälso- och sjukvårdsutbildningar. Datainsamlingen gjordes med hjälp av frågeformulär som inkluderade den generella delen av Beliefs about Medicines Questionnaire (BMQ), Mediciation Adherence Report Scale (MARS) och olika bakgrundsfrågor: tex kön, ålder, yrke, utbildning och egen läkemedelsanvändning.

Resultat: Det fanns skillnader mellan apotekskundernas och hälso- och sjukvårdspersonalens uppfattningar om läkemedel. Apotekskunder uppfattade läkemedel som skadligare än vad hälso- och sjukvårdspersonal gjorde. Läkare, apotekare och receptarier såg mer till nyttan med läkemedel och mindre till deras skadliga effekter jämfört med sjuksköterskor. Liknande mönster identifierades hos läkar-, apotekar- och sjuksköterskestudenterna. Läkar- och apotekarstudenter på sitt tredje år var mer positiva till läkemedel än under det första året. Vidare var utbildning, ursprung och egen läkemedelsanvändning av betydelse för generella uppfattningar om läkemedel. Det fanns ett samband mellan uppfattningar om läkemedel som något skadligt och självskattad följsamhet hos apotekskunder.

Slutsats: Klara skillnader fanns i generella uppfattningar mellan apotekskunder och hälso- och sjukvårdspersonal. Om dessa skillnader inte uppmärksammas kan det få betydelse för patientkommunikationen samt för de inbördes relationerna mellan läkare, sjuksköterskor och apotekspersonal. Det är också viktigt att öka medvetenheten om sambandet mellan generella uppfattningar om läkemedel och följsamhet till läkemedel. Kunskapen från denna avhandling kan användas för framtida interventioner och forskning som syftar till en förbättrad följsamhet.

Nyckelord: Generella uppfattningar om läkemedel, BMQ, apotekskunder, hälso- och sjukvårdspersonal, universitetsstudenter, följsamhet, patientkommunikation, Sverige

ISBN: 978-91-628-7418-6

ORIGINAL PAPERS

This thesis is based on the following papers:

I. Mårdby A-C, Åkerlind I and Hedenrud T. Does education in medicine, pharmacy or nursing change general beliefs about medicines? (submitted)

II. Jörgensen T, Andersson K and Mårdby A-C. Beliefs about medicines among Swedish pharmacy employees. Pharmacy World of Science (2006) 28:233–238.

III. Mårdby A-C, Åkerlind I and Hedenrud T. General beliefs about medicines among doctors and nurses: a cross-sectional study (submitted)

IV. Mårdby A-C, Åkerlind I and Jörgensen T. Beliefs about medicines and self-reported adherence among pharmacy clients. Patient Education and Counseling 69 (2007) 158–164.

The papers will be referred to in the text by their Roman numerals.

The papers have been printed in this thesis by kind permission of the publishers.

Contents

Abbreviations

BMQ	Beliefs about Medicines Questionnaire
HBM	Health Belief Model
MARS	Medication Adherence Report Scale
OR	Odds Ratio
OTC	Over-the-counter medicines
SRM	Self Regulatory Model
TPB	Theory of Planned behaviour
TRA	Theory of Reasoned Action
WHO	World Health Organisation

Definitions of key concepts

Compliance

Compliance is the oldest definition of medicine-taking behaviour. It is defined in research literature as 'the extent to which a person's behaviour in terms of taking medications, following diets or executing lifestyle changes coincides with medical or health advice' (1). According to this definition the patient has a passive role and is expected be obedient towards the treatment recommended by the prescriber (2).

Adherence

Medicine-taking behaviour also has a newer definition: adherence. Adherence is defined as 'the extent to which a person's behaviour – taking medication, following a diet, and/or executing lifestyle changes – corresponds with agreed recommendations from a health care provider' (3). Adherence is often defined as a medicine-taking behaviour, but can be considered as any type of health behaviour (3). The definition of adherence implies that the patient takes a more active role in the decision process (2). The term will be used in this thesis when medicine-taking behaviour is described.

1. Preamble

Many people have a chronic disease or an illness: pain, cancer, diabetes, obesity, psychiatric disorder or cardiac disease (4). It may have many causes: genetic, environmental, behavioural or social. Great advances in medical treatment in recent times have opened the door to easier treatment of symptoms with medicines instead of prevention or treatment through, for example, lifestyle changes, cognitive treatments or stress reduction. These non-medical treatments may sometimes even replace medical treatment for some diseases.

When it comes to medicines, the utopia is of course rational use: the correct medicine prescribed for the right diagnosis with individually adjusted dosage and treatment period at the lowest expense to patient and society (5). This, unfortunately, does not always happen. Research shows that approximately 5% of all hospital admissions are medication-related (6, 7) and although medication-related costs for the patient and society are very difficult to establish (8) they are estimated to be considerable (9-11). This thesis has, however, been written on the assumption that with rational medical use, adherent medication behaviour could increase the health and quality of life of many people.

2. Introduction

Medicines are prescribed with the aim of preventing, treating and curing diseases. The costs of prescribed medicines have risen over time and are expected to increase over the next few years as well (12). Some of these extra costs are the result of new and more expensive medicines and an increase in the volume of medicines (12). The increase could be a positive thing, if it resulted in a decrease of other more expensive treatments or if patient health or quality of life improved or if sick leave and hospitalisations were reduced. If the right treatment is prescribed for the correct diagnosis in an individualised manner an increased adherence (for definition, see Page 9) is something to strive for. An increased adherence has been seen to reduce hospitalisation (2, 3) and mortality (13), and improve health-related outcomes (3, 13-16). Despite these positive outcomes, adherence to medicines is said to be 50% on average (3, 17) but vary a lot (18). It does not matter if new and better medicines are developed if medicines are not taken in an adequate way. Since the 1970s there have been many attempts to increase adherence to treatments (19, 20). Most of these efforts have been complex and have shown only minor effects on adherence (19, 20). A new slant is therefore needed in adherence research.

3. Background

3.1. Lay perceptions of medicines

According to research people relate differently to the word medicine (21-24). The responses can be divided into several themes: positive and negative beliefs about medicines (22-24), a ticket to normality (21), something associated with the intake of the medicine (22) and something that has bodily effects (25). In a qualitative Swedish thesis patients were asked if they viewed the words medicines and drugs (Swedish: *medicin* and *läkemedel*) as interchangeable (22). This was not always the case. Some stated that drugs and medicines were synonyms or different levels in the same group (22). Others saw them as having different effects and as being different in terms of when or how they should be used (22). In any study of beliefs about medicines in groups of healthcare professionals and patients, understanding of the word medicine is important, since it could mean different things to different people (26).

3.2. Beliefs about medicines

The beliefs people have about medicines have been shown to be important in adherence to medicines (2, 3, 24, 27-31). Research in this area could provide a new angle and important knowledge that can be used in optimising adherence.

3.2.1. Definition of beliefs and attitudes

Beliefs, according to the Scottish philosopher David Hume (1711-1776), are a sort of lively idea (32). In the *Merriam-Webster Online Dictionary* beliefs are explained as a state of mind where trust or confidence is placed in a person or a thing (33). Attitude, on the other hand, is explained as a mental position with regard to a faith or a fact (33). In the research literature, beliefs and attitudes are not synonyms, either (34-36). Beliefs can be defined as a probable characteristic of a concept (36) and does not need to be based on facts or rational thinking (35). Once a belief is formed, it can shape attitudes (35). Attitudes are generally said to represent a summary of evaluations of a psychological object capturing an attribute: good-bad or harmful-beneficial (35).

3.2.2. Beliefs and behaviour

This thesis focuses on beliefs about medicines in different populations: pharmacy clients, healthcare professionals and university students. It discusses how communication, patient-centred care and adherence can influence health. In the literature there are several models which try to explain the link between beliefs and health/illness behaviour: e.g. Health Belief Model (HBM) (37), Theory of Reasoned Action (TRA) (38), Theory of Planned Behaviour

(TPB) (39) and Self Regulatory Model (SRM) (40). HBM focuses on the threat of an illness which leads to a behavioural response to the threat (37). It combines four beliefs or perceptions to predict a health-related behaviour: own experienced susceptibility, severity of a condition, benefits and barriers of a behaviour which all lead to action (37). In addition to these beliefs, a separate factor 'cues to action' is important in making the individual aware of his/her feelings (37). HBM suggests that behaviour arises from one single decision which is based on a cost-benefit analysis (37). The primary determinant of behaviour, according to Ajzen and Fishbein and their TRA model, is an intention to engage in the behaviour (38). In TRA, behavioural intentions are divided into two parallel cognitive processes: own attitudes towards the behaviour (own beliefs and evaluation of the behaviour) and considerations of the social norms (the beliefs of others and how likely they are to give support) (38). It focuses on the relationship between beliefs, attitudes and behaviour and puts the individual in a social context (41). TPB is a development from TRA and includes a further dimension: experienced control (internal and external) of the intended behaviour (39). SRM on the other hand focuses on illness representation and coping procedures (40). In this model there are either external or internal stimuli creating two parallel threat experiences: an emotional and a somatic one (40). These two threat experiences cause coping procedures which lead to an appraisal (40). A coping strategy can be to take/not take medicines because of an experienced physical and/or emotional pain and then evaluate the effect after some time. SRM is different from the other described models, since it is dynamic. The steps of the experiences are connected to each other and in constant adjustment (40).

When it comes to predicting adherence to medicines research shows that HBM (42-44), TRA (44) and TPB (45) do not explain adherence fully. It has been suggested that the original health behaviour models can be lacking some parts which are of high significance when it comes to explaining and predicting adherence (46). SRM has been combined with beliefs about medicines for specific diseases (47). This study, however, only partly succeeded in predicting adherence as well (47). Another reason for the lack of success could be that these original models are ineffective at predicting actual behaviour and more effective at predicting intentional behaviour (48). One study aiming for increased adherence based the intervention on only TRB was unable to show any improvement on adherence (49). Two British intervention studies based on SRM and beliefs about medicines for specific illnesses did, however, find differences in non-adherence between the group receiving the intervention and the control group (50, 51).

3.2.3. Measuring beliefs about medicines

Beliefs about medicines have been examined in several qualitative studies (22, 23, 52, 53). Qualitative studies are important methods, specially when a field is new (54). Interviews are, however, usually time-consuming and expensive (55). Furthermore, qualitative methods are not used for estimating the proportion of these beliefs (56). To measure beliefs about medicines, the Beliefs about Medicines Questionnaire (BMQ) was developed by Horne *et al* (57). BMQ was developed from extensive qualitative research, both theirs and others' (57).

The questionnaire has been validated with good results: internal consistency, re-tested on other data sets and tested for its psychometric capacities (57). The results from the development of BMQ also showed that a distinction between general beliefs about medicines (general BMQ) and specific beliefs about medicines for specific diseases (specific BMQ) ought to be made (56). These two parts of BMQ can be used separately or together (57). Specific beliefs about medicines are used to analyse specific patient groups and their beliefs about their specific medicines while, general beliefs about medicines are broader in concept and measure beliefs in general (56). A generic measurement is best when the group of interest has different diseases or when comparisons are made for heterogeneous groups (58). The general part of BMQ is therefore used to measure beliefs about medicines in this thesis, and the questionnaire can be viewed in Appendix 1. The specific and/or general part of BMQ been used in several studies (28, 29, 31, 47, 57, 59-70). BMQ can be used on its own or integrated with existing health belief models to improve their ability to explain medicine-taking behaviour (47, 71).

3.2.4. Variables with effect on general beliefs about medicines according to literature

Few studies, which include the general part of BMQ, have tried to examine differences in general beliefs about medicines between groups: e.g. males versus females, education, age, origin and medicine use (57, 64, 65). Two of these studies included university students and the other included patients (57, 64, 65). Although one Swedish population-based questionnaire study has examined the importance of several background variables in attitudes towards medicines, this study only included one question about attitudes towards medicines (72). Another Swedish questionnaire study has examined differences in general beliefs about medicines between pharmacy clients and pharmacists (67). This study did not, however, examine any background variables influencing these beliefs and the participants were fewer than the power calculation demanded (67).

Since users of medicines have been observed to have more beneficial beliefs about medicines (65), and women buy more medicines on prescription (12), sex was expected to be significant in the studies included in this thesis. Previously when differences in general beliefs about medicines have been studied between males and females, male university students were more negative about medicines than females were (65). None of the earlier studies have, however, included any analyses of age and general beliefs about medicines (57, 64, 65). Education has been studied once and the type of education was significant: pharmacy students saw medicines as more beneficial and less harmful than non-healthcare students did (64). Students studying different healthcare educations could also have different beliefs about medicines. Recently a British study showed that cultural background was important to general beliefs about medicines: Asian students were more likely to see medicines as more harmful and less beneficial compared with those with a European background (65). This ought to be examined in other groups as well. Research also indicates that people using complementary medicines see conventional medicines as more harmful (24, 53, 71). Since patients and healthcare professionals meet during patient-healthcare communication all the variables above need to be

studied further among to see if there are differences in beliefs about medicines between different groups.

3.3. Communication about medicines

Beliefs can, then, bias patient-healthcare communication (73) in terms of both content and how the information is communicated (74). Good communication is critical for good patient care (75). Communication can be seen as a linear model: sender – message – receiver (76). It can be verbal and non-verbal and it is important to recognise both (76). Non-verbal communication can be both conscious and unconscious: gestures, poses, facial expressions, touches and tone of voice (76). These can all be used to strengthen and limit verbal communication (76). It is important to note that most non-verbal expressions can vary in different individuals and cultures (76).

