From the Division of International Health (IHCAR), Department of Public Health Sciences, Karolinska Institutet, SE-171 76 Stockholm, Sweden

Information and Interaction

Influencing Drug Prescribing in Swedish Primary Care

Cecilia Stålsby Lundborg

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ABSTRACT

Aim

The studies concern drug information and continuing education on drug treatment, focusing on doctors' prescribing in primary care in Sweden. The long-term aim has been to develop educational models accepted by the doctors, and to develop and apply means of evaluating the education.

Methods

Data have been collected from the study populations mainly through questionnaires and dispensed prescriptions, i.e., quantitative data. In addition, qualitative interview data were included. The studies were; (i) a population based cross-sectional descriptive study (202 doctors, in one county) including development of an educational outreach model, with drug information visits to peer groups (150 doctors, part of the 202, in one county); (ii) a study with a phenomenographic approach focusing on General Practitioners' (GPs) ways of experiencing asthma management (20 GPs, in seven counties); and (iii) a randomised parallel trial, of a new educational model (36 GP groups, totally 204 GPs, in seven counties). The content of national guidelines was used as a basis for this education. The model included externally facilitated (GP + pharmacist) discussions in peer groups on the participants' individual feedback, related to the guideline content. The two study arms, education on uncomplicated urinary tract infection (UTI) respectively asthma, were each other's controls. Data were collected before and after the intervention. Using this rigorous evaluation model, potential effects could be attributed to the education itself and not to the attention effect. The education was evaluated regarding the participants' acceptance, knowledge and attitudes, and prescribing, the latter measured through developed prescribing indicators.

Results

Lack of verbal non-commercial drug information sources was reported (61%) in the first study. GPs reported a variation in adoption patterns of drugs depending on category. One educational model was developed, which has been sustainable for more than 10 years. The results of a prescribing survey (2469 norfloxacin prescriptions) within this educational model indicated that a combination of oral and written information influences prescribing more (in line with recommendations) compared to written information only. About 10% of the prescribers had prescribed >50% of the prescriptions. In the qualitative interview study, four different ways of GPs' ways of experiencing asthma management were found. The new educational model was effective in improving drug treatment for UTI, measured as knowledge ($p=0.028$) and prescribing ($p<0.001$) in accordance with guideline recommendations. For asthma, no significant improvements were seen although positive trends were recorded in the prescribing of inhaled steroids. A total of 8,114 prescriptions were analysed for UTI and 15,694 for asthma. The use of feedback was considered important by 86% of the participants, and 87% would like to receive education concerning other conditions, using the same model.

Conclusions

It was found that GPs appreciated the types of non-commercial education on drug treatment developed in this work, i.e., education in small peer groups, facilitated by an external team of one GP and one pharmacist. The results indicate that individualised educational strategies depending on the disease condition seem necessary. In this work, effects were seen on knowledge and behaviour for clear messages concerning UTI, a short-term treatment, but not for asthma, a chronic treatment.

Key words*:* general practitioners, prescribing, knowledge and attitudes, educational interventions, urinary tract infection, asthma, guidelines, randomised controlled trial, phenomenography.

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ORIGINAL PAPERS

The thesis is based on the following papers:

I. Stålsby Lundborg C, Hensjö L-O, Gustafsson LL. Drug information sources: Reported preferences by general practitioners. *Drug Inf J* 1998;32:777-785.

II. Stålsby Lundborg C, Hensjö L-O, Gustafsson LL. "Academic drug-detailing" - from project to practice in a Swedish urban area. *Eur J Clin Pharmacol* 1997;52:167-172.

III. Stålsby Lundborg C, Wahlström R, Dall'Alba G. Ways of experiencing asthma management - variations among general practitioners in Sweden. *Scand J Prim Health Care* 1999; (in press).

IV. Stålsby Lundborg C, Wahlström R, Diwan VK, Oke T, Mårtenson D, Tomson G. Combining feedback from simulated cases and prescribing, design and implementation of an educational intervention in primary care in Sweden. *Int J Technol Assess Health Care* 1999; (in press).

V. Stålsby Lundborg C, Tomson G, Wahlström R, Oke T, Diwan VK. GPs' knowledge and attitudes regarding treatment of UTI and asthma in Sweden - a randomised controlled educational trial on guideline implementation. Submitted.

VI. Stålsby Lundborg C, Wahlström R, Oke T, Tomson G, Diwan VK. Influencing prescribing for urinary tract infection and asthma in primary care in Sweden - a randomised controlled trial of an interactive educational intervention. *J Clin Epidemiol;* (accepted).

The papers will be referred to by their Roman numerals I - VI.

ABBREVIATIONS AND DEFINITIONS

ATC	Anatomical Therapeutic Chemical classification system according to WHO's Collaborating Centre for Drug Statistics Methodology, Oslo, 1996.
CJA	Clinical Judgement Analysis
CME	Continuing Medical Education
DDD	Defined Daily Dose
DEP	Drug Education Project
DTC	Drug and Therapeutic Committee
EBM	Evidence-Based Medicine
FASS	Farmacevtiska Specialiteter i Sverige (Pharmaceutical specialities in Sweden)
FQ	Continuing education and quality circles for GPs
GP	General Practitioner, in this thesis referring to vocationally trained doctors working in primary care
IHCAR	Division of International Health (previously International Health Care Research) at the Department of Public Health Sciences, Karolinska Institutet
KAP	Knowledge - Attitudes - Practice
MPA	Medical Products Agency
NEPI	Nätverk för läkemedelsepidemiologi (Network for Pharmacoepidemiology)
OECD	Organization for Economic Co-operation and Development
RCT	Randomised Controlled Trial
RECAP	Recall, Comprehension, Application, Problem solving
SBU	Statens beredning för medicinsk utvärdering (The Swedish Council on Technology Assessment in Health Care)
UTI	Urinary Tract Infection
WHO	World Health Organization

PREAMBLE

The work for this thesis was initiated through my first professional experience as a pharmacist, working as a drug representative for a pharmaceutical company in the early eighties. Immediate feedback on sales figures made me aware of the potential effectiveness of the instrument, information and interaction in groups of doctors for influencing prescribing practices. In some cases one single visit seemed to strongly influence prescribing, at least for a short period of time. I became convinced of the necessity to adapt the method for non-commercial purposes, which some years later became possible in the development of the multi-disciplinary drug information services, "*Drugwatcher*" (ÖGAT på LÄKEMEDEL).

Through an international course, "*Medicines and Society*", at IHCAR, I got my first contact with Health Systems Research. During the course we were exposed to a number of different disciplines, which I previously only had vague ideas about. The added value of including perspectives, such as epidemiology and behavioural sciences, in the study of medicines in society seemed evident and challenging.

Some years later, back at IHCAR, after the development of the "*Drugwatcher*" service and some years in a community pharmacy, I became involved in the development and scientific testing of a new model for continuing medical education in primary care. This work was part of the European Drug Education Project, for which researchers at IHCAR were among the initiators. This project involved participants, with various educational backgrounds, working in a total of seven countries.

Having had the privilege of doing the work for this thesis at IHCAR with its many professional and cultural backgrounds, I have learned a lot. Although my work has concerned mainly one aspect of drug treatment, discussions on the importance of drugs and appropriate drug use in a public health perspective have definitely widened my perspective.

"*Learning comes through work*"

Celtic proverb

INTRODUCTION

Background

More than thirty years ago, the following words were written in the foreword of a pioneering study on the diffusion of the prescribing of a new drug among American physicians:

> *"Demonstrated is the extreme importance of the existing social ties as the channels through which innovations moves. This must give pause to those among us who believe that we read and think and decide in splendid isolation. The world out there is one of influence-flow, and its volume, intensity and direction tend to determine our behaviour, much as we may protest"*
>
> (JA Precker in Coleman et al. 1966)

The focus of this thesis is the development and evaluation of non-commercial educational models to influence doctors' prescribing in primary care in Sweden. Other important aspects of drug treatment, e.g., concerning the final drug users, (the patients), as well as financial aspects related to the developed models are not included. However, although the patient has not been the focus of the research, she or he was in focus in case histories in questionnaires, during the qualitative interviews and during the discussions in the educational sessions.

Prescribing of drugs is one of the most common interventions within healthcare, with about 60% of consultations with a General Practitioner (GP) resulting in the prescribing of at least one drug, as demonstrated in, e.g., Sweden (Diagnosis and Therapy survey 1997) and Britain (Bligh & Walley 1992, Britten & Ukoumunne 1997). The percentage of public healthcare expenditures for drugs was about 13% in Sweden in 1993 (Anell et al. 1998), which compared to other OECD countries was below the median. In comparison, there are examples of countries in Africa and Asia, where more than half of the healthcare budgets are spent on drugs (Quick et al. 1997a, World Development Report 1993). Looking at the drug cost per capita in the OECD countries, only Denmark and Ireland had lower costs than Sweden in 1993 (Anell et al.

1998). However, the total drug cost as well as the drug share of the healthcare expenditure has increased in Sweden in the 1990s. A decrease in total healthcare expenditures combined with an increase in drug costs has been put forward as an explanation (Anell et al. 1998). The increase in drug costs is partly a function of the introduction of new therapeutic possibilities, but it has been argued that ”unnecessary expensive” drugs, i.e. drugs without therapeutic advantages compared to less expensive drugs, are often used (Melander et al. 1999). The financing of the reimbursed part of the drugs started to be transferred from the state to the county councils beginning in 1998 to be fully effective in 2001, although the forms for this are not yet clear (Gerne 1999). The expectation of the reform is that it would induce a more conscious view on drug cost in the prescribing situation. However, a recent report examining results of decentralising drug costs in Britain, Germany and the Netherlands showed that, when the cost-minimising effects of changing to less expensive drugs had been attained prescribing needed to be viewed in a broader perspective. For example, focusing on the positioning of new drugs in relation to other drugs (discussed, e.g., by Martin 1998). To achieve this, the authors claim that a more therapeutically oriented drug information is needed, preferably disseminated through some kinds of counsellors and other information providers (Anell et al. 1999). However, the mere provision of information as such is not enough. We need to know more about the effects of various information strategies (Hoffman 1997) and to target the choice of strategy according to theories of behavioural change and previous experiences (Robertson et al. 1996).

The healthcare system, general practice and prescribing

In 1978, primary health care was launched as part of WHO’s global strategy ”Health for all by the year 2000” at a global meeting in Alma Ata. Despite the fact that it was intended as a ”Global Strategy”, most high income countries have not implemented primary health care as originally defined, including decentralisation, community planning, community implementation and focusing on areas such as health education besides prevention and treatment (Basch 1990). What is available in the high income countries is rather primary medical care, defined as ”preventive or curative personal care carried out by a primary care physician, specialising in general or family practice”

(Basch 1990). In Sweden the total number of physicians increased from about 11,000 in 1970 to about 28,000 today. During the same time, the number of physicians specialised in general practice/family medicine increased from about 800 to about 4,700 (Swedish Medical Association, Kerstin Johansson personal message 1999). Today, about 4,000 GPs are practising in Sweden of about 25,000 practising physicians in total (Swedish Medical Association, personal message 1999). Close to 40% of the GPs were female in 1994 and 1998 (Physicians in Sweden 1995, 1998). Primary care is the responsibility of the county councils as well as often organised by them. GPs are most often employees working in group practices, primary care centres, often referred to as health centres, usually with three to ten GPs in each. In 1975 there were 680 health centres in Sweden, while in 1996 there were 1170 health centres (personal message Landstingsförbundet/Socialstyrelsen lkelp 1976, basårsstatistik 1996). Most of them are public (about 80%), however, with an increased privatisation anticipated in the coming years.

Despite the fact that only about one fifth of all practising physicians are GPs in Sweden, they account for about half of the prescribing according to estimates from the Diagnosis and Therapy survey. In 1997 it was estimated that each GP prescribe drugs for about SEK 1.7 million (about USD 250,000) (Diagnosis and Therapy Survey 1997). Each GP issues on average about 2,600 prescriptions a year (Diagnosis and Therapy survey 1997). Compared to doctors in many other medical specialities, GPs, due to the broad spectrum of conditions met, prescribe drugs from a wide range of drug groups. They are allowed to prescribe all approved drugs. Also non-approved drugs may be prescribed after an individual licensing procedure-involving approval by the Medical Products Agency (MPA). For many years, the number of different approved drugs on the Swedish market was relatively stable around 3,000. Since some years, however, there is an increasing trend in the number of drugs available, now standing at about 4,200 (MPA 1999).