3.3.1. Patient-healthcare professional communication in theory

Within patient-healthcare communication patient-centredness is a concept often discussed. Patient-centred care can be dated at least from the 1960s when many authorities in society, including those within the healthcare system, came under question (77). The definition of patient-centred care consists of several dimensions: biopsychosocial perspective, patient-as-a-person, sharing power, therapeutic alliance and doctor-as-a-person (78). The biopsychosocial dimension means that the healthcare provider needs to see the patient from a psychological and social perspective as well as from a biomedical perspective (78). It is important for the healthcare provider to see the whole patient and to become fully involved in the patient's situation. It is also ideal to have a shared power-relationship: not a 'parent-child relationship' but an 'adult relationship' (78). There is, however, usually a competence gap between the healthcare provider and the patient and it is questionable whether this is achievable (78). The therapeutic alliance is fundamental for patient-centred care, emphasising the importance, effectiveness and goal of the treatment (78). The patient is the one who has got to live with the medicine (79). Motivation is therefore important when it comes to treatment (79) and adherence to medicines (80). Patient-centred care is a 'two person medicine' where it is important to recognise the patient as a person as well as the doctor's influence on the patient (78), although the latter is not necessarily something negative (78). For example, if a patient is determined to receive a prescription for antibiotics for his/her cold and the doctor knows that the cause of the cold is a virus the doctor ought to convince the patient that antibiotics are not the answer. Patient-centredness is correlated with health (75, 81), but different approaches are associated with different physical health outcomes (82). Furthermore, patient-centred advice based on the health models SRM and BMQ has been shown to be associated with adherence (50).

Patient-centred care is not the only concept to describe patient-healthcare communication: concordance is another (83, 84). Concordance is 'based on the notion that the work of prescriber and patient in the consultation is a negotiation between equals and that therefore the aim is a therapeutic alliance between them' (2). According to Stevenson *et al* the key

issues for concordance are: patient discussing own beliefs, experiences and preferences, healthcare professionals asking the patient to provide information, a balanced patient-healthcare professional discussion and healthcare professionals expressing their own views (85). Since concordance is not a behaviour, a patient cannot be non-concordant, but the consultation process between the two parties may be (83, 84).

From the above (2, 78, 83, 85, 86), it is evident that patient-centred care and concordance include almost the same dimensions. Concordance can be seen as an extended version of the principles in patient-centred care, especially if these are applied in medicine behaviour and prescription of medicines (87). It is more useful, however, to include patient-centred care in the discussion of healthcare communication, since this concept encompasses not only medical treatment but other possible non-medical treatment as well.

3.3.2. Patient-healthcare professional communication in practise

Doctors, nurses and pharmacy employees usually do not have the same starting-point or goals with the communicating situation (88-90).

Doctors' consultations can be regarded as overarching, with a biomedical perspective (90). Doctors have been observed, however, to be more patient-centred with patients they perceive to be satisfied with the care, who ask questions or express feelings (91, 92). The doctors' patient-centredness may also depend on other factors like the educational level and social class of the patient. The doctors' patient-centeredness may also depend on other factors like education and social class of the patient (91).

The nurse-patient communication is often premised on contribution from the patient (90). The agenda of the nurses does not seem to be as 'routinised' as that of the doctors (93). Nurses also seem to address adherence and lifestyle factors to a higher extent than doctors do (93).

Studies have shown that pharmacy employees focus on information concerning the medicines in the communication situation: main- and side-effects and dosage (88, 89). According to a Swedish qualitative study very few of the questions (2%) to the pharmacy clients were open in character (88). Pharmacists are more often seen as specialists in medicines rather than experts on health and illnesses by their clients (94). Research indicates that patient-centredness (95) and concordance (96) are important to pharmacy employees.

Patients do not talk as much during consultations as doctors, nurses and pharmacy employees do (85, 88, 93, 97, 98). The patients, however, do want patient-centred care (86) and often like to be a part of decision-making (99, 100), but this varies with the type of problem and several sociodemographic variables (97, 99). It seems important for patients to feel that they are met with respect and contribute meaningfully to the consultation and that their opinions and feelings are taken into account (101). If healthcare professionals encourage patients to talk about their medicines it is perceived as something positive (85). Sometimes, however,

patients do not want to take as much part in the decision as healthcare professionals think they do (102, 103). For instance, patients may not discuss adherence with their doctors for fear of annoying him/her (85). Furthermore, patients usually have different questions for different healthcare professionals (85): GPs are preferred for serious problems and nurses for minor problems (104). Patients may also be differently positioned in consultation situations with different healthcare professionals (90): e.g. more active in consultations with nurses than when seeing the physician (93). Another indication is that patient-centredness at the pharmacy is not as important to pharmacy clients as it is to the pharmacy employees (95).

3.3.3. Teamwork in healthcare

Today the healthcare team can consist of several professionals: e.g. doctors, nurses (105-108), pharmacists (107-110), psychologists (105-107) and physiotherapists (105-107). Health improvement is the common overall aim of all of these healthcare professionals. Opinions as to how health improvement should be achieved may, however, differ (111, 112). Doctors have traditionally based decisions on scientific evidence (111) and a clinical and emotionally-neutral approach (113). They are usually seen as the team leader (105, 107, 114). Nurses, on the other hand, have usually included the whole patient (111) from a more emotional and social perspective (113). The nurse can also be seen as the patient's advocate within the team creating a more patient-centred environment (115). The pharmacists' approach is also based more on scientific evidence (116, 117). Pharmacists in healthcare teams have been perceived to increase patient safety (110) and improve patients' medicine use (108) and patient information about medicines (109). In the interests of patients' health it is essential that all members of a healthcare team should have a functioning working relationship and good inter-professional communication (111, 118, 119). Some tension has historically occurred in the classical nurse-doctor teamwork which has caused difficulties to cooperate (111, 114, 120). This has been explained partly by the traditional male doctor and female nurse situation (113, 121), where doctors make the actual decisions and nurses care for the patients emotionally and physically (114). Doctors and nurses have vague knowledge of a pharmacist's role of in the healthcare team, especially in the pharmacist's classical setting, the pharmacy (107, 109). It is feasible that close daily contact between doctors, nurses and pharmacists can improve the former's understanding of the contribution made by pharmacists to the healthcare team (108, 109).

In summary, healthcare professionals have varying educational and professional backgrounds and their views on how best to increase the health of the patient may differ. If there are differences in their beliefs about medicines, patients may receive mixed messages. If differences in beliefs are concealed and not acknowledged, teamwork may be impaired.

3.4. Adherence

3.4.1. Adherence to medicines as a way to increase health

Adherence to treatments should not be a goal in itself, but should be seen as an instrument for increasing the health of the individual as well as society. As pointed out earlier, adequate adherence to treatments does increase health outcomes (3, 13-16). From a patient's perspective adherence to medicines may not be the same as from a healthcare professional's perspective. According to qualitative studies, some patients do not reflect about the decision to be adherent or not while others are more concerned about it (22, 23). The decision can therefore be a balance between the effects of the illness against the effects of the medicines or beliefs about medicines (22, 23).

Health itself can also be seen from different perspectives (122) resulting in varying reasons for people being adherent or not. World Health Organisation (WHO) has a broad and commonly-used definition of health (123). It '… is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' (123). This description of health has been criticised for being broad and unreachable (124). Adequate adherence could, however, still be seen as a way to come closer to WHO's definition of health.

The literature describes health from a number of different perspectives. From the traditional biomedical perspective, health is the presence or absence of disease (125). The body and soul are within the statistical normality or all parts of the body are functioning in a way that meets societal norms (125). For someone who sees health from this perspective, adherence could be a tool to obtain or reach normal functioning of the body. From a more holistic perspective, on the other hand, the starting-point is health, not absence of disease (125), and the extent to which someone can realise vital goals with the conditions or qualifications s/he has (126, 127). With this perspective on health, adherence might be one way of increasing conditions or qualifications which make it easier to reach important goals. The biopsychosocial perspective of health focuses not only on the disease, but on the patient and the perceived illness and supporting the patient's coping strategies, as well (128). From this perspective it is important that adherence fits into a person's whole life situation.

3.4.2. Measuring adherence

In the literature medicine-taking behaviour has most frequently been stated as a dichotomised behaviour (3, 18, 19, 29, 50, 63, 66, 70, 129-131). How adherence is then defined varies in several ways. Over/under a certain percentage of medication intake, however, is common (14, 59). Dichotomising adherence can of course be questioned. Is it the best way to handle adherence in all illnesses? Another possibility is to use different degrees of adherence behaviour. Some studies have used adherence as a continuous variable (31, 60, 61).

Measurement of adherence can be done both directly and indirectly (132). Direct methods like measuring drug concentrations in the blood are used to provide proof that the patient has taken their medication (132). The methods mostly used are indirect methods like self-reported

adherence (questionnaire, diaries or interviews) and medication measuring (e.g. pill count and electronic monitoring) (132). It is important to recognise that all ways of measuring adherence have their limits (132). When it comes to self-reported adherence, a person claiming to be non-adherent is usually telling the truth, but those who declare adherence may not be (132). When comparing different self-report methods, questionnaires and diaries are more compatible with nonself-reporting measuring methods than interviews are (133).

There are a few self-reporting adherence questionnaires (47, 134, 135). The Medication Adherence Scale is a questionnaire with four questions about forgetting to take medicines, carelessness over the intake time and whether the person feels better or worse when s/he stops taking the medicine (134). The patients' answers these questions with 'Yes' or 'No' (134). A recent study presents an 11-item questionnaire, the Medication Adherence Rating Scale, developed for patients with psychosis (135). Part of the questionnaire includes questions about medicine-taking behaviour and uses terms like 'forget', 'careless when taking', 'feel better – stop taking' and 'feel worse – stop taking' (135). The questions also require 'Yes' and 'No' answers (135). The Medication Adherence Report Scale (MARS) is a 5-item questionnaire, including 'take less medicine than instructed', 'miss out on a dose', 'alter the dosage', forget' and 'stop taking medicines' (47). Unlike the other questionnaires the MARS statements are answered on a five-point Likert scale where 1 = always and 5 = never (47) (Appendix 2). MARS has been used in several studies to measure self-reported adherence in different patient groups (31, 45, 47, 61, 130, 131).

3.4.3. Beliefs about medicines and adherence

An association between specific beliefs about medicines and adherence has been seen in studies including specific patient groups diagnosed with depression (60), coronary heart disease (61) and asthma (31, 47) and groups of patients (57) and pharmacy clients (29) with medicines for different diseases.

It has been more difficult, however, to establish an association between general beliefs about medicines and adherence. An association has only been observed in two prior studies: one where the patients had different disease diagnoses (57) and one including asthma patients (31). Studies of patients with coronary heart disease (61) and pharmacy clients with medication for various diseases (29) did find initial associations between general beliefs about medicines and adherence, but were not able to confirm these in the final analyses (29, 61). In a study including patients with depression, no association was found at all (60). Since the results from previous studies (29, 31, 57, 60, 61) show inconclusive results, further studies are needed to analyse the association between general beliefs about medicines and adherence.

3.5. The importance of beliefs about medicines in practise and research

Although beliefs about medicines can affect adherence to medicines (2, 3, 24, 27-31, 60, 61) and the information in the consultation (73), not all healthcare professionals have been seen to recognise the importance of discussing patient beliefs during patient-healthcare communication (96, 136). Inclusion of the patient in the consultation and discussion of his/her thoughts are fundamental to patient-centred care (78, 86), and have been seen to have positive effects on the health of the patient (75, 81) and adherence to medicines (50). Creating interventions based on beliefs about medicines is one new way to proceed to obtain improved adherence. First, however, it is necessary to examine and analyse any differences in beliefs about medicines in patients and those healthcare professionals who discuss medicines with patients. It is also important to receive more knowledge about the association between general beliefs about medicines and adherence.

4. Aims of the thesis

The aims of this thesis were to:

- Examine general beliefs about medicines in different populations: university students in healthcare educations (I), pharmacy employees (II), doctors (III), nurses (III) and pharmacy clients (IV);
- To analyse whether general beliefs about medicines were associated with adherence to medicines among pharmacy clients (IV);
- To analyse any differences in general beliefs between healthcare professionals and pharmacy clients.

5. Participants and methods

5.1. Table with summary of studies I-IV

Table 1 provides an overview of the studies.

Table 1: *A summary of studies I-IV: design, study period, study population, outcome measurements and statistical analysis*

Study	**Design**	**Study period**	**Study population**	**Outcome measurements**	**Statistical analysis**
I	Two cross-sectional studies	August – September 2003 and October – November 2005	1040 University students: medicine, pharmacy, pharmaceutical bioscience, dispensing pharmacy, nursing and economics, University of Gothenburg, Sweden	General-Harm, General-Overuse and General-Benefit	Cronbachs alpha, Chi2-tests, independent t-test, ANOVA, multiple linear regression
II	Cross-sectional study	2003	372 Pharmacy employees, community pharmacies, Gothenburg, Sweden	General-Harm, General-Overuse and General-Benefit	Cronbachs alpha, independent t-test, ANOVA, ANCOVA
III	Cross-sectional study	2007	907 Doctors and nurses, in the county of Västra Götaland, Sweden	General-Harm, General-Overuse and General-Benefit	Independent t-test, ANOVA, multiple linear regression
IV	Cross-sectional study	2004	570 Pharmacy clients, community pharmacies, Gothenburg, Sweden	Adherence, General-Harm, General-Overuse and General-Benefit	Cronbachs alpha, Chi2-tests, independent t-test, ANOVA, logistic regression

5.2. Participants

5.2.1. Study I – University students

The participants of study I were university students at the University of Gothenburg, Sweden. This university is one of the largest in Sweden and had approximately 35000 registered students in 2005 (137). The included students were registered as new first-year (2003) and third-year (2005) healthcare students in educations with future medicine and patient contact: medicine, pharmacy, nursing and dispensing pharmacy. A comparison group was chosen outside healthcare education that could be followed up in Year Three: economics students. In 2003 there were 642 registered first year students while in 2005 there were 398 students registered in all the included educations.

5.2.2. Study II – Pharmacy employees

Study II included pharmacists, dispensing pharmacists and pharmacy technicians from twenty-four of the thirty-seven community pharmacies in Gothenburg. Gothenburg is the second-largest city in Sweden with approximately 490000 inhabitants (137). The included pharmacies had 372 employees in the three professional categories. The pharmacies were carefully chosen to include as many employees as possible and cover Gothenburg geographically.

5.2.3. Study III – Doctors and nurses

The participants of study III were healthcare professionals outside hospitals, who prescribed and/or discussed medicines: 303 nurses and 298 general doctors (GPs) and 306 private practising doctors (PPs). The group defined as nurses consisted of district nurses, midwives and nurses. The nurses and the GPs were practising in the primary care sector. Furthermore, all participants were practising medicine and care in the county of Västra Götaland. This county has about 1.5 million inhabitants and includes the second largest city of Sweden (Gothenburg), smaller towns and rural areas (137).