Prescriptions are valid for 12 months. The reimbursement system accepts a maximum of three months supply per dispensing. Each dispensing of a chronic medication thus usually comprises estimated drug supply for a three-month period. There have been changes in the drug financing and reimbursement systems in recent years. Drugs for specified chronic conditions, such as asthma, are no longer free of charge to patients, which they were until 1996. There were, however, no major

changes in reimbursement rules during the periods of the respective studies in this thesis.

Health Systems Research

Research in the field of health generally falls under three interlinking categories; biomedical sciences, behavioural sciences and health systems research (HSR) (Paik et al. 1992). In addressing research on the healthcare system, many terms are used, sometimes interchangeably, sometimes not. Some terms are health system research, health services research, health policy research, health planning research, operational research, clinical epidemiology, technology assessment and public health research (Varkevisser et al. 1991, Paik et al. 1992, Hassouna 1992, White et al. 1992, Daly et al. 1997). In this thesis the term HSR is preferred and constitutes the framework, although not articulated from the outset of the studies. HSR is concerned with problem solving; it is action oriented, participatory, involves a wish for change and is defined as multi- or interdisciplinary. Policy making, planning, management and evaluation are other central concepts (Hassouna 1992). The aim of HSR has been defined as ”to provide unbiased, scientific evidence to influence health services policy at all levels so as to improve the health of the public” (Black 1997), a task important in all countries. It has been argued that HSR is essential in order to incorporate knowledge or appropriate technology developed through biomedical research into health systems (Paik et al. 1992). Results from HSR are likely to be context specific. Although methods used can be applied to similar problems in different contexts, the solutions need to be contextualised due to various social, economic, political and cultural situations in different contexts (Diwan 1992a, Varkevisser et al. 1991). Increased application of HSR is one way of obtaining evidence of the efficacy and effectiveness of procedures used in healthcare, such as educational interventions on prescribing, and might thus be seen as a way towards ”Evidence-based healthcare” defined as doing the right things right (Gray 1997). In this field this would apply to finding out under what circumstances educational methods are the right way to influence prescribing and then to use the right, i.e. scientifically evaluated, and effective educational methods.

Influencing prescribing

The act of prescribing

When the diagnosis has been made and the decision to prescribe has been taken, the procedure of issuing a prescription is seemingly easy. However, closely examined, it involves a number of possible choices; choose (i) one of often several alternative drug substances, (ii) a specific brand name or a generic drug, (iii) strength and pack size (iv) dosage (amount and interval), and (v) treatment length. Theories have been presented, concerning how prescribing decisions are made including factors affecting those decisions (e.g. Raisch 1990a, Raisch 1990b, Denig 1994, Tomson 1990, Lilja et al. 1996, Hemminki 1975, Bradley 1991). The patient's role in decision processes regarding prescribing is increasing, due to, e.g., more readily available information on drugs and to the fact that the Swedish legislation gives the patient an increasing role in treatment decisions (SOU 1998:41, SOU 1997:154).

For the prescriber, a two-step procedure has been proposed regarding the decision-making process in prescribing. This process has been summarised by Denig and Haaijer-Ruskamp (1992). It is suggested that the prescriber, when making a prescribing decision, chooses between a few preformulated treatment options, the "evoked set". This set includes all therapies, also the non pharmaceutical ones, which a doctor might consider for a certain diagnosis, usually between two and five, but it might include only one. Many factors influence whether a certain drug is included in a specific doctor's evoked set. Such factors include, e.g., where the doctor was educated, later training and information (commercial and non-commercial), drug related factors such as the perceived risk with the drug, and how serious the disease is. Whether or not the inclusion of a drug within the evoked set is always a reasoned decision is not clear. When faced with a specific patient problem, the decision of a specific therapy from among the alternatives in the evoked set might be analytical, using active problem solving, or habitual, using reasoned or unreasoned rules. In active problem solving, the advantages and disadvantages of various therapies are weighed against each other. Different aspects are likely to be valued differently, depending on how serious the disease is. Choices of a habitual nature are probably most common for non serious common diseases, such as, e.g., urinary tract infection. These habits may have been developed through active problem solving but may also be adopted from someone else or develops in practice without an active analytical process.

Rational prescribing

Rational prescribing is part of the increasingly recognised strive for evidence-based methods within medicine (Sackett 1997). The concept of ”Rational drug therapy” (WHO 1987) is widely used although it has been claimed that it is hardly possible to make a generally valid definition (Lunde 1992). Various terms have been used, for example ”Rational drug therapy”, ”Rational drug use” (Dukes et al. 1990, Tomson et al. 1994), ”Rational prescribing” (Walley 1993) and ”Appropriate prescribing” (Cantrill et al. 1998, Buetow et al. 1997). Specific problems of rational prescribing in primary care, such as, e.g., elderly patients with multiple pathology, not usually included in hospital-based clinical trials, have been addressed (Dukes et al. 1990). Definitions of rational prescribing have often included biomedical and pharmaco-economic aspects, such as making the correct diagnosis, making the decision to prescribe a drug or not, choosing the correct drug, choosing the optimal dosage for an optimal period of time, and using drugs in an economically sound way (e.g., Sjöqvist et al. 1980, Dukes 1989, cited in Haaijer-Ruskamp et al. 1993). One definition of appropriate prescribing is ”The outcome of a process of decision-making that maximises net individual health gains within society’s available resources” (Buetow et al. 1997). In this definition prescribing as an outcome is separated from prescribing as a process.

Using the concept of biomedical or pharmacoeconomic rational prescribing, problems at the population level have been identified. In certain cases, prescribing has been described as too low, e.g., of inhaled steroids for asthmatics (Lorentzson 1993) and antidepressants for depressed patients (Rutz et al. 1992), while in other cases as too high, e.g., antibiotics (Wilhelmson 1997) or unnecessarily long treatment, e.g., bensodiazepines (Isacson et al. 1992). Other types of irrational prescribing have also been identified, e.g., using other drugs than the recommended, such as, e.g., using non-recommended drugs for uncomplicated UTI (Frieden 1990, VI). Unexplained wide geographical and inter-individual differences in prescribing patterns have been described (Bradley 1991, Larsson 1993, WHO Drug Utilization Research Group 1986). As the concept of rational prescribing is developed within a biomedical paradigm it has been argued that the characteristics of patients’ or prescribers’ rationality in individual prescribing situations may be overlooked (Denig 1994). The argument being that those factors could be part of an explanation for seemingly

irrational prescribing. One such example is that prescribing sometimes is reported as being used as a means of ending a consultation (Cartwright 1983). Aspects, such as doctors', patients' and social rationality, have also sometimes been included in the concept of rational prescribing (Denig 1994, Sachs & Tomson 1992, Clark et al. 1991).

Factors and actors influencing prescribing

Prescribing is influenced by a number of factors (Hemminki 1975, Bradley 1991, Tomson 1990). The factors could be attributed to various levels; the individual patient level, the practice level, and the population level (Denig 1994). Public (i.e. governmental) influence has access to the most forceful means, such as legislation, financial or regulatory means (Quick et al. 1997b). The commercial side lacks these most forceful means but have developed their information/education to become effective agents for change (Denig 1992). Public as well as commercial and professional interests apply various means of enforcing or inducing what is considered desirable changes in prescribing. Factors besides educational influence are mainly left out of this presentation.

In Sweden, there is a number of different actors wishing to influence GPs' prescribing. Commercial information is common and relatively evenly spread over the country (SOU 1998:41). Besides advertisements, leaflets and other printed material, a mixture of meetings are held targeting GPs, e.g., at health centres, evening meetings, and conferences. Especially evening meetings and conferences generally also include participation of medical experts. Information regarding money spent on marketing/information is not readily available. The sum has been reported to be about 15% of the total selling (year 1983), as compared to 18% spent on research and development (year 1995). No updated figures on the information cost are publicly available (SOU 1998:41).

The most important non-commercial actors are; the Medical Products Agency (MPA), The Swedish Council on Technology Assessment in Health Care (SBU), Drug and Therapeutic Committees (DTCs) and linked activities such as the "*Drugwatcher*" (II), the National Board of Health and Welfare and Apoteket AB[1]. The MPA, publish

[1] National Corporation of Swedish Pharmacies.

national recommendations (developed through expert workshops) and present drug monographs. Non-commercial drug information has traditionally mainly been provided in written form. This has changed and today also verbal non-commercial drug information is provided in many places. Apoteket is involved in, e.g., oral dissemination of the content of recommendations from the MPA, a practice developed after a study initiated by IHCAR (Wahlström 1997a). In some places DTCs are active both in providing written information and outreach activities. Early such examples was the service described in II and one in South Sweden (Ekedahl et al 1995). Systematic scientific evaluations of therapies in different medical areas are done by "The Swedish Council on Technology assessment in Health Care" (SBU). In such evaluations drug treatment has been addressed, although it is not the sole target. An outreach organisation employing physicians has been initiated by SBU, and also establishment of co-operation with information pharmacists within Apoteket AB. Increasingly, it is possible for both prescribers and patients to inform themselves about drug therapy through Internet. Various information is available from MPA, SBU as well as from Apoteket. In Stockholm a new form of drug information (Telepharmacology) a client-server application for decision support and for prescribing in general practice is currently being developed and tested (Gustafsson et al 1997). Apoteket AB has an agreement with the State to provide unbiased information (SOU 1998:41). Apoteket usually works in co-operation with the MPA and/or DTCs, and is also responsible for the publication of the "*Drug Therapy Handbook*"; published biannually since 1977. So called FQ-groups (Continuing education and quality circles for GPs) (Rudebeck 1996) could address issues on drug treatment, although they work with many aspects of general practice. When addressing drug treatment, external facilitators might be invited, as could be the case also in other activities.

Use of educational outreach visits

Public and professional interests have increasingly recognised a need to develop effective educational means. Educational outreach visits have been identified as one successful educational form for influencing prescribing (Thomson et al. 1999a). Educational outreach visits are defined as ”the use of a trained person who meets with health providers in their own practice settings to provide information with the intent of changing providers’ performance”. The information given may include feedback on providers’ performance, one important educational form for influencing prescribing (Grol & Lawrence 1995). Academic detailing is a concept commonly used for educational outreach visits, particularly regarding physicians’ prescribing. In the Cochrane review on educational outreach (Thomson et al. 1999a), only 18 studies met the inclusion criteria; (i) random or quasi-random allocation to one or more intervention groups; (ii) the target group should be health professionals; (iii) outreach visits, defined as above; and (iv) outcomes should be objectively measured provider performance. Thirteen of the 18 trials mainly concerned influence on prescribing behaviour (Avorn & Soumerai 1983, Avorn et al. 1992, Berings et al. 1994, de Burgh et al. 1995, Diwan et al. 1995, McConnell et al. 1982, Newton-Syms et al. 1992, Raisch et al. 1990c, Ross-Degnan et al. 1996, Santoso et al. 1996, Steele et al. 1989, Stergachis et al. 1987, Yeo et al. 1994) and, in one trial, prescribing was one of several variables examined (Feder et al. 1995). The outreach visits were generally combined with written educational material and, in one of the trials concerning prescribing, the outreach visits were combined with audit and feedback (McConnell et al. 1982). Some kind of positive outcome was reported in all the included trials.

Originally, academic detailing was provided to individual doctors (Avorn & Soumerai 1983), while, at present, local conditions determine if one-to-one visits or visits to groups are preferred (Silagy & May 1998). There is no clear evidence that any of the approaches would be better, nor is there any evidence that a particular group of health professionals has advantages over the other groups. Nurses as well as pharmacists or physicians have been used with varying results. The capabilities of the individual academic detailer is probably more important than the professional background (nurse, pharmacists or physician) of the person (Silagy & May 1998).

However, besides being influenced by factors which could be considered as rational, such as legal, financial, regulatory, administrative or educational means,

prescribing is also influenced by more tacit factors such as emotional influence of various kinds (Soumerai & Avorn 1990). In commercial information/education, the educational messages are often combined with these kinds of influences (e.g., Avorn et al. 1982, Lexchin 1989). The non-commercial education on drug use has, on the other hand, been aimed almost exclusively at the rational side of prescribing (Denig 1994), although, e.g., the educational climate is being increasingly recognised.