5.2.4. Study IV – Pharmacy clients

Patients in this thesis were represented by pharmacy clients. The 570 pharmacy clients who were asked for participation in study IV were recruited from seven community pharmacies in Gothenburg by the researcher (A-CM). The included pharmacies were geographically spread across the city centre and suburbs. These pharmacies were also required to have secluded areas to facilitate informing the participants and completion of the questionnaire.

5.3. Questionnaires

5.3.1. Background questions

The questionnaires for studies I-IV all included background questions. Study I included questions concerning sex, age, education and prior and present experience with medicines. Study II covered questions about sex, age, occupation, year of graduation, years of professional experience and previous and current medication use. Study III included questions such as sex, age, country of birth, parents' country of birth, professional occupation and years

of professional experience. In study IV, questions about sex, age, country of birth, education and prior and present experiences with medicines were asked.

5.3.2. Beliefs about Medicines Questionnaire

In addition to the background questions the questionnaire also included the Beliefs about Medicines Questionnaire (BMQ) (57, 64). This is a questionnaire developed in Great Britain (57, 64) and consists of two separate parts: specific and general. The general part of the questionnaire was used in studies I-IV and can be viewed in Appendix 1. BMQ has been translated into Swedish, with a back translation accepted by the original author. The Swedish version of BMQ was piloted and had good face validity. The general part of BMQ measures the beliefs people have about medicines in general. It consists of twelve statements, which can be divided into three sub-parts: General-Harm, General-Benefit and General-Overuse. General-Harm, which has five statements, measures beliefs about harmful effects of medicines. General-Benefit, with four statements, stands for beliefs of the benefits of medicines. General-Overuse, with three statements, measures peoples' beliefs about whether doctors overprescribe medicines. All the statements are answered on a five-point Likert scale: 1=strongly disagree, 2=disagree, 3=uncertain, 4=agree and 5=strongly agree. Mean scores were calculated for each participant and for all BMQ sub-parts from one to five. A higher mean indicated a stronger belief in the concept described.

5.3.3. Medication Adherence Report Scale

In study IV an additional questionnaire was added to measure self-reported adherence: the Medication Adherence Report Scale (MARS) (47). The questionnaire has been translated into Swedish, with a back translation accepted by the original author. It consists of five statements and is answered on a five-point Likert scale: 1 = always, 2 = often, 3 = sometimes, 4 = rarely and 5 = never. The full version of the questionnaire can be viewed in Appendix 2. The Swedish version of MARS was piloted and received an acceptable Cronbach's alpha value (0.61). A sum was calculated for each participant ranging from five to twenty-five. A participant was considered to be non-adherent if the sum was between five and twenty-two and adherent between twenty-three and twenty-five. The cut-off point was decided before any analyses were made and was based on the response alternatives for MARS: adherent if one statement was answered with 'sometimes' or two statements with 'rarely'. This cut-off point was decided by the authors of study IV since previous studies that used a dichotomisation of MARS showed no consensus about the cut-off point (130, 131).

5.4. Data collection

The thesis is based on cross-sectional studies. The studies were made in compliance with the Helsinki Declaration and were granted permission by the Ethical Committee of the Sahlgrenska Academy, University of Gothenburg, Sweden.

5.4.1. Study I – University students

The data collection was performed once when the students were first-year students (autumn 2003) and once when they were third-year students (autumn 2005). One of the researchers (A-CM) distributed the questionnaires at the beginning of or directly after a lecture, with permission from the teacher responsible for the course. The students were informed both orally and in writing about the purpose of the study and that it was voluntary and anonymous. The questionnaires were collected directly in sealed envelopes. Since the number of students present were not counted at the data collections the analyses on response rates were made on the number of registered students.

5.4.2. Study II – Pharmacy employees

The questionnaires were distributed by the researchers during the pharmacies' weekly information meetings in the autumn of 2003. The pharmacy employees received oral and written information about the aim of the questionnaire, and that participation was voluntary and anonymous. Furthermore, the pharmacy employees were informed that no analysis would be made at pharmacy level. The pharmacy employees returned the questionnaires in sealed envelopes.

5.4.3. Study III – Doctors and nurses

In the spring of 2007, 907 questionnaires were sent in letters to general practitioners (GPs), private practitioners (PPs) and nurses in the county of Västra Götaland, Sweden. The nurses and GPs were randomly chosen, but the PPs were not. All PPs with a service contract of care with the county of Västra Götaland were included in the study. To increase the chance of getting the required amount of questionnaires, a few of the PPs without a service contract of care were also included in the study. The included doctors and nurses received written information about the aim of the study and that the study was voluntary. It was also stressed that the final data material would be unidentifiable to the researchers. The included leaflet also included contact information about the researchers. One reminder was sent to those who had not responded after one month. The answered questionnaires were sent by post in sealed envelopes. The identification lists were destroyed after the reminder had been sent.

5.4.4. Study IV – Pharmacy clients

Permission to distribute the questionnaires to voluntary pharmacy clients was obtained from all pharmacy managers at included pharmacies. The data were not randomly collected. The procedure for selecting pharmacy clients was decided in advance by the researchers and strictly followed throughout the whole data collection process. In 2004 the clients were approached consecutively by one researcher (A-CM) at the pharmacy and asked if they would consider participating in the study. Clients were only approached if the following inclusion criteria were fulfilled: understand spoken and written Swedish, minimum age of eighteen, and taking a queue number to the prescription counter, alternately choosing OTC medicines or other items. If the clients sat down in a crowded area, were waiting outside the pharmacy for their turn or were talking to pharmacy staff in the OTC department they were not approached.

The participating pharmacy clients received oral and written information about the purpose of the study. They also got information about their right to decline participation and that the study was anonymous. All participants filled out the questionnaires and returned them directly to the researcher in sealed envelopes. Sex and given reason were noted for those clients who declined to participate.

How differences in general beliefs about medicines between healthcare professionals and pharmacy clients were examined is described in 5.5.

5.5. Statistical analysis

With an internal consistency test the homogeneity of and the extent to which the statements in the questionnaires are related to a specific dimension in a scale could be analysed (138). In this thesis Cronbach's alpha was used to test the internal consistency on the data sets for the BMQ sub-parts in studies I and II. Study IV reports Cronbach's alpha for the statements in MARS.

Differences in proportion between males and females concerning educations with large drop-outs in study I and respondents versus non-respondents in study IV were analysed by Chi-square tests.

Dichotomous variables in studies I-IV were analysed for differences in beliefs by independent t-tests. In study I these were sex, stage of education and own experience of medicines. The only dichotomous variables in study II were own experience of medicines. Study III had two dichotomous variables: sex and birth area. The dichotomous variables for study IV were sex, birth area, own experience of medicines and adherence.

By use of univariate analysis of variance (ANOVA) categorical variables were tested for differences in beliefs in studies I-IV. The categorical variables in studies I and IV were age and education. Study II had three categorical variables: age, occupation and professional experience. In study III, age, number of parents born outside the Nordic countries and professional experience were categorical variables.

In study II analysis of covariance (ANCOVA) was used to analyse if any interactions occurred for general beliefs about medicines in occupation owing to sex, age, years of professional experience, current and previous medication use.

Linear regression

In study I multiple linear regression models were mainly used to test any interactions between specific background variables and education in General-Harm, General-Overuse and General-Benefit respectively. The models were, however, also used to examine any influence of own use of medicines on beliefs. Each variable was tested with separate linear regression models for any statistical significance for each BMQ sub-part. Those variables suggesting further

analyses had p-values<0.20 (139). Statistical results were considered when identifying possible interaction variables for education: separate linear regression models, independent t-tests and ANOVA analysis. The distribution of specific background variables was also considered. All variables of potential importance were included in the multiple linear regression models for General-Harm, General-Overuse and General-Benefit, respectively. The reference group for study I was economics students.

For study III the multiple linear models were used to analyse differences in general beliefs about medicines between nurses and doctors as well as to test for any interaction variables for occupation. The same steps were taken as in study I. The nurses were treated as a reference group in study III.

Logistic regression

Any association between the BMQ sub-parts was analysed with a logistic regression model in study IV. Adherence was dichotomised as stated earlier and treated as the dependent variable. The BMQ sub-parts were treated as continuous variables. First, separate logistic regression models were made for each BMQ sub-part to test any separate associations between the BMQ sub-part and adherence. For each BMQ sub-part, all background variables were tested for any confounding effects in new separate logistic regressions. Those background variables that caused an approximate 15–20% change in the coefficient for any BMQ sub-part compared with the first logistic regressions for the BMQ sub-parts, and had $p \leq 0.05$, were included in the final logistic regression model (140). The final logistic regression model was then made with adherence, all BMQ sub-parts and significant background variables. The most non-significant independent variable was then excluded and the logistic regression rerun until all included independent variables showed statistical significance ($p<0.05$).

Structural Equation Modelling

Structural Equation Modelling (SEM) was used to analyse whether any differences in beliefs occurred between healthcare professionals (studies II and III) and pharmacy clients (study IV). The BMQ statements are the observed variables and were treated as manifest variables while general beliefs about medicines were treated as latent variables.

All data modelling and analyses of any differences between the study groups (studies II-IV) were done with LISREL 8.7 (141). First, a model had to be developed that fitted the included data (studies II-IV). Then, any differences between the healthcare professionals and pharmacy clients within this model could be analysed. The modelling can be viewed in Appendix 3. The first model was broad: all twelve general beliefs about medicines statements from the questionnaire got relations with one latent variable. In order to find the best model for general beliefs about medicines, previous findings from studies in the area of general beliefs about medicines were considered (57, 64). In the second model the twelve statements had relations to three different latent variables. In the third to fifth model one covariance was added

between the latent variables each time. In model six, one manifest variable had a relation with two latent variables.

Several factors are of importance in testing the fit of a model against the data: e.g. Chi2, degrees of freedom (df) and Root Mean Square Error of Approximation (RMSEA) (142). A Chi2-test (χ^2) is useful as a base for making decisions about the fit of a model (142). A significant χ^2-test indicates that the model does not fit the data (142) indicating that a model is not good. This test is, however, sensitive to large and small sample sizes (142). A large sample means there is a risk that a satisfactory model may be rejected, and with a small sample size a bad model may be non-significant (142) (not rejected). In an attempt to overcome the problem with sample sensitivity several goodness-of-fit indices have been developed (142). The one used in this thesis is RMSEA, a population-based index of fit relatively insensitive to sample size (142). A model may be considered good with a RMSEA value <0.10 or very good with a RMSEA value<0.05 (142). All included variables, relations and covariances in the chosen model, however, have to be based on own logic and previous theory.

The model that best fitted the included data of this thesis was then analysed for any differences between the healthcare professionals and pharmacy clients. Since there were few pharmacists participating in study II the pharmacists and the dispensing pharmacists were treated as one group. Differences within the model were tested first by fully constraining the model and then loosening it up one step at a time when testing for differences: Step 0-6 (143). This means that no values in the chosen model had any freedom at first and included variables were allowed to take any value in the last step (see below).

Step 0: Fully constrained model
The hypothesis: no differences between healthcare professionals or pharmacy clients occur for any values of any variable in the model. This hypothesis is then tested against the data included in the thesis. In other words: this model has no freedom. If the model showed an acceptable fit no differences would occur between pharmacy clients and healthcare professionals according to this model. If the fully constrained model shows a bad fit (RMSEA>0.10) some differences probably occur between healthcare professionals and pharmacy clients within the model.

Where the differences appear is then investigated further: the model is relaxed in the six different steps. After each step the model is compared with the latest model to receive a χ^2-difference and a df-difference. Significant differences between the χ^2-test indicate differences in this stage of the model.

Step 1: no constraints on the latent variables
The mean values of the latent variables (General-Harm, General-Overuse and General-Harm) are relaxed. This is an important step for this thesis since if the result shows significant

differences between the χ^2-tests differences occur in general beliefs about medicines among healthcare professionals and pharmacy clients for this model.

Step 2: remove constraints on intercepts of manifest variables
This step means that all constraints on the means in the model of the thesis are removed. In other words, the means of the manifest variables are also allowed to differ.

Step 3: no constraints on variances of residuals in manifest variables
In this step the residuals do not have to take the same values for the groups of interest in this thesis (studies II-IV). They are allowed to vary.

Step 4: no constraints on variances for latent variables
The values of the variances for latent variables are allowed to be different for the healthcare professionals and pharmacy clients.

Step 5: no constraints on covariances of latent variables
Any differences in the values of covariances of the latent variables are analysed for the included groups.

Step 6: no constraints on relations between latent and manifest variables
Here the homogeneity of regression of the manifest variables on the latent variables is tested. Any differences in the relations between latent and manifest variables are tested between the groups.

Missing data
Missing data were handled in one way in studies I-IV and in another way in SEM. To ensure the validity of the questionnaires in studies I-IV individuals with one or more missing answer for a statement were excluded from the calculation of that specific BMQ sub-part or MARS (55). These individuals were not included in the logistic or multiple linear regression models either.

Missing data in SEM were handled in a combination of two different ways: first by excluding those individuals with few or no answered statements in an original latent variable (BMQ sub-part) and then by maximum likelihood estimation of the rest of those with missing data (143, 144).