Providers of outreach visits in Sweden

In commercial verbal drug information, the outreach persons are not seldom, e.g., economists, with a short training in medical science. However, also, e.g., pharmacists and nurses work as drug representatives. They all get ”selling training”, which might be seen as a comparative advantage. Selling training, often referred to as marketing strategies have been integrated in the training also of academic detailers in other countries such as US, UK and Australia (Soumerai & Avorn 1990, Elliot 1993), but so far to a limited extent in Sweden. However, academic detailing has been described as being rather ”social advocacy” than marketing or selling (Elliot 1993). There are about 500 drug representatives in Sweden (SOU 1998:41), serving mainly the 25,000 practising physicians, giving a very rough, estimated drug representative time of almost 40 hours per year, almost one hour per week. There are no comprehensive data available on the non-commercial verbal information time spent on prescribers, but it is likely to be much lower. As an example it could be mentioned that pharmacists from Apoteket AB visited about half of the health centres 3-4 times a year and that an additional 25% of the health centres were visited 1-2 times a year (SOU 1998:41). The commercial providers of information have a relatively ”easy” message, which could very simplified be described as ”Use our product, on the right occasions with the following preconditions”. The drug representatives are usually well educated regarding their product(s), but often have a more limited knowledge of other areas. The non-commercial providers, on the other hand, are less specialised in only a few drugs. They usually work with more complicated messages; comparative, problem-oriented and patient-oriented as well as with issues without interest to commercial actors (SOU 1998:41). Providers of non-commercial drug information are sometimes vocationally trained doctors, specialists in specific areas such as, e.g., infectious diseases or clinical pharmacologists. They are highly qualified in their area, but are often less familiar with

the GPs' broad working situation (Dukes et al. 1990). Community or hospital pharmacists are other categories involved in non commercial drug information. They have a wide experience of meeting GP patients at the pharmacy and meeting patients' unmet needs and worries, in addition to their broad technical drug knowledge, but are usually less familiar with diagnostic procedures and routines. GPs alone, or in combination with pharmacists, as in the studies here (II, IV-VI) is another possibility. The value of an increased co-operation and information exchange between GPs and pharmacists has been stressed in the literature (Lipton 1994, Panton & Fitzpatrick 1996, Bond & Bradley 1996, Wahlström 1997a, de Vries 1998). In the Netherlands this co-operation has been formalised, and 90-95% of Dutch GPs and pharmacists regularly participate in joint pharmacotherapy counselling sessions (cited in de Vries 1998). Also the value of an increased co-operation between the primary care and clinical pharmacologists have been emphasised (Dukes et al. 1990).

Adult learning in continuing medical education

For the providers of non-commercial drug information/continuing medical education, it is necessary to take theories and experiences of adult learning and communication into account. Schön (1987) has formulated a theory on adult learning. He described the essential sequence in learning as being closely related to the professional practice, where the professional knowledge is now and then challenged by an unexpected event. This event leads to a professional reflection as well as a search for a new solution to deal with the unexpected event. The solution might or might not solve the problem, on both occasions again leading to a professional reflection, where the learning from the event is integrated into the person's professional practice. This was by Schön named as; knowing-in-action, surprise, reflection-in-action, experimentation and reflection on action (Schön 1987). The necessity to use this way of thinking also in the medical field has been emphasised (Coles & Holm 1993, Fox 1991, Brigley et al. 1997). In medicine as in other professions, lifelong self-directed learning is an important component, referred to as probably the most important way of professional development (Jennet 1993). Nowlen (1983; cited in Jennet 1993), e.g., stated that "Formal educational experiences must be positioned within a larger self-directed framework". Cervero (1990) divided knowledge into two parts, so-called declarative (abstract, formal and general) and procedural (specific, based in practice and practical) and concluded that

formal knowledge must be integrated into practical knowledge. Schön (1983) has a similar division between two dimensions, (i) structured knowledge and reflections on knowledge and acts, and (ii) ideas, exchanges, events brought to a situation for reflection, the professional ”inner voice” or ”art”. Both these parts of knowledge are important, reinforcing each other, and need to be addressed in learning situations to achieve meaningful learning. Similar thoughts were presented already at the beginning of this century by Osler (cited in Jennet 1993). However, it is still common to disregard the importance of professional reflection in learning and hence to overutilise lectures or other teacher-centred activities in CME, e.g., on drugs, without fully using the resources of the highly educated and experienced prescribers.

A central concept in drug information/education is ”communication” (Lilja et al. 1996). Several models have been presented from the traditional linear process model, where the source (encoder) sends a message through a channel to the receiver (decoder), and this is supposed to result in effects on knowledge, attitudes or behaviour. This model has been criticised mainly due to its linearity, its emphasis on the role of the source, and for more or less ignoring the context of the communication. Valbuena (1992) summarised several communication models. One model is Berlo’s SMCRE model (source, message, channel, receiver, effects). This model is linear but sees communication as a process, where each step is characterised by a number of attributes, such as communication skills, attitudes, knowledge’s, social system and culture, for the source and receiver. Another model is the interactive model by Osgood. In this model both parties in a communication process are equal participants; both encode, interpret and decode messages. The process is highly interactive. A third model, the ”Feedforward-feedback model”, combines the linear source - receiver part with “feedforward”, i.e., what the receiver tells the source before the source provides the information, and with feedback from the receiver to the source. This has been described as a participatory, consultative communication process. A general definition of communication in this summary was ”the process of sharing information or messages for the purpose of common understanding. The information - (which may be) coded in signs and symbols - may be shared by means of personal interaction or through the mass media” (Valbuena 1992).

The mere provision of information has often been expected to induce a change in behaviour, although educational psychology (Ausubel et al. 1978, Norman & Schmidt

1992, Ramsden 1992) has pointed out the importance for the learner to; (i) adapt new knowledge to the existing one; (ii) control the learning process; and (iii) be able to apply the new knowledge. Other factors, such as a social supportive climate and involvement of emotions, facilitate learning as do the perception of a gap between current and needed knowledge or skills (Fox 1991). Other factors known to be important for behaviour are doctors' underlying values and norms (e.g., Tuckett 1976, cited in Pendleton et al. 1985). Also doctors' "own thinking" or ways of experiencing phenomena in relation to case management are liable to influence prescribing (Wahlström et al. 1997b).