6. Results

6.1. An overview of the result from studies I-IV

Table 2: *Mean scores of BMQ sub-parts for all groups in studies I-IV*

Group	**General-Harm** (SD)	**General-Benefit** (SD)	**General-Overuse** (SD)
Study I			
Pharmacy students year 1	2.47 (0.47) *n=81*	4.16 (0.38) *n=80*	3.74 (0.63) *n=81*
Pharmacy students year 3	2.01 (0.51) *n=72*	4.47 (0.37) *n=71*	3.45 (0.65) *n=72*
Medical students year 1	2.37 (0.66) *n=65*	4.25 (0.46) *n=65*	3.39 (0.79) *n=65*
Medical students year 3	1.83 (0.52) *n=72*	4.49 (0.41) *n=73*	3.03 (0.76) *n=73*
Nursing students year 1	2.48 (0.64) *n=110*	4.03 (0.64) *n=110*	3.63 (0.73) *n=111*
Nursing students year 3	2.31 (0.73) *n=62*	4.23 (0.51) *n=61*	3.84 (0.65) *n=62*
Dispensing pharmacy students year 1	2.35 (0.52) *n=50*	4.27 (0.44) *n=51*	3.29 (0.69) *n=51*
Dispensing pharmacy students year 3	2.26 (0.45) *n=43*	4.38 (0.38) *n=43*	3.43 (0.62) *n=43*
Economics students year 1	2.39 (0.54) *n=142*	4.20 (0.54) *n=146*	3.33 (0.79) *n=147*
Economics students year 3	2.30 (0.64) *n=42*	4.24 (0.68) *n=41*	3.45 (0.83) *n=42*
Study II			
Pharmacists	1.77 (0.74) *n=27*	4.36 (0.61) *n=28*	3.25 (0.78) *n=28*
Dispensing pharmacists	1.72 (0.51) *n=159*	4.39 (0.46) *n=159*	3.46 (0.68) *n=156*
Pharmacy technicians	1.97 (0.60) *n=97*	4.17 (0.43) *n=100*	3.59 (0.63) *n=101*
Study III			
General practitioners	1.76 (0.56) *n=171*	4.28 (0.49) *n=181*	3.11 (0.77) *n=179*
Private practitioners	1.69 (0.52) *n=175*	4.39 (0.51) *n=184*	2.88 (0.86) *n=182*
Nurses	1.92 (0.54) *n=230*	4.18 (0.52) *n=236*	3.50 (0.77) *n=236*
Study IV			
Pharmacy clients	2.49 (0.64) *n=310*	4.16 (0.57) *n=317*	3.36 (0.82) *n=316*

Table 3: *Multiple linear regression models with BMQ sub-parts as dependent variables and sex, age, education and use of medicines as independent variables – university students (I)*

	b (SD)	**p-value**
a) General-Harm		
Pharmacy	0.237 (0.114)	0.038
Medicine	0.033 (0.108)	0.759
Nursing	-0.162 (0.138)	0.243
Dispensing pharmacy	-0.142 (0.255)	0.577
Female	0.129 (0.083)	0.123
Female*pharmacy students	-0.251 (0.132)	0.057
Female*medicine students	-0.091 (0.129)	0.482
Female*nursing students	0.276 (0.153)	0.073
Female*dispensing pharmacy students	0.093 (0.268)	0.728
Year 3 of studies	-0.120 (0.103)	0.245
Pharmacy students*year 3	-0.297 (0.139)	0.033
Medicine students*year 3	-0.417 (0.141)	0.003
Nursing students*year 3	-0.066 (0.137)	0.632
Dispensing pharmacy*students year 3	0.011 (0.156)	0.942
Prior use of medicines on prescription	-0.142 (0.066)	0.030
Prior use of herbal/homeopathic medicines	0.239 (0.056)	<0.001
Present use of analgesic medicines	-0.101 (0.043)	0.020
Present use of asthmatic medicines	-0.424 (0.085)	<0.001
b) General- Overuse		
Pharmacy	0.523 (0.145)	<0.001
Medicine	0.137 (0.138)	0.320
Nursing	0.287 (0.173)	0.098
Dispensing pharmacy	-0.511 (0.333)	0.126
Female	0.088 (0.106)	0.404
Female*pharmacy students	-0.178 (0.166)	0.283
Female*medicine students	-0.168 (0.163)	0.304
Female*nursing students	-0.035 (0.191)	0.853
Female*dispensing pharmacy students	0.460 (0.350)	0.189
Year 3 of studies	0.113 (0.127)	0.371
Pharmacy*students year 3	-0.448 (0.173)	0.010
Medicine*students year 3	-0.480 (0.177)	0.007
Nursing*students year 3	0.086 (0.171)	0.614
Dispensing pharmacy*students year 3	-0.029 (0.197)	0.885
Prior use of herbal/homeopathic medicines	0.167 (0.055)	0.002

Table 3 cont.: *Multiple linear regression models with BMQ sub-parts as dependent variables and sex, age, education and use of medicines as independent variables – university students (I)*

	b (SD)	**p-value**
c) General-Benefit		
Pharmacy	-0.090 (0.100)	0.371
Medicine	0.073 (0.093)	0.435
Nursing	-0.126 (0.122)	0.300
Dispensing pharmacy	0.177 (0.225)	0.431
Female	-0.039 (0.073)	0.591
Female*pharmacy students	0.094 (0.116)	0.418
Female*medicine students	-0.079 (0.113)	0.482
Female*nursing students	-0.036 (0.135)	0.789
Female*dispensing pharmacy students	-0.140 (0.236)	0.554
Year 3 of studies	0.060 (0.092)	0.511
Pharmacy*students year 3	0.188 (0.123)	0.128
Medicine*students year 3	0.165 (0.125)	0.186
Nursing *students year 3	0.093 (0.121)	0.442
Dispensing pharmacy*students year 3	0.065 (0.138)	0.640
Prior use of Over-the-counter medicines	0.174 (0.072)	0.016
Prior use of prescription medicines	0.136 (0.058)	0.018
Present use of asthmatic medicines	0.265 (0.075)	<0.001

Missing values on General-Harm, General-Overuse and General-Benefit not included.
Reference group: Economic students
b = unstandardized regression coefficient
The table shows the three final models with one BMQ sub-part as the dependent variable.

6.2. Study I – University students

The response rates for the data collection in 2003 were 71.7% (*n=460*) and 73.6% (*n=293*) in 2005. Two-thirds of the responding students were women. The majority of the participating students in medicine, pharmacy and economics were under 25-years-old when beginning university. Only 30-45% of the students in nursing and dispensing pharmacy were as young as that.

In Table 2 it is shown that nursing students had the least positive beliefs about medicines throughout the study period. Third-year pharmacy and medical students had more beneficial ($p_{\text{medical students}}=0.001$; $p_{\text{pharmacy students}}<0.001$) and less harmful ($p_{\text{medical students}}<0.001$; $p_{\text{pharmacy students}}<0.001$) beliefs compared with first-year students in these educations. No differences in beliefs were found between the first- and third-year economics students (comparison groups).

Small or non-significant differences in general beliefs about medicines were found for the BMQ sub-parts between first-year students. For General-Overuse, however, first-year pharmacy and nursing students were more likely to believe that medicines were overprescribed by doctors compared with first-year dispensing pharmacy and economics students ($p<0.001$). More obvious differences in beliefs about medicines were observed between the third-year students. Nursing students saw more to harmful effects of medicines

compared with medical and pharmacy students (p<0.01). Furthermore, nursing students were most likely to believe medicines to be overprescribed by doctors and medical students were least likely to believe this (p<0.001).

In the multiple linear regression models for General-Harm and General-Overuse shown in Table 3, the mean scores for first-year pharmacy students were significantly different from the comparison group (economics students). For General-Harm and General-Overuse, the mean scores for the third-year medical and pharmacy students were significantly different compared with the comparison group. Sex did not interact with education for General-Harm or General-Overuse. No significant differences were found in the model for General-Benefit, indicating interactions between the including variables. Furthermore, all BMQ sub-parts were influenced by own experience of medicines.

6.3. Study II – Pharmacy employees

In this study the response rate was 78.5% (*n=292*). Almost all participants were women. The age of the participants was quite high: more than half were forty-five or older. Few of the participants were pharmacists, 54% were dispensing pharmacists and about a third were pharmacy technicians. Over half of the pharmacy employees used prescription or OTC medicines. Herbal medicines were used by 14% and almost 20% did not use medicines at all.

Years of professional experience influenced general beliefs about medicines. Those who had worked in pharmacies for 30-34 years regarded medicines as less harmful than did those with up to four years' experience. Furthermore, pharmacy employees who used medicines on prescription saw medicines as more beneficial than did non-users.

Pharmacy technicians saw more harmful effects of medicines compared with dispensing pharmacists (Table 4). Both pharmacists and dispensing pharmacists saw more benefits of medicines compared with pharmacy technicians. None of the included background variables could explain the differences in beliefs found between the occupations.

Table 4: *Pharmacy employees and general beliefs about medicines (II)*

	General-Harm *	General-Benefit *	General-Overuse
Pharmacists	1.77 (0.74)	4.36 (0.61) [a]	3.25 (0.78)
Dispensing pharmacists	1.72 (0.51) [a]	4.39 (0.46) [b]	3.46 (0.68)
Pharmacy technicians	1.97 (0.60) [a]	4.17 (0.43) [a,b]	3.59 (0.63)

*** p<0.001, ** p<0.01, * p<0.05

Differences between mean scores tested with ANOVA tests (post hoc tukey's *b*): "a"s are different from each other and "b"s are different from each other

6.4. Study III – Doctors and nurses

The response rates in study III were 67.9%: 190 PPs, 182 GPs and 244 nurses. About 40% of the GPs and 75% of the PPs were male, while almost no nurses were male. The PPs' mean age was sixty compared with forty-seven for GPs and fifty-two for nurses. The doctors had a larger distribution over age compared with the nurses. Few nurses were born or had at least one parent born outside the Nordic countries. Less than 15% of the PPs and about a quarter of the GPs were born or had at least one parent born outside the Nordic countries. Over 40% of the doctors had worked for up to fifteen years while it was more common for PPs (50%) and nurses (30%) to have worked over thirty years.

Male PPs saw more to harmful effects of medicines compared with female PPs ($p<0.05$). GPs who declared a Nordic heritage saw medicines as more beneficial ($p<0.001$) and less harmful ($p<0.001$) compared with GPs of non-Nordic heritage. Furthermore, GPs stating Nordic origin also saw more to the benefits of medicines and less to them as being overprescribed by doctors compared with GPs of non-Nordic origin ($p<0.01$). This could also be seen in PPs but the only statistical significant result was for General-Harm ($p<0.05$). GPs with no more than fifteen years of professional experience were more likely to believe medicines to be overprescribed by doctors compared with GPs with long professional experience ($\geq$ 30 years) ($p<0.05$).

The multiple linear regression models for study III are presented in Table 5. The nurses' mean scores were higher for General-Harm and lower for General-Benefit compared with GPs and PPs. One interaction variable was significant: GPs with at least one parent born outside the Nordic countries, but the differences in mean scores for General-Benefit remained. None of the included independent variables for the multiple linear regression model was significantly different for General-Overuse, indicating interactions.

Table 5: *Multiple linear regression models for beliefs about medicines as dependent variable and background variables as independent variables – doctors and nurses (III)*

	b (SD)	**p-value**
Model A: General-Harm		
General practitioners	-0.240 (0.059)	<0.001
Private practitioners	-0.267 (0.057)	<0.001
At least 1 parent born outside the Nordic countries	0.003 (0.171)	0.985
At least 1 parent born outside the Nordic countries *GP	0.252 (0.193)	0.192
At least 1 parent born outside the Nordic countries *PP	0.227 (0.201)	0.259
Model B: General-Benefit		
General practitioners	0.217 (0.054)	<0.001
Private practitioners	0.232 (0.052)	<0.001
At least 1 parent born outside the Nordic countries	0.204 (0.159)	0.202
At least 1 parent born outside the Nordic countries *GP	-0.577 (0.180)	0.001
At least 1 parent born outside the Nordic countries *PP	-0.331 (0.188)	0.079
Model C: General-Overuse		
General practitioners	0.337 (0.805)	0.676
Private practitioners	-0.476 (0.814)	0.559
Female	-0.285 (0.404)	0.481
Female*general practitioners	0.208 (0.423)	0.623
Female*private practitioners	0.085 (0.427)	0.843
Age in years	0.012 (0.011)	0.288
Age in years*GP	-0.018 (0.019)	0.345
Age in years*PP	0.005 (0.016)	0.743
Professional experience in years	-0.001 (0.008)	0.902
Professional experience in years*GP	-0.005 (0.017)	0.747
Professional experience in years*PP	-0.025 (0.015)	0.085

Missing values not included
Reference group: Nurses
b = unstandardized regression coefficient
GP = general practitioners
PP = private practitioners

6.5. Study IV – Pharmacy clients

In study IV the response rate was 56.8% (*n=324*). The majority of the clients were women and the average age was forty-seven. Over 90% were born within the Nordic countries. Almost half of the pharmacy clients had a university degree. Many of the clients stated use of prescription (71%) and OTC (53%) medicines. Herbal medicines were used by 17% and 8% did not use any medicines at all. Compared with women, significantly more men declined to participate according to the Chi2-test (p=0.02). According to MARS, 54% of the participating pharmacy clients were considered to be non-adherent.

Adherent pharmacy clients did see more benefits (p<0.05) and less harmful (p<0.001) effects of medicines compared with non-adherent clients. Furthermore, clients born within the Nordic

countries saw medicines as more beneficial than those born outside the Nordic countries ($p<0.01$). Education was also important in general beliefs about medicines: high school or university education meant more beneficial ($p<0.05$) and less harmful ($p<0.001$) beliefs compared with lower levels of education. Those clients who either used herbal medicines ($p<0.01$) or not any medicines at all ($p<0.01$) were more likely to believe medicines were overprescribed by doctors.

Initial associations were found between all the BMQ sub-parts and adherence according to the separate logistic regression models (Table 5, step a). The final logistic regression model included adherence as dependent variable, all BMQ sub-parts as independent variables and born outside the Nordic countries as a possible confounder. General-Harm was associated with adherence. Although being born outside the Nordic countries was a potential confounder it did not have any modifying effect since the Odds Ratio (OR) of General-Harm did not change.