Guidelines

Guidelines have been defined as "systematically developed statements to assist practitioners and patient decisions about appropriate healthcare for specific clinical circumstances" (Field & Lohr 1990, cited in Hutchinson 1998). Guidelines for various conditions and procedures, including prescribing, are increasingly being published (Fresle et al. 1996, Hibble et al. 1998, Hutchinson 1998). According to Hutchinson (1998), there seem to be three reasons for the growing interest in guidelines, a belief (i) that guidelines will enable clinicians to use resources more efficiently, (ii) that guidelines will contribute to a reduction in inappropriate variation of clinical practice between practitioners, and (iii) that they would act as a means of obtaining synthesised research evidence for clinicians, for the benefit of the patients. Guidelines might be developed nationally or locally, they may be evidence-based or consensus based and, if so, expert or peer-based (Grol 1993, Eve et al. 1996, Grol & Lawrence 1995) and may be developed especially for general practice (Grol 1992). Reviews have been published on methods for changing clinical practice and for guideline implementation, specifically implementation in general practice (e.g., Grimshaw & Russel 1993, Davis & Taylor-Vaisey 1997, Oxman et al. 1995, Conroy & Shannon 1995, Wensing et al. 1998). Evidence shows that more effective strategies, than in printed form only, are usually needed (Granados et al. 1997, Lomas et al. 1989, Davies et al. 1992, Wahlström 1997a, Freemantle et al. 1999). It has been suggested that the effectiveness of an intervention strategy is probably dependent on the clinical area (Wensing et al. 1998). Examples show that change, e.g., in prescribing (Goldberg et al. 1998) or knowledge (Denig et al. 1990), was more difficult to achieve in chronic than in episodic

conditions. Further research into methods for dissemination and implementation of guidelines has been called for (James et al. 1997, Grol 1997).

The adoption process of guidelines among GPs includes several steps, which all have been suggested to be associated with success in implementation (Grol 1992, Grol & Lawrence 1995): (i) awareness of guideline existence, (ii) insight into need for change, e.g., performance gaps, (iii) acceptance of the guideline content, and (iv) actual change in practice.

Explanations put forward for why GPs do not agree with or apply guidelines are (Grol 1992, Olesen & Lauritzen 1997, Grol et al. 1998): the guideline (i) is developed without enough involvement of GPs, (ii) is produced geographically too far away, and (iii) messages are not clear enough. However, GPs also report preference for guidelines that could be modified (Wolff et al. 1998). Another line of critique regards the dissemination and implementation process (Davis & Taylor-Vaisey 1997); the guideline: (i) is often too lengthy (Wolff et al. 1998, Hibble et al. 1998), succinctness is perceived as very important, (ii) needs active implementation strategies, i.e., mailing is not sufficient, (Hunskaar et al. 1996), and (iii) the production and dissemination strategy must be followed by a close examination of the process of the task in question in the health service where the guideline is to be implemented (Solberg et al. 1997).

The third line of critique lies in the GPs' views on barriers to using guidelines (Langley et al. 1998), where GPs' input, ownership and brevity were viewed positively. Furthermore, a guideline does not act in a vacuum; a number of other guidelines and other information or educational activities compete for the GP's interest. Individual doctors are sometimes negative to extensive "pushing" for use of guidelines as they consider that the individualisation and "art of medicine" would then diminish in importance (Hutchinson 1998). Outreach visits, tailored to practices, have been proposed as one means of a more active strategy for guideline implementation (Hulscher et al. 1998).

Audit and feedback

Audit and feedback have been put forward as a possibly advantageous way of changing prescribing habits (Denig 1994). Two Cochrane reviews have been performed in the area. One on the effectiveness of audit and feedback in improving health professionals' practice and health care outcomes (Thomson et al. 1999b) and the other on comparing

audit and feedback with other interventions and whether or not the effectiveness can be improved by how audit and feedback are done (Thomson et al. 1999c). In the first review 37 studies were included. Thirty-three of the studies were done in North America. Six of the trials concerned prescribing (Andersson et al. 1996, Gehlbach et al. 1984, Hershey et al. 1986, Meyer et al. 1991, Schectman et al. 1995, Steele 1989). A conclusion drawn both in this review and in other reviews is that audit and feedback may be effective in improving prescribing practices, but that they should preferably be combined with other educational means in multi-faceted intervention strategies, including social influence strategies (Thomson et al. 1999b, Oxman et al. 1995, Mugford et al. 1991, Mittman et al. 1992, Haaijer-Ruskamp & Denig 1995). In a recently published study, e.g., no effect was seen when using prescribing feedback alone (O'Connell et al. 1999). Further, it was advantageous if the participants had agreed to review their practice (Mugford et al. 1991). For the second Cochran review, only seven studies were retrieved (Thomson et al. 1999c). In the conclusion they ask for studies modifying characteristics of the feedback.

Rationale for the studies

In the work for the thesis the emphasis has been on educational outreach visits concerning drug treatment with focus on prescribing. This has been a process, where aspects related to educational outreach have been investigated. The emphasis is on a randomised controlled study evaluating a new model for educational outreach. At present, especially in high income countries, there is a move towards using evidence-based methods in healthcare (Sackett et al. 1997). However, this is far from fully implemented, both regarding methods for patient treatment, and for procedures and methods used in healthcare (Gray 1997). For example, Grol (1997) stated that "Different players in healthcare use different approaches to changing clinical practice; most of these approaches are more based on beliefs than on scientific evidence" and that "Evidence-based medicine should be complemented by evidence-based implementation". One example is that educational methods on drug treatment are seldom evaluated using the same rigorous methods as applied to the drugs themselves.

There are few examples of new means of information/education being evaluated in RCTs or even at all before they come into practice. One randomised controlled study was performed concerning drug information/education for GPs in Sweden (Wahlström 1997a) before the study reported in Papers IV-VI in this thesis. Two previous theses from IHCAR have addressed education on drug treatment also in lower middle income countries (Tomson 1990, Diwan 1992a), including a RCT on drug information (Angunawela et al. 1991). There are also some other examples of RCT (Santoso et al 1996, Prawitasari Hadiyono et al. 1996, Bexell et al. 1996) or quasi-experimental studies (Pérez-Cuevas et al. 1996) on drug use from lower and upper middle income and low income countries.