Table 5: *A logistic regression model with adherence as a dependent variable, BMQ subscales as independent variables and background variables as possible confounders – pharmacy clients (IV)*

	b	**OR**	**CI**	**p-value**
a) General-Harm	-0.78	0.46	0.31-0.69	<0.001
General-Overuse	-0.41	0.67	0.49-0.90	0.008
General-Benefit	0.63	1.89	1.20-2.97	0.006
b) General-Harm	-0.78	0.46	0.30-0.70	<0.001
Born outside the Nordic countries	-1.51	0.22	0.07-0.68	0.009

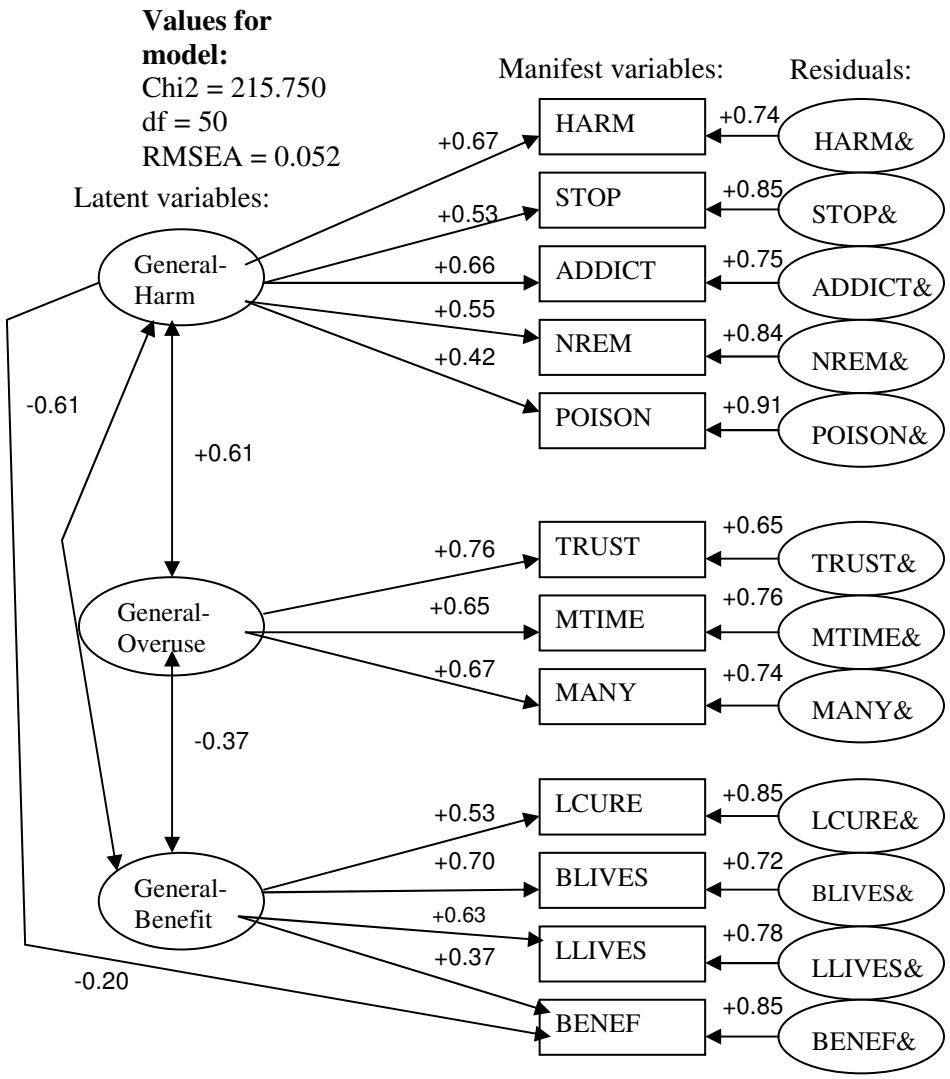
Missing values not included
The logistic regressions include only pharmacy clients using medicines
Only significant variables are shown in the table
b = unstandardized regression coefficient

6.6. Overall comparison of general beliefs about medicines

In Appendix 3 the development of the best model can be viewed and the model which fitted the data best can be viewed in Figure 1. The statements 'HARM', 'STOP', 'ADDICT', 'NREM', 'POISON' and 'BENEF' had relations with the latent variable General-Harm. The statements 'MANY', 'TRUST' AND 'MTIME' had relations with General-Overuse. 'LCURE', 'BLIVES', 'LLIVES' and 'BENEF' had relations with General-Benefit. Covariances occurred between all three latent variables. Furthermore, both General-Harm and General-Benefit showed a relationship with the manifest variable 'BENEF'.

Figure 1: *Structural Equation Model for general beliefs about medicines for Swedish healthcare professionals and pharmacy clients*

Explanations for the abbreviations included in the model representing the statements of BMQ:
HARM = Medicines do more harm than good
STOP = People who take medicines should stop their treatment for a while every now and again
ADDICT = Most medicines are addictive
NREM = Natural remedies are safer than medicines
POISON = All medicines are poison
MANY = Doctors use too many medicines
TRUST = Doctors place too much trust on medicines
MTIME = If doctors had more time with their patients they would prescribe fewer medicines
LCURE = Without medicines doctors would be less able to cure people
BLIVES = Medicines help many people to live better lives
LLIVES = Medicines help many people to live longer
BENEF = In most cases the benefits of medicines outweigh the risks



6.6.1. Differences in the model between healthcare professionals and pharmacy clients

Step 0: fully constrained model
Chi2 = 1776.330, df = 410, RMSEA = 0.120
Results: RMESA shows that the fully constrained model does not have a good fit, since RMSEA>0.10. Differences do occur between healthcare professionals and pharmacy clients within this model.

Step 1: no constraints on means of latent variables (general beliefs about medicines)
Chi2 = 1301.260, df = 398, RMSEA = 0.096
$\chi^2(12) = 475.07$ significantly different when p=0.001

Table 6 shows the differences between the means General-Harm, General-Overuse and General-Benefit for the pharmacy clients and the healthcare professionals. The pharmacy clients saw medicines as more harmful than all the healthcare professionals did. Pharmacy clients did not see medicines as being as beneficial as the doctors, pharmacists and dispensing pharmacists did. Compared with doctors, the pharmacy clients were more likely to believe that medicines were overprescribed by doctors. The pharmacy clients were, however, less likely to believe that medicines were overprescribed by doctors compared with the beliefs of the pharmacy technicians.

Nurses and pharmacy technicians saw medicines as more harmful than doctors, pharmacists and dispensing pharmacists did (Table 6). Furthermore, doctors, pharmacists and dispensing pharmacists also saw more benefits of medicines than nurses and pharmacy technicians did. The doctors were least likely to believe that doctors overprescribed medicines.

Table 6: *T-values of latent variable means for step 1 (SEM)*

	General-Harm	**General-Benefit**	**General-Overuse**
Reference group: pharmacy clients			
Doctors	-15.25 *	2.53 *	-6.77 *
Nurses	-10.75 *	-0.54	1.83
Pharmacists#	-12.29 *	3.40 *	0.40
Pharmacy technicians	-7.07 *	-0.68	2.28 *
Reference group: doctors			
Nurses	5.35 *	-2.89 *	7.96 *
Pharmacist#	1.95	1.35	6.19 *
Pharmacy technicians	5.55 *	-2.43 *	6.87 *
Reference group: pharmacists#			
Nurses	2.85 *	-3.67 *	1.23
Pharmacy technicians	3.70 *	-3.18 *	1.80
Reference group: nurses			
Pharmacy technicians	1.53	0.87	-0.26

* t-values > 1.96 – statistically significant difference

Pharmacist and dispensing pharmacists were treated as one group in SEM

Step 2: no constraints on intercepts of manifest variables
Chi2 = 991.390, df = 362, RMSEA = 0.084
$\chi^2(36) = 309.87$ significantly different when p=0.001
Results: the result means that differences also occur between the means of the different statements of the questionnaires (manifest variables) for the healthcare professionals and the pharmacy clients.

Step 3: no constraints on variances of residuals in manifest variable
Chi2 = 473.790, df = 314, RMSEA = 0.046
$\chi^2(48) = 517.6$ significantly different when p=0.001
Results: the model shows differences between the variances of the residuals in the statements of the questionnaire for the included groups. It is, however, difficult to say exactly how and where these differences are.

Step 4: no constraints on variances of latent variables
Chi2 = 456.120, df = 302, RMSEA = 0.046
$\chi^2(12) = 17.67$ not significantly different when p=0.05

Step 5: no constraints on covariances of latent variables
Chi2 = 433.650, df = 290, RMSEA = 0.045
$\chi^2(12) = 22.47$ significantly different when p=0.05

Results: the model shows differences between the groups owing to the covariances of the latent variables. The covariances between the latent variables have different strength for the healthcare professionals and the pharmacy clients.

Step 6: no constraints on relations between latent and manifest variables
Chi2 = 367.810, df = 250, RMSEA = 0.044
$\chi^2(40) = 65.84$ significantly different when p=0.01
Results: this stage shows a statistically significant difference. Despite the statistical significance, the t-values in this step hardly differed throughout the material indicating homogeneity in the tested relations.

Although several of Steps 1-6 showed statistical differences the most important results for the third aim of this thesis were that this SEM model resulted in several significant differences in general beliefs about medicines between pharmacy clients and the healthcare professionals.

7. Discussion

7.1. Main findings

Beliefs about medicines as something harmful were associated with non-adherence in Swedish pharmacy clients. Differences in general beliefs about medicines were found between pharmacy clients and healthcare professionals. Pharmacy clients were found to believe medicines to be more harmful than all included healthcare professionals. They saw medicines as less beneficial than doctors, pharmacists and dispensing pharmacists. The doctors were least likely to believe that doctors overprescribed medicines compared with all other healthcare professionals and pharmacy clients. The nurses saw medicines as more harmful and less beneficial compared with doctors, pharmacists and dispensing pharmacists. This pattern was also seen among medical, pharmacy and nursing students. The nursing students had the least positive beliefs about medicines throughout the study period. Furthermore, the nursing students did not have the same trend of differences in beliefs between the first and the third year as the pharmacy and medical students had. Last, several background variables were found to be significant in general beliefs about medicines: education, origin and own medicine experience.

The association between general beliefs about medicines and adherence is one important finding. Another is the differences in beliefs between pharmacy clients and healthcare professionals. A variable expected to emerge as important to beliefs about medicines in the included studies was sex. This expectation was based on previous findings that users of medicines have more beneficial beliefs about medicines than non-users (65) and that females buy more medicines on prescription than males do (12). The importance of this background variable for general beliefs about medicines is, according to studies I-IV, somewhat difficult to interpret. This variable was not of major importance, in contrast with other background variables: education, stated origin and own medicine experience. It ought to be recognised, however, that males with lower education have lower representation in included studies. This could of course have influenced the results. Males had more negative beliefs about medicines than females in one prior study including university students (65). Men and women have also been seen to differ in their perceptions of how medicines could affect them personally or socially (24).

7.1.1. Differences in general beliefs about medicines between pharmacy clients and healthcare professionals

Pharmacy clients believed medicines to be more harmful than all healthcare professionals did and less beneficial than doctors, pharmacists and dispensing pharmacists did. That differences

in beliefs about medicines were found between the users of medicines and those who meet them and discuss treatments is interesting, since beliefs about medicines may be a bias in the patient-communication (73, 74). Previous studies have shown that several healthcare professionals do not seem to be fully aware of the impact that beliefs may have during the consultation situation (96, 145) and that it is important to learn about their patients' beliefs about medicines (96). Doctors have been seen to practise more patient-centred communication if the patient is perceived to express his/her own beliefs (92). Patients are, however, not always encouraged to do so (85). It is important that all healthcare professionals are aware that differences may exist in general beliefs about medicines during patient-healthcare communication. Furthermore, differences could occur for patients owing to several background variables like the patients' education, birth area or prior experience of medicines. The beliefs may also differ for the doctor depending on his/her background: Nordic origin or not. Increasing awareness of possible differences in beliefs about medicines and the importance of beliefs for consultation could increase patient-centred consultation: e.g. seeing the patient as a person and establishing a therapeutic alliance. This may also decrease the patients' misunderstandings of (79) and concerns about medicines. Questions about and discussing beliefs about medicines, thus increasing the involvement of the patient, are also likely to mean that the prescription of unnecessary and inappropriate drugs, the need for healthcare service and the costs of healthcare will decrease (101).

The beliefs about medicines of healthcare professionals are a combination of professional and personal beliefs (74). This is important in discussion of the differences in beliefs found among the different healthcare professionals included in this thesis. Doctors, pharmacists and dispensing pharmacists saw more to the benefits of medicines and not as much to the harmful effects as the nurses and pharmacy technicians did. The results are not surprising but they are nevertheless important. These professions have different tasks and communicate with patients in different ways. They are, however, part of the same team and they all have the best interests of the patient at heart. Furthermore, they are all needed to help the patient. If nurses, doctors and pharmacy employees have different beliefs, different messages about medicines may be mediated to the patient. Different messages could create confusion for the patient. These differences in beliefs about medicines between doctors, nurses and pharmacy employees do not, however, always have to be negative. If the beliefs and perspectives of each other's professions can be discussed and not taken for granted these differences can be used during teamwork as a source of creative solutions for medical problems (112).

7.1.2. Association between general beliefs about medicines and adherence

BMQ was developed for use on its own or to enhance existing health belief models (71). This thesis can confirm that general beliefs about medicines can be used alone since an association was found with adherence. Although 54% of the non-adherence was explained by beliefs about medicines as something harmful there is still a large part not explained by included factors in this thesis. Research where different health belief models like HBM (42, 43), TRA (44) and TPB (45) have tried to explain and predict adherence have only partly succeeded.

This ought to be a hint that this is a complicated behaviour and that the models in their original states are missing some parts important for adherence. SRM includes the important dynamic dimension where coping decisions are constantly questioned and evaluated. Many patients question their medicines and want to test what happens if they stop taking them(24). Probably the decision about adherence is not one decision fixed forever, but a decision under constant review. TRA or TPB are also possible models, however, since it includes a social influence dimension. Research shows that direct-to-consumer advertisements can influence the patients' behaviour (146): e.g. commercials to the population in journals or TV. Furthermore, medicines also need to be put in a social context which shows how treatment and illness are seen in society: e.g. influence and support of family, friends and neighbours (24). By combining beliefs about medicines as something harmful with one health belief model adherence may be more fully explained and predicted. This, however, has to be studied further.

8. Methodological considerations

One issue is if the statements of BMQ meant the same things for all groups included in the studies I-IV. Lay persons may relate to the word medicine differently from healthcare professionals: solutions or pills versus different therapeutic groups (26). It is, however, unlikely that such an issue could fully explain the differences in general beliefs about medicines found between pharmacy clients and healthcare professionals.

The answers from both BMQ and MARS were given on Likert scales. BMQ was used as a continuous scale. It could be questioned whether the steps between the answers on the Likert scale are the same within the different questionnaires and throughout the studies (147). One way of avoiding some of these problems could have been to dichotomise the variable instead of treating it as a continuous variable. Then, however, information would have been lost.

MARS can also be used as a continuous variable. This has been done in a few recent studies (31, 60, 61) and recommended in a review (14). In this thesis MARS was treated as a dichotomised variable although this meant losing some information. This decision was based on the fact that adherence so far usually has been discussed and studied as a dichotomised variable (3, 18, 19, 50, 63, 66, 70, 129-131).

It may also be questioned if MARS really measures adherence. The included statements rather concern the definition of compliance. This questionnaire has, however, been stated as measuring adherence and ought to be treated as such. This could not have been avoided by using any of the other known questionnaires since they do not include any statements concerning the definition of adherence, either (134, 135).

During the planning of study I it was not considered ethical to do identified data collections of the university students since one of the authors is a teacher at the educations of pharmacy and dispensing pharmacy. Paired statistical analysis could therefore not be considered. The two data collections were treated as two cross-sectional studies when the data were analysed. Although a large proportion of students was the same in both data collections, it is likely that some had dropped out and some new ones were present during the third year. In this case it is, however, possible to use tests like independent t-tests, although a large correlation between the two data collections did occur (148).

In this thesis Cronbach's alpha was used to measure internal consistency of the BMQ sub-parts (studies I-II) and MARS (study IV). A low value on Cronbach's alpha means that the

included statements or questions do not belong together (138). There is, however, no consistency in the literature about a lower acceptable limit for Cronbach's alpha (26, 138). Values of 0.70 (138), 0.60 (26) to as low as 0.50 (138) have been discussed as acceptable values. In this thesis General-Harm had values as low as 0.54 in study I. Conclusions concerning study I have to be drawn in the light of the above.

As with all model-building (logistic, linear regression and SEM) there may be a question as to whether the best possible model has been found. To minimise the risk it is important to use adequate theory and data and enough model practice when different hypotheses for the best fitted model are tested (149). Two researchers with the same data set could, however, end up with different models based on their references and previous experiences, and both could be right.

When differences in beliefs between healthcare professionals and pharmacy clients were to be analysed, SEM was chosen instead of linear regression modelling. This decision was based on the fact that possible covariances between the BMQ sub-parts could be taken into account in development of the model in SEM. The covariances between the latent variables contributed to the fit of the model. Furthermore, it is hardly ever possible to predict all variables that may be worth investigating. With SEM, variables that have not been included from the beginning are represented as 'residuals' representing non-found confounders and random error.

The literature argues that there is a risk with SEM that differences found in mean scores between the latent variables (general beliefs about medicines) for the included groups could come from measurement non-equivalence (150). Measurement non-equivalence occurs if the relations between the manifest variables (BMQ statements) and the latent variables are not identical across the different groups (150). According to the SEM analysis (Step 6, page 39) the small differences actually found between the relations of the latent and manifest variables could not explain the differences in beliefs about medicines between healthcare professionals and pharmacy clients.

Single item missing values can be handled in various ways (138, 142). The most usual way is to assign the missing item an average value from the answered items of this scale (138). The effect of this has, however, not been fully evaluated (138). The choice in studies I-IV was, therefore, to remove those individuals with any missing item from the calculation of that BMQ sub-part. One strength of the data set used in the SEM model was that the missing values of single items could not have been structural since the same questionnaire was used in all the data collections for studies II-IV (143). The best way to deal with the missing items in SEM modelling is usually to combine listwise deletion with an imputation method e.g. maximum likelihood estimation (143). Through combination of these two methods participants with many missing values could be excluded but those with few missing values could be retained (143).

9. Limitations of the thesis

The studies (I-IV) are based on cross-sectional data and any conclusions regarding causality are of course questionable.

The BMQ and MARS were chosen to measure beliefs about medicines and adherence since a quantitative way of examining beliefs and adherence was wanted. Questionnaires can be used to collect data quite quickly, with limited costs and interviewer bias (55, 151) and are suitable for collection of data on beliefs and social processes (55). There are, however important limitations with this sort of data collection: e.g. weakness in pre-coded response choices, statements not meaning the same thing to all who answers the questionnaires (55), risk of low response rate and limited control of who answer the questionnaire (151).

BMQ is a validated questionnaire (57) and had been used in other study groups before: patients (47, 57) and university students (64). When, however, the studies I-IV were conducted, some specific limitations with the BMQ were observed. The questionnaire had not been used on healthcare professionals before and these groups sometimes had difficulties generalising their beliefs into the Likert-scaled answers. Perhaps this could have been foreseen by a pilot study including these professions. A professional general BMQ might have been one solution. This ought to be based on qualitative studies: e.g. focus groups with several healthcare professional groups. However, studies including such a questionnaire could not have been directly compared with studies including the general BMQ for patients (57, 64).

When it comes to measuring adherence it is important to choose the method that is best suited to the research question and then identify the limitations of this method. All methods to measure adherence have limitations (132). Direct methods may show current presence of a medicine in the blood, but may not say anything about the pattern of adherence (132). Indirect methods to measure adherence are usually inexpensive and easy to administer (132). Pill counts and electronic measuring are common ways to measure adherence in clinical trials (132). They too, however, have limits: e.g. the patient has to bring all included medicine packages when the time comes for the pill count (132). Self-reported questionnaires are often used in similar research to study IV (31, 47, 61, 130, 131).

MARS was chosen to measure self-reported adherence although the validation had not, at the time this thesis was printed, been published. The choice was made because MARS was the only questionnaire found that was answered on a Likert scale, not only with black and white answers like ‘yes’ and ‘no’. Furthermore, MARS has been used in various previous studies (31, 47, 61, 130, 131). It has also been tested against prescription adherence (31). MARS has

limitations as well. Self-reported adherence are said to be correct if non-adherence are stated (132). Those stating adherence, however, could still be non-adherent (132). This means that the proportion of non-adherent pharmacy clients in study IV is probably not over-estimated.

In study I there was a considerable drop-out of third-year economics and nursing students. The proportion of male and female students did not differ between third- and first-year students in either education. Many of the third-year economics students study their third year abroad. This drop-out, however, probably did not affect the results since it is unlikely that those who chose to study abroad had specific types of beliefs about medicines. Since similar patterns for beliefs were found for practicing nurses and doctors in study III it is not likely that the large drop-out of nursing students can explain the differences in general beliefs about medicines found in study I.

In study II there was a low proportion of pharmacists. This could have influenced the results. Perhaps more differences in general beliefs about medicines could have been found if there were more pharmacists participating in the study. There are, however, not many pharmacists working at the Swedish pharmacies. Study I included both pharmacy and dispensing pharmacy students and no significant differences in beliefs were found between them either. Study II did comprise a large proportion of the pharmacy employees available at community pharmacies in Gothenburg at the time of the data collection. Furthermore, until 2000 pharmacists and dispensing pharmacists were educated at one Swedish university and pharmacy technicians at a specific high school. Since age and professional experience were not interacting with occupation it is likely that the results from this study can be seen from a Swedish perspective.

In study III the doctors had quite low response rates compared with the nurses: doctors approximately 60% and nurses 80%. The response rate reported in the literature has been seen to be generally lower for doctors than for nurses (55). A low response rate could of course be a source of bias if some particular group does not answer the questionnaire. Attempts were made in advance and during the data collection to increase the response rate. The questionnaire was kept rather short, sent to home addresses (GPs and nurses) and to private clinics (addressed to specific PPs). Furthermore, a reminder was sent to non-responders after one month (152). The BMQ sub-parts were normally distributed so the response rate did not skew the results. Since the doctors and nurses were recruited from both larger cities and rural areas in Västra Götaland it is likely that these results can be partly be representative for Sweden.

For the pharmacy clients (study IV) the response rate was 56.8%. This response rate has to be seen in the light of the fact that several people who go to the pharmacy do not feel well and do not wish or have the energy to fill out questionnaires. Other clients were just there during their break from work and did not have time. The data collection was, however, made at different times during the day to increase the chance of different pharmacy clients coming to

the pharmacy. The education level was higher in this study than in Sweden overall: 47% versus 30% (137) with a university education. This and the low response rate could, however, mean that some important pharmacy client groups did not participate in the study to the same extent as others: e.g. males with lower education. Differences in beliefs between male and female pharmacy clients might have been a result if more males with lower education had participated in this study. This, however, is an area for further research. Although there are limitations to this study, it ought to be possible to generalise the results to a Swedish cohort of pharmacy clients since these results confirm those found in a previous study including pharmacy clients in Stockholm and Gotland (67).

10. Main conclusions

There are differences in general beliefs about medicines between pharmacy clients and healthcare professionals. Pharmacy clients saw medicines as more harmful compared with doctors, nurses and pharmacy employees. Furthermore, clients also saw medicines as less beneficial than doctors, pharmacists and dispensing pharmacists did. Nurses were least positive about medicines of all the healthcare professionals. Doctors were least likely to believe that doctors overprescribed medicines. Several background variables are important in general beliefs about medicines: type and level of education, birth area and own experience of medicines. This knowledge is important since no studies have been found examining and analysing the differences in general beliefs about medicines of doctors, nurses, pharmacy employees and pharmacy clients. If these results are acknowledged they could have a positive impact on the consultation situation between the patient and the healthcare professional as well as for the interrelationship between doctors, nurses and pharmacy employees.

Furthermore, there is a significant association between beliefs about medicines as something harmful and non-adherence found in pharmacy clients. This indicates that these statements can be used as a new way of predicting non-adherence to medicines.

11. Practise implications

It is important to improve knowledge and awareness among healthcare professionals about differences in general beliefs about medicines between different groups. Healthcare professionals have to recognise that their beliefs may have an influence on their communication with their patient and vice versa. It is therefore important to encourage the patient to express any concerns and questions s/he might have about medicines. This could increase patient-centred care.

Differences in beliefs were also found between the different healthcare professionals. They are different members of the same team and have different perspectives. They all, however, share the same interest in improving patients' health. It is crucial that the patient does not leave this team more confused then when s/he came. Maybe the same beliefs about medicines are not achievable, or even desired, among doctors, nurses and pharmacy employees. One idea could be to stimulate discussion of their beliefs at interprofessional meetings: what these beliefs mean and how these beliefs could influence their teamwork and communication with the patients. It is also important that practising and future healthcare professionals encounter balanced beliefs about medicines during their university and further education.

It is also important that healthcare professionals should receive information and become aware of the association between general beliefs about medicines and adherence. The findings of this thesis are important for future interventions and research aiming at optimised adherence.

12. Future research

This thesis should be seen as the basis for further research and a new angle in adherence research. Use of the association between general beliefs about medicines and adherence, combined with the results from differences in beliefs about medicines, means that new studies and interventions can be developed. Since some limitations in the BMQ have been acknowledged additional qualitative studies may be needed.

Another suggestion for further research would be to examine in detail how best to combine general beliefs about medicines with any health belief model aiming to explain and predict adherence better than the single components do by themselves.

If general beliefs about medicines are examined from a gender perspective, differences between men and women may be discovered.

13. Acknowledgements

The thesis has been funded by the National Corporation of Swedish Pharmacies' fund for research and studies in health economics and social pharmacy and the Lenhoff Foundation (Swedish Pharmaceutical Academy). The Swedish Council for Working Life and Social Research and the Swedish Pharmaceutical Association have funded additional conference participations.

Tove Hedenrud, my supervisor and friend, thank you for being a great support and teacher. Thank you for giving me faith in myself and my abilities and for calming me in times of panic… To my other supervisor, Ingemar Åkerlind, I offer thanks for your valuable support and advice. Thanks for being there whenever I needed your expertise.

Karolina Andersson and Pernilla Jonsson, whose support and friendship have meant more to me during these last few years than I can say. All your advice, our interesting discussions and many, many laughs have made my years as a PhD student full of light and fun.

Thank you, Valter Sundh, for your statistical support and for your patience when discussing and emailing answers to my questions.

Helena Carlsten knew all those practical and important things I needed to know as a PhD student but did not. Thank you for keeping an eye on me and for your valuable administrative help.

Thanks to all my fellow PhD student colleagues for being there with a pat on the shoulder in time of need, supportive discussions and tasty cakes at meetings…

Social Medicine is filled with brilliant, lovely people who have made my life so much more interesting these last few years. With your help my thesis has risen to a higher research level. Thank you!

I would also like to thank the Pharmaceutical Unit in the Department of Health in the county of Västra Götaland and especially Kristina Svenungsson and Peter Amundin for their help with the addresses of the participants in study III.

To all of those who participated in my studies, without you this thesis would never have been accomplished.

My dad, Kjell Söderberg, and Ingegerd and the rest of my extended family – thank you for being there whenever I needed support.

Thank you, my extra mum Agneta Nilsson, for always being there in times of joy, sorrow and need. Thank you for telling me things I needed to hear.

To my mother-in-law, Marianne, thank you for helping out with everything. You are indispensable!

Raymond and Pustan, my other parents-in-law, thank you for laughs and support.

Thank you, Lena, for always being a dear friend and a great support. Challe and Sofia, thank your for old, present and future friendship and many laughs. Fia thanks for your ability to make me laugh and forget any problems. To all my other close and dear friends: THANK YOU for your support! You all know who you are … here in Gothenburg, Örebro, Uppsala and Stockholm.

Last but not least – I would also like to thank Magnus, Gustav, Arvid and Erik, my beloved family, who have been there with happy smiles and lots of support. With you in my life I have not been able to think about research 24-7, thank you. I really needed that. With you all at my side the future is bright and I can do anything I set my mind on.