Educational methods are important to evaluate, but for other reasons than, e.g., drugs. The importance of evaluating drugs for safety and efficacy is evident. The reasons for evaluating educational interventions are closely related to resource reasons (financial as well as human). There are similar problems in the evaluation of educational interventions as in the evaluation of drugs. In drug trials the placebo effect, including the expectancy effect, is present (which can be controlled for by the randomised controlled trials technique and a double-blind design). In educational interventions, the attention and expectancy effects (Diwan 1992a) are of importance. The attention effect, i.e., change because of mere attention, is often referred to as the ”Hawthorne” effect (Mayo 1945, Diwan 1992a). Similarly to the drug trials, where it is considered important to separate the actual drug effect from the placebo effect, a similar reasoning could be introduced in studying educational interventions. If the educational effect as such is of interest to study, the attention effect needs to be controlled for (the expectancy effect will never be fully controlled for in educational studies). This has to my knowledge not been extensively addressed, and it has been common to evaluate educational intervention against a control group or against a group receiving written information (e.g., Thomson et al. 1999a). One way of minimising the expectancy effect has been to seek consent for evaluating practice after completion of the study (Wahlström 1997a). The best way of controlling the attention effect is probably to provide also the control group with education, but for another area. This is, however, rarely done (Feder 1995). The importance of also incorporating ideas about adult learning and the doctor as an active learner in educational interventions in medicine has been stressed (Grol 1997, Holm 1998).

Deciding disease areas to work with

In deciding disease areas for the studies in this thesis, the following aspects were considered:

- The condition should be commonly treated in primary care.
- The condition should be of significance for the person suffering from it.
- The treatment of the condition should commonly involve the use of drugs.
- Conditions where treatment guidelines with clear recommendations exist were preferred.
- Some kind of identified problem in prescribing should be present.

Treatment of UTI respectively asthma was found suitable. Both UTI and asthma were among the ten most common diagnoses in primary care 1990 - 1996 (Diagnosis and Therapy Surveys). Drugs are prescribed in about 90% of consultations concerning both UTI and asthma (Diagnosis and Therapy Surveys). In asthma treatment, drugs are important not only as a symptomatic relief, but also to avoid long-term lung complications (Strandberg et al. 1993). Regarding uncomplicated UTI, although a self-limiting condition, it gives inconvenience to the person. National treatment guidelines, for UTI and asthma intended for specialist and primary care, were available before the studies presented in Papers III-VI. The recommendations had been published in the most widespread Swedish Medical Journal (Lakartidningen) (Recommendations from Expert Meetings 1990, 1992) and had twice been sent individually from the MPA to all practising GPs (Strandberg et al. 1990, Strandberg et al. 1993, MPA 1990, MPA 1992). No other national implementation strategy had been applied.

AIMS AND OBJECTIVES

The general aim was to develop educational models to improve drug treatment, focusing on doctors' prescribing in primary care in Sweden and further, to assess and evaluate these educational models.

The specific objectives were:

- To describe the use and assessment of drug information sources.
- To explore variations in ways of experiencing management of asthma.
- To develop models of outreach and group based peer education on drug treatment.
- To develop instruments for evaluating one educational model, based on group discussions on individual feedback related to guidelines, regarding knowledge and attitudes, and prescribing for UTI and asthma.
- To evaluate the effects of the above-mentioned model (group discussions on individual feedback related to guidelines) on *knowledge and attitudes* in relation to UTI and asthma.
- To evaluate the effects of the above-mentioned model (group discussions on individual feedback related to guidelines) on *practice measured as prescribing* of drugs in relation to UTI and asthma.

PARTICIPANTS, METHODS, RESULTS AND COMMENTS

Information on design, methods, data sources and participants in each paper is presented in Table 1. Figure 1 shows the geographical location. Papers I and II originate from the ongoing academic-detailing service "*Drugwatcher*" (ÖGAT på LÄKEMEDEL) and Papers III-VI from the Swedish study within the European Drug Education Project[2]. The Ethics Committees at Karolinska Institutet (94:3) and Uppsala University Hospital (388/93) approved the study.

Table 1. Design methods, data sources and participants in the included papers.

Paper	Design, methods	Data sources	Study groups
I	Cross-sectional, descriptive.	Mailed questionnaire.	291 primary care doctors[3] in three administrative areas of Stockholm County Council.[4]
II	Cross-sectional.	Mailed questionnaire, telephone interview. Data on dispensed prescriptions.	163 primary care doctors[3] in 30 primary care centres in two administrative areas in Stockholm County Council.[4]
III	Explorative, qualitative, using the phenomenographic approach.	Face to face interviews.	20 GPs[3] from 16 primary care centres in seven counties in central Sweden.[5]
IV	Randomised controlled study evaluating an educational method. Presentation of education and methods.	Questionnaire.	204 GPs[3] in 36 GP groups from seven counties in central Sweden.[5]
V	Randomised controlled study.	Questionnaire.	204 GPs[3] in 36 groups (the same as in Paper IV).
VI	Randomised controlled study.	Data on dispensed prescriptions.	204 GPs[3] in 36 groups (the same as in Paper IV).

[2] The Drug Education Project group includes: FM Haaijer-Ruskamp (international coordinator), P Denig, CCM Veninga (The Netherlands); V Diwan, G Tomson, R Wahlström, T Oke, C Stålsby Lundborg (Sweden); M Andrew, the late I Matheson, M Loeb, Per Lagerløv (Norway), MM Kochen, E Hummers-Pradier (Germany); M Muskova, Z Kopernicka (Slovak Republic).
[3] In Papers I and II, all doctors working in primary care centres were included, while, in Papers III - VI, exclusively vocationally trained doctors were included.
[4] The study population in Paper I includes the study population in Paper II.
[5] The results in Paper IV - VI refer to the same study population. The participants in Paper III come from the same counties as the participants in Papers IV - VI, but from other primary care centres.

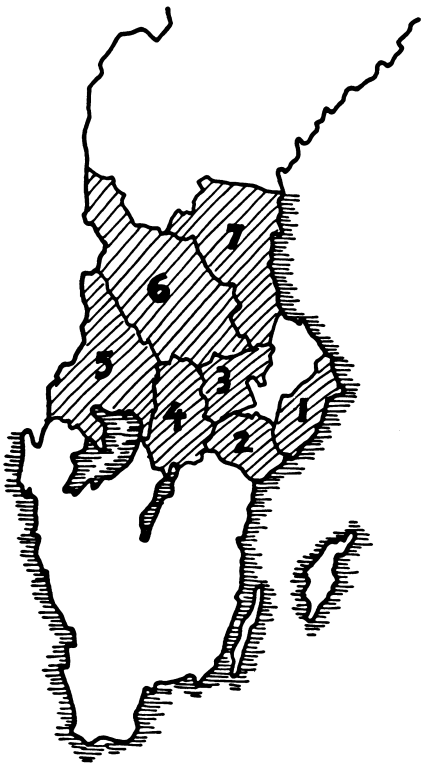


Fig 1. Included county councils were:

County councils	**Papers**
1. Stockholm	I-VI
2. Sörmland	III-VI
3. Västmanland	III-VI
4. Örebro	III-VI
5. Värmland	III-VI
6. Dalarna[a]	III-VI
7. Gävleborg	III-VI

[a] At the time of the study referred to as Kopparberg County Council.

The methods, including participants, results and comments for each paper, are presented below. More detailed information can be found in the individual papers. The presentation is done paper by paper for Papers I-III. For Papers IV-VI, participants and common methods are presented together, while specific methods, results and comments are presented paper by paper.

Paper I – *GPs' use and assessment of drug information sources*

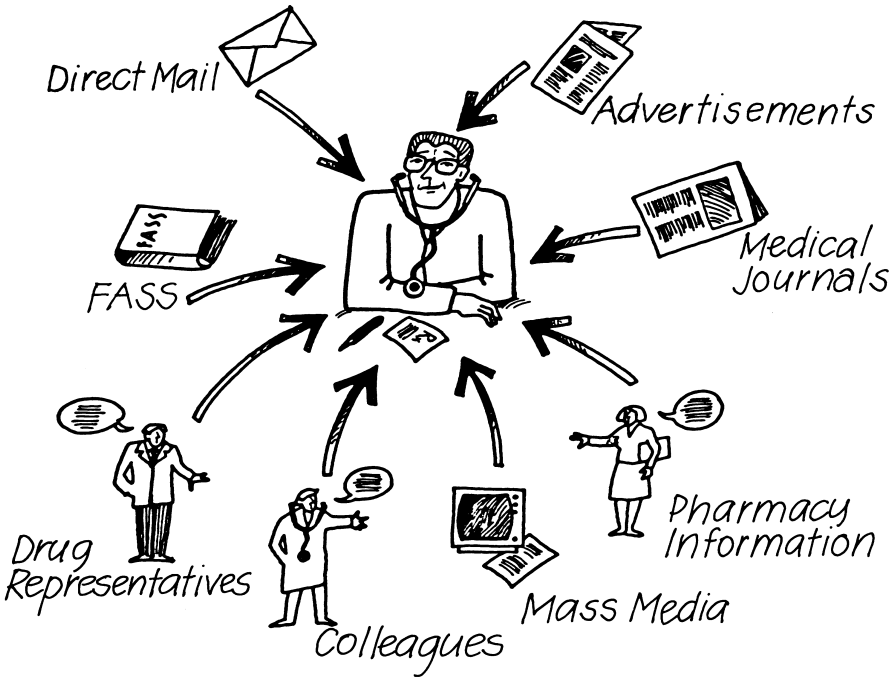
Methods and participants

As part of the process of developing an interdisciplinary independent drug information service (described in Paper II), a study was undertaken in 1988 to elucidate exposure, use and assessment of the value of drug information sources among doctors working in primary care in three administrative areas of Stockholm County Council. A

questionnaire, including questions with fixed response alternatives, was developed and used. Descriptions of hypothetical drugs were included to study attitudes towards adoption of new drugs.

Results

The response rate was 69%. Commercial sources, especially drug advertisements, were reported to be the most frequent sources of drug information. Direct mail advertisements and advertisements in medical journals were read weekly by two-thirds of the participants.



Few drug information sources were reported to be actively used by the participants, with FASS[6] (Swedish PDR) being the outstanding source used daily by more than two-thirds and by almost everyone at least weekly. The next most common actively used source was drug advertisements read daily by more than ¼ of the responders.

Verbal information from non-commercial sources was considered ”too little” by almost two-thirds of the doctors, while more than two-thirds considered written commercial information to be ”too much”.

The non-commercial sources received higher ratings than commercial sources except for FASS. Direct-mail advertisements, advertisements in journals, and written information from the MPA were most commonly mentioned as the first source of information regarding new drugs. The attitudes towards adoption of hypothetical drugs showed varying patterns depending on drug category. For example, a majority of the GPs reported that they would prescribe a new low-sedating antihistamine rather quickly, while a majority reported that they would wait for guidelines or a collegial discussion before prescribing a new antibiotic for lower UTI.

[6] Published by the drug manufacturers’ organisation in Sweden, but containing no advertisements. Even though FASS does not contain any direct commercial information such as advertisements, it still functions as a commercial product, as the drugs are ordered alphabetically according to their trade names, thus reinforcing the content of more overt commercial activities.

Comments

This study was undertaken to elucidate drug information habits in order to develop the drug information service described in Paper II. Notable is that one fourth of the doctors reported that they actively read drug advertisements in medical journals daily. Drug advertisements were thus the next most common way of seeking information, next to FASS. This finding strengthens the conclusion from a previous study (Herxheimer et al. 1993) that doctors need to take advertisements seriously, i.e., read them critically, to find information on, e.g., new drugs without being unduly influenced by the often pre-tested messages in the advertisements (SOU1998:41). The fact that only two-thirds reported that they read advertisements weekly may be due to a technical problem in the questionnaire, giving a high non-response rate for that specific item (29%). Surprising was perhaps that, although discussion with other GPs was the most common source of verbal information, only one out of seven reported that they did so weekly. Results similar to ours regarding use and assessment have recently been reported in a statistical random sample of prescribers. In combining results from different prescriber categories, 98% of the prescribers reported a high or very high level of confidence in FASS, 72% in information from the MPA, 90% in the "*Drug