14. References

1. Haynes RB. Introduction. In: Haynes RB, Taylor DW, Sackett DL, editors. Compliance in Health Care. Baltimore: John Hopkins University Press; 1979. p. 1-7.
2. Royal Pharmaceutical Society of Great Britain. Working Party from Compliance to Concordance, Achieving Shared Goals in Medicine Taking. London: Royal Pharmaceutical Society of Great Britain; 1997.
3. World Health Organization. Adherence to long-term therapies: Evidence for action. Geneva: WHO; 2003.
4. The National Board of Health and Welfare. Hälso- och sjukvård – Lägesrapport 2007 (In Swedish). Stockholm; 2007. Report No.: 978-91-85999-10-1.
5. World Health Organization. The rational use of drugs. Report on the conference of experts, Nairobi. Geneva: WHO; 1987.
6. Beijer HJ, de Blaey CJ. Hospitalisations caused by adverse drug reactions (ADR): a meta-analysis of observational studies. Pharm World Sci 2002;24(2):46-54.
7. van der Hooft CS, Dieleman JP, Siemes C, Aarnoudse AJ, Verhamme KM, Stricker BH, et al. Adverse drug reaction-related hospitalisations: a population-based cohort study. Pharmacoepidemiol Drug Saf 2008.
8. Lundkvist J, Jonsson B. Pharmacoeconomics of adverse drug reactions. Fundam Clin Pharmacol 2004;18(3):275-80.
9. Bates DW, Spell N, Cullen DJ, Burdick E, Laird N, Petersen LA, et al. The costs of adverse drug events in hospitalized patients. Adverse Drug Events Prevention Study Group. Jama 1997;277(4):307-11.
10. Classen DC, Pestotnik SL, Evans RS, Lloyd JF, Burke JP. Adverse drug events in hospitalized patients. Excess length of stay, extra costs, and attributable mortality. Jama 1997;277(4):301-6.
11. Nuckols TK, Paddock SM, Bower AG, Rothschild JM, Fairbanks RJ, Carlson B, et al. Costs of intravenous adverse drug events in academic and nonacademic intensive care units. Med Care 2008;46(1):17-24.
12. The National Board of Health and Welfare. Läkemedelsförsäljningen i Sverige – analys och prognos (In Swedish). Stockholm, Sweden; 2007. Report No.: 978-91-85483-65-5.
13. Simpson SH, Eurich DT, Majumdar SR, Padwal RS, Tsuyuki RT, Varney J, et al. A meta-analysis of the association between adherence to drug therapy and mortality. BMJ 2006;333(7557):15.
14. DiMatteo MR, Giordani PJ, Lepper HS, Croghan TW. Patient adherence and medical treatment outcomes: a meta-analysis. Med Care 2002;40(9):794-811.
15. DiMatteo MR, Haskard KB, Williams SL. Health beliefs, disease severity, and patient adherence: a meta-analysis. Med Care 2007;45(6):521-8.
16. Burnier M. Medication adherence and persistence as the cornerstone of effective antihypertensive therapy. Am J Hypertens 2006;19(11):1190-6.
17. Sackett D.L., Snow J.C. The Magnitude of Compliance and Noncompliance. In: Haynes RB, Taylor DW, Sackett DL, editors. Compliance in Health Care. Baltimore: Johns Hopkins University Press; 1979. p. 11-22.

18. DiMatteo MR. Variations in patients' adherence to medical recommendations: a quantitative review of 50 years of research. Med Care 2004;42(3):200-9.
19. Haynes RB, Yao X, Degani A, Kripalani S, Garg A, McDonald HP. Interventions to enhance medication adherence. Cochrane Database Syst Rev 2005(4):CD000011.
20. Van Wijk BL, Klungel OH, Heerdink ER, de Boer A. Effectiveness of interventions by community pharmacists to improve patient adherence to chronic medication: a systematic review. Ann Pharmacother 2005;39(2):319-28.
21. Conrad P. The meaning of medications: another look at compliance. Soc Sci Med 1985;20(1):29-37.
22. Fallsberg M. Tankar om mediciner och medicinering - en kvalitativ analys bland människor med långvarig läkemedelsbehandling (In Swedish) (Reflections on medicines and medications). Stockholm: Apotekarsocietens förlag; 1991.
23. Britten N. Patients' ideas about medicines: a qualitative study in a general practice population. Br J Gen Pract 1994;44(387):465-8.
24. Pound P, Britten N, Morgan M, Yardley L, Pope C, Daker-White G, et al. Resisting medicines: a synthesis of qualitative studies of medicine taking. Soc Sci Med 2005;61(1):133-55.
25. Shoemaker SJ, Ramalho de Oliveira D. Understanding the meaning of medications for patients: the medication experience. Pharm World Sci 2008;30(1):86-91.
26. Horne R. Assessing perceptions of medications: psychological perspectives. In: McGavock H, editor. Handbook of Drug Research Methodology. New Castle: United Kingdom Drug Utilisation Research Group; 2000. p. 299-319.
27. Richards HL, Fortune DG, Griffiths CE. Adherence to treatment in patients with psoriasis. J Eur Acad Dermatol Venereol 2006;20(4):370-9.
28. Horne R, Weinman J. Patients' beliefs about prescribed medicines and their role in adherence to treatment in chronic physical illness. J Psychosom Res 1999;47(6):555-67.
29. Phatak HM, Thomas J, 3rd. Relationships between beliefs about medications and nonadherence to prescribed chronic medications. Ann Pharmacother 2006;40(10):1737-42.
30. Horne R. Patients' beliefs about treatment:The hidden determinant of treatment outcome? J Psychosom Res 1999;47(6):491-5.
31. Menckeberg TT, Bouvy ML, Bracke M, Kaptein AA, Leufkens HG, Raaijmakers JA, et al. Beliefs about medicines predict refill adherence to inhaled corticosteroids. J Psychosom Res 2008;64(1):47-54.
32. Encyclopaedia Brittanica Online. In; 2008.
33. Merriam-Webster Online Dictionary. In: Merriam-Webster Inc; 2008.
34. Fishbein M, Raven B. The AB scales: An operational definition of belief and attitude. Human Relations 1962;15(1):35-44.
35. Ajzen I, Fishbein M. The influence of attitudes on behavior. In: Albarracin D JB, Zanna MP, editor. The Handbook of Attitudes. New Jersey: Lawrence Erlbaum Associates; 2005. p. 173-221.
36. Albarracín D, Zanna MP, Jonson BT, Kumkale GT. Attitudes: Introduction and Scope. In: Albarracín D, Jonson BT, Zanna MP, editors. The Handbook of Attitudes. Mahwa, New Jersey: Lawrence Erlbaum Associates; 2005. p. 3-19.
37. Becker MH. The health belief model and personal health behavior. Thorofare, NJ: Slack, Inc; 1974.
38. Ajzen I, Fishbein M. Introduction. In: Understanding attitudes and predicting social behavior. Englewood Cliffs, N.J.: Prentice-Hall; 1980. p. 4-10.

39. Ajzen I. From intentions to action: a theory of planned behavior. In: Kuhl J, Beckman J, editors. Action control: From Cognitions to Behaviors. New York: Springer; 1985. p. 11-39.
40. Leventhal H, Diefenbach M, Leventhal E. Illness cognition: Using common sense to understand treatment adherence and affect cognition interactions. Cognitive Therapy and Research 1992;16(2):143-163.
41. Ogden J. Health Beliefs. In: Health Psychology: A textbook. 3rd ed. Berkshire: Open University Press; 2004. p. 14-45.
42. Kelly GR, Mamon JA, Scott JE. Utility of the health belief model in examining medication compliance among psychiatric outpatients. Soc Sci Med 1987;25(11):1205-11.
43. Cerkoney KA, Hart LK. The relationship between the health belief model and compliance of persons with diabetes mellitus. Diabetes Care 1980;3(5):594-8.
44. Ried D, Christensen D. A psychosocial perspective in the explanation of patients' drug-taking behavior. Social science and medicine 1988;27(3):277-285.
45. Farmer A, Kinmonth AL, Sutton S. Measuring beliefs about taking hypoglycaemic medication among people with Type 2 diabetes. Diabet Med 2006;23(3):265-70.
46. Horne R, Weinman J. Predicting Treatment Adherence: a review of existing research. In: Myers LB, Midence K, editors. Adherence to treatment in medical conditions. New Deli: Harwood academic publishers; 1998. p. 25-43.
47. Horne R, Weinman J. Self-Regulation and Self-Management in Asthma: Exploring the Role of Illness Perceptions and Treatment Beliefs in Explaining Non-Adherence to Preventer Medication. Psychology & Health 2002;17(1):17-32.
48. Sutton S. Predicting and explaining intentions and behavior: How well are we doing? J Appl Social Psychol 1998;28(15):1317-1338.
49. Jackson C, Lawton RJ, Raynor DK, Knapp P, Conner MT, Lowe CJ, et al. Promoting adherence to antibiotics: a test of implementation intentions. Patient Educ Couns 2006;61(2):212-8.
50. Clifford S, Barber N, Elliott R, Hartley E, Horne R. Patient-centred advice is effective in improving adherence to medicines. Pharm World Sci 2006;28(3):165-70.
51. Elliott RA, Barber N, Clifford S, Horne R, Hartley E. The cost effectiveness of a telephone-based pharmacy advisory service to improve adherence to newly prescribed medicines. Pharm World Sci 2008;30(1):17-23.
52. Lorish CD, Richards B, Brown S, Jr. Perspective of the patient with rheumatoid arthritis on issues related to missed medication. Arthritis Care Res 1990;3(2):78-84.
53. Morgan M, Watkins CJ. Managing hypertension: beliefs and responses to medication among cultural groups. Sociology of Health and Illness 1988;10(4):561-578.
54. Bowling A. Qualitative and combined research methods, and their analysis. In: Research Methods in Health. 2nd ed. Berkshire: Open University Press; 2002. p. 351-354.
55. Bowling A. Data collection methods in quantitative research: questionnaires, interviews and their response rate. In: Research Methods in Health. 2nd ed. Berkshire: Open University Press; 2002. p. 258-272.
56. Horne R. Representation of Medication and Treatment: Advances in Theory and Measurement. In: Petrie K.J., Weinman J.A, editors. Perceptions of Health and Illnesses: Current Research and Applications. Amsterdam: Hardwood Academic Publishers; 1997. p. 155-188.
57. Horne R, Weinman J, Hankins M. The beliefs about medicines questionnaire: the development and evaluation of a new method for assessing the cognitive representation of medication. Psychol Health 1999;14:1-24.

58. Maciejewski M. Generic measures. In: Kane RL, editor. Understanding Health Care Outcomes Research. 2nd ed. Sudbury, Massachusetts: Jones and Bartlett Publishers; 2006. p. 123-164.
59. Bane C, Hughes CM, McElnay JC. The impact of depressive symptoms and psychosocial factors on medication adherence in cardiovascular disease. Patient Educ Couns 2006;60(2):187-93.
60. Brown C, Battista DR, Bruehlman R, Sereika SS, Thase ME, Dunbar-Jacob J. Beliefs about antidepressant medications in primary care patients: relationship to self-reported adherence. Med Care 2005;43(12):1203-7.
61. Byrne M, Walsh J, Murphy AW, Bonner S, Zimmerman BJ, Evans D, et al. Secondary prevention of coronary heart disease: patient beliefs and health-related behaviour. J Psychosom Res 2005;58(5):403-15.
62. De Las Cuevas C, Sanz EJ. Attitudes toward psychiatric drug treatment: the experience of being treated. Eur J Clin Pharmacol 2007;63(11):1063-7.
63. George J, Shalansky SJ. Predictors of refill non-adherence in patients with heart failure. Br J Clin Pharmacol 2007;63(4):488-93.
64. Horne R, Frost S, Hankins M, Wright S. "In the eye of the beholder": pharmacy students have more positive perceptions of medicines than students of other disciplines. Int J Pharm Pract 2001;9:85-89.
65. Horne R, Graupner L, Frost S, Weinman J, Wright SM, Hankins M. Medicine in a multi-cultural society: the effect of cultural background on beliefs about medications. Soc Sci Med 2004;59(6):1307-13.
66. Horne R, Cooper V, Gellaitry G, Date HL, Fisher M. Patients' perceptions of highly active antiretroviral therapy in relation to treatment uptake and adherence: the utility of the necessity-concerns framework. J Acquir Immune Defic Syndr 2007;45(3):334-41.
67. Ramstrom H, Afandi S, Elofsson K, Petersson S. Differences in beliefs between patients and pharmaceutical specialists regarding medications. Patient Educ Couns 2006;62(2):244-9.
68. Ross S, Walker A, MacLeod MJ. Patient compliance in hypertension: role of illness perceptions and treatment beliefs. J Hum Hypertens 2004:1-7.
69. Neame R, Hammond A. Beliefs about medications: a questionnaire survey of people with rheumatoid arthritis. Rheumatology (Oxford) 2005;44(6):762-7.
70. Clifford S, Barber N, Horne R. Understanding different beliefs held by adherers, unintentional nonadherers, and intentional nonadherers: Application of the Necessity-Concerns Framework. J Psychosom Res 2008;64(1):41-6.
71. Horne R. Treatment perceptions and self-regulation. In: Cameron L, Leventhal H, editors. The Self-Regulation of Health and Illness Behaviour. London: Routledge Taylor & Francis Group; 2003. p. 138-153.
72. Isacson D, Bingefors K. Attitudes towards drugs - a survey in the general population. Pharm World Sci 2002;24(3):104-10.
73. Ajzen I. Nature and operation of attitudes. Annu Rev Psychol 2001;52:27-58.
74. Ogden J. Doctor-patient communication and the role of health professionals' health beliefs. In: Health Psychology - a textbook. 3rd ed. Berkshire: Open University Press; 2004. p. 75-97.
75. Beck RS, Daughtridge R, Sloane PD. Physician-patient communication in the primary care office: a systematic review. J Am Board Fam Pract 2002;15(1):25-38.
76. Eide H, Eide T. Omvårdnadsorienterad kommunikation (In Swedish). Lund: Studentlitteratur; 1997.
77. Pollock K. Concordance in Medical Consultations - a critical review. Oxford: Radcliffe Publishing; 2005.

78. Mead N, Bower P. Patient-centredness: a conceptual framework and review of the empirical literature. Soc Sci Med 2000;51(7):1087-110.
79. Pollock K. The doctor-patient relationship. In: Concordance in Medical Consultations - a critical review. Oxon: Radcliffe Publishing; 2005. p. 33-44.
80. Sodergard B, Hofer S, Halvarsson M, Sonnerborg A, Tully MP, Lindblad AK. A structural equation modeling approach to the concepts of adherence and readiness in antiretroviral treatment. Patient Educ Couns 2007;67(1-2):108-16.
81. Stewart M. The impact of patient-centred care on outcomes. The Journal of Family Practice 2000;49(9):796-804.
82. Michie S, Miles J, Weinman J. Patient-centredness in chronic illness: what is it and does it matter? Patient Educ Couns 2003;51(3):197-206.
83. Weiss M, Britten N. What is concordance? Pharm J 2003;271:493.
84. Bell JS, Airaksinen MS, Lyles A, Chen TF, Aslani P. Concordance is not synonymous with compliance or adherence. Br J Clin Pharmacol 2007;64(5):710-1; author reply 711-3.
85. Stevenson FA, Cox K, Britten N, Dundar Y. A systematic review of the research on communication between patients and health care professionals about medicines: the consequences for concordance. Health Expect 2004;7(3):235-45.
86. Stewart M. Towards a global definition of patient centred care. BMJ 2001;322(7284):444-5.
87. Pollock K. The medical consultation. In: Concordance in Medical Consultations. Oxon: Radcliffe Publishing Ltd; 2005. p. 45-65.
88. Skoglund P, Isacson D, Kjellgren KI. Analgesic medication - communication at pharmacies. Patient Educ Couns 2003;51(2):155-61.
89. Hassell K, Noyce P, Rogers A, Harris J, Wilkinson J. Advice provided in British community pharmacies: what people want and what they get. J Health Serv Res Policy 1998;3(4):219-25.
90. Collins S. Explanations in consultations: the combined effectiveness of doctors' and nurses' communication with patients. Med Educ 2005;39(8):785-96.
91. Willems S, De Maesschalck S, Deveugele M, Derese A, De Maeseneer J. Socio-economic status of the patient and doctor-patient communication: does it make a difference? Patient Educ Couns 2005;56(2):139-46.
92. Street RL, Jr., Gordon H, Haidet P. Physicians' communication and perceptions of patients: is it how they look, how they talk, or is it just the doctor? Soc Sci Med 2007;65(3):586-98.
93. Aminoff UB, Kjellgren KI. The nurse - a resource in hypertension care. J Adv Nurs 2001;35(4):582-9.
94. Anderson C, Blenkinsopp A, Armstrong M. Feedback from community pharmacy users on the contribution of community pharmacy to improving the public's health: a systematic review of the peer reviewed and non-peer reviewed literature 1990-2002. Health Expect 2004;7(3):191-202.
95. Worley MM, Schommer JC, Brown LM, Hadsall RS, Ranelli PL, Stratton TP, et al. Pharmacists' and patients' roles in the pharmacist-patient relationship: are pharmacists and patients reading from the same relationship script? Res Social Adm Pharm 2007;3(1):47-69.
96. Kansanaho HM, Puumalainen, II, Varunki MM, Airaksinen MS, Aslani P. Attitudes of Finnish community pharmacists toward concordance. Ann Pharmacother 2004;38(11):1946-53.
97. Zandbelt LC, Smets EM, Oort FJ, Godfried MH, de Haes HC. Patient participation in the medical specialist encounter: does physicians' patient-centred communication matter? Patient Educ Couns 2007;65(3):396-406.

98. Deveugele M, Derese A, De Maeseneer J. Is GP-patient communication related to their perceptions of illness severity, coping and social support? Soc Sci Med 2002;55(7):1245-53.
99. McKinstry B. Do patients wish to be involved in decision making in the consultation? A cross sectional survey with video vignettes. BMJ 2000;321(7265):867-71.
100. Coulter A, Jenkinson C. European patients' views on the responsiveness of health systems and healthcare providers. Eur J Public Health 2005;15(4):355-60.
101. Pollock K. Introduction. In: Concordance in Medical Consultations. Oxon: Radcliffe Publications Ltd; 2005. p. 1-4.
102. McKeown R. Shared decision making: Views of first-year residents and clinic patients. Academic Medicine 2002;77(5):438-445.
103. Ogden J, Ambrose L, Khadra A, Manthri S, Symons L, Vass A, et al. A questionnaire study of GPs' and patients' beliefs about the different components of patient centredness. Patient Educ Couns 2002;47(3):223-7.
104. Redsell S, Stokes T, Jackson C, Hastings A, Baker R. Patients' accounts of the differences in nurses' and general practitioners' roles in primary care. J Adv Nurs 2007;57(2):172-80.
105. Hansson A, Friberg F, Segesten K, Gedda B, Mattsson B. Two sides of the coin - general practitioners' experience of working in multidisciplinary teams. J Interprof Care 2008;22(1):5-16.
106. Hultberg EL, Lonnroth K, Allebeck P. Co-financing as a means to improve collaboration between primary health care, social insurance and social service in Sweden. A qualitative study of collaboration experiences among rehabilitation partners. Health Policy 2003;64(2):143-52.
107. da Costa Saar SR, Trevizan MA. Professional roles of a health team: a view of its components. Rev Lat Am Enfermagem 2007;15(1):106-12.
108. Bremberg ER, Hising C, Nylen U, Ehrsson H, Eksborg S. An evaluation of pharmacist contribution to an oncology ward in a Swedish hospital. J Oncol Pharm Pract 2006;12(2):75-81.
109. Sodergard BM, Baretta K, Tully MP, Kettis Lindblad AM. A qualitative study of health-care personnel's experience of a satellite pharmacy at a HIV clinic. Pharm World Sci 2005;27(2):108-15.
110. Fairbanks RJ, Hildebrand JM, Kolstee KE, Schneider SM, Shah MN. Medical and nursing staff highly value clinical pharmacists in the emergency department. Emerg Med J 2007;24(10):716-8.
111. Storch JL, Kenny N. Shared moral work of nurses and physicians. Nurs Ethics 2007;14(4):478-91.
112. Lindeke LL, Sieckert AM. Nurse-physician workplace collaboration. Online J Issues Nurs 2005;10(1):5.
113. Corser WD. The contemporary nurse-physician relationship: insights from scholars outside the two professions. Nurs Outlook 2000;48(6):263-8.
114. Sweet SJ, Norman IJ. The nurse-doctor relationship: a selective literature review. J Adv Nurs 1995;22(1):165-70.
115. Hewitt J. A critical review of the arguments debating the role of the nurse advocate. J Adv Nurs 2002;37(5):439-45.
116. Jesson JK, Langley CA, Wilson KA, Hatfield K. Science or practice? UK undergraduate experiences and attitudes to the MPharm degree. Pharm World Sci 2006;28(5):278-83.
117. O'Neill R. Professional Judgement and Ethical Dilemmas. In: Taylor K, Harding G, editors. Pharmacy Practice. London: Taylor & Francis Group; 2001. p. 203-226.

118. Reeves S, Nelson S, Zwarenstein M. The doctors-nurse game in the age of interprofessional care: a view from Canada. Nursing Inquiry 2008;15(1):1-2.
119. Larson E. The impact of physician-nurse interaction on patient care. Holist Nurs Pract 1999;13(2):38-46.
120. Kappeli S. Interprofessional cooperation: why is partnership so difficult? Patient Educ Couns 1995;26(1-3):251-6.
121. Gjerberg E, Kjolsrod L. The doctor-nurse relationship: how easy is it to be a female doctor co-operating with a female nurse? Soc Sci Med 2001;52(2):189-202.
122. Ogden J. Illness cognitions. In: Health Psychology - a textbook. 3rd ed. Berkshire: Open University Press; 2004. p. 47-73.
123. World Health Organization. Constitution. Geneva: WHO; 1948.
124. Åkerlind I, Schunder S. Perspective on health. In: Johanson U, Ahonen G, Roslender R, editors. Work Health and Management Control. Stockholm: Thompson Fakta; 2007.
125. Medin J, Alexandersson K. Begreppet hälsa. In: Begreppen Hälsa och Hälsofrämjande - en litteraturstudie (In Swedish). Lund: Studentlitteratur; 2000. p. 37-99.
126. Nordenfelt L. Om holistiska hälsoteorier. In: Klockars K, Österman B, editors. Begrepp om hälsa - filosofiska och etiska perspektiv på livskvalitet, hälsa och vård (In Swedish). Stockholm: Liber Utbildning; 1995.
127. Pörn I. Vad är hälsa? In: Klockars K, Österman B, editors. Begrepp om hälsa - filosofiska och etiska perspektiv på livskvalitet, hälsa och vård (In Swedish). Stockholm: Liber utbildning; 1995. p. 14-28.
128. Engel GL. The need for a new medical model: a challenge for biomedicine. Science 1977;196(4286):129-36.
129. Haynes RB, Taylor DW, Sackett DL, editors. Compliance in Health Care. Baltimore: The John Hopkins University Press; 1979.
130. George J, Kong DC, Thoman R, Stewart K. Factors associated with medication nonadherence in patients with COPD. Chest 2005;128(5):3198-204.
131. Bowskill R, Clatworthy J, Parham R, Rank T, Horne R. Patients' perceptions of information received about medication prescribed for bipolar disorder: Implications for informed choice. J Affect Disord 2007;100(1-3):253-7.
132. Farmer KC. Methods for measuring and monitoring medication regimen adherence in clinical trials and clinical practice. Clin Ther 1999;21(6):1074-90.
133. Garber MC, Nau DP, Erickson SR, Aikens JE, Lawrence JB. The concordance of self-report with other measures of medication adherence: a summary of the literature. Med Care 2004;42(7):649-52.
134. Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. Med Care 1986;24(1):67-74.
135. Fialko L, Garety PA, Kuipers E, Dunn G, Bebbington PE, Fowler D, et al. A large-scale validation study of the Medication Adherence Rating Scale (MARS). Schizophr Res 2008;100(1-3):53-9.
136. Stevenson FA, Gerrett D, Rivers P, Wallace G. GPs' recognition of, and response to, influences on patients' medicine taking: the implications for communication. Fam Pract 2000;17(2):119-23.
137. Statistics Sweden. Statistical Yearbook of Sweden 2008 (In Swedish). Örebro; 2007.
138. Bowling A. The principles of research. In: Research Methods in Health. 2nd ed. Berkshire: Open University Press; 2002. p. 134-162.
139. Altman DG. Practical Statistics for Medical Research. London: Chapman & Hall; 1999.
140. Hosmer D, Lemeshow S. Applied Logistic Regression. New York: John Wiley & Sons; 2000.

141. Jöreskog KG, Sörbom D. LISREL 8: User's Reference Guide. In. Chicago: Scientific Software International; 1996.
142. Loehlin J. Latent variable models: an introducation to factor, path, and structural equation analysis. 4th ed. Mahawa, New Jersey: Lawrence Erlbaum Associates; 2004.
143. Gustafsson J-E, Stahl PA. STREAMS User's Guide Version 2.5 for Windows. In. Mölndal, Sweden: MultivariateWare; 2000.
144. Allison PD. Missing data techniques for structural equation modeling. J Abnorm Psychol 2003;112(4):545-57.
145. Makoul G, Arntson P, Schofield T. Health promotion in primary care: physician-patient communication and decision making about prescription medications. Soc Sci Med 1995;41(9):1241-54.
146. Wilkes MS, Bell RA, Kravitz RL. Direct-to-consumer prescription drug advertising: trends, impact, and implications. Health Aff (Millwood) 2000;19(2):110-28.
147. Bowling A. Questionnaire design. In: Research Methods in Health. 2nd ed. Berkshire: Open University Press; 2002. p. 274-309.
148. Proschan MA. On the distribution of the unpaired t-statistic with paired data. Stat Med 1996;15(10):1059-63.
149. Breckler S. Application of Covariance Structure Modeling in Psychology: Cause for Concern? Psychological Bulletin 1990;107(2):260-273.
150. Drasgow F. Scritinizing Psychological Tests: Measurement Equivalence and Equivalent Relations With External Variables Are the Central Issues. Psychologial Bulletin 1984;95(1):134-135.
151. McColl E, Jacoby A, Thomas L, Soutter J, Bamford C, Steen N, et al. Design and use of questionnaires: a review of best practice applicable to surveys of health service staff and patients. Health Technology Assessment 2001;5(31).
152. Barclay S, Todd C, Finlay I, Grande G, Wyatt P. Not another questionnaire! Maximizing the response rate, predicting non-response and assessing non-response bias in postal questionnaire studies of GPs. Fam Pract 2002;19(1):105-11.

15. Appendix

Appendix 1: General Beliefs about Medicines Questionnaire (BMQ) (Original version)

	Strongly disagree	Disagree	Uncertain	Agree	Strongly Disagree
General-Harm					
People who take medicines should stop their treatment for a while every now and again					
Most medicines are addictive					
Medicines do more harm than good					
Natural remedies are safer than medicines					
All medicines are poison					
General-Overuse					
Doctors use too many medicines					
Doctors place too much trust on medicines					
If doctors had more time with their patients they would prescribe fewer medicines					
General-Benefit					
Without medicines doctors would be less able to cure people					
Medicines help many people to live better lives					
Medicines help many people to live longer					
In most cases the benefits of medicines outweigh the risks					

R Horne ©, Reprinted with permission from the original constructor

Appendix 2: Medication Adherence Report Scale (MARS) (Original version)

		Always	Often	Sometimes	Rarely	Never
M1	I forget to take my medicines					
M2	I alter the dose of my medicines					
M3	I stop taking my medicines for a while					
M4	I decide to miss out a dose					
M5	I take less than instructed					

R Horne ©, Reprinted with permission from the original constructor

Appendix 3: Development of the general beliefs about medicine model (model 1-6)

	Data of fit
Model 1: 1 factor model "General beliefs about medicines"	Chi2 = 841.510 df = 54 RMSEA = 0.110
Model 2: 3 factor model "General-Harm", "General-Overuse" and "General-Benefit"	Chi2 = 780.340 df = 54 RMSEA = 0.100
Model 3: 3 factor model with covariance between "General-Harm" - "General-Overuse"	Chi2 = 529.160 df = 53 RMSEA = 0.086
Model 4: 3 factor model with covariance between "General-Harm" - "General-Overuse" and "General-Harm" - "General-Benefit"	Chi2 = 333.010 df = 52 RMSEA = 0.067
Model 5: 3 factor model with covariance between "General-Harm" - "General-Overuse", "General-Harm" - "General-Benefit" and "General-Overuse" - "General-Benefit"	Chi2 = 232.730 df = 51 RMSEA = 0.054
Model 6 (final model)**:** 3 factor model with covariance between "General-Harm" - "General-Overuse", "General-Harm" - "General-Benefit", "General-Overuse" - "General-Benefit" and "General-Harm" and "General-Benefit" had relation to the manifest variable "Benef"	Chi2 = 215.750 df = 50 RMSEA = 0.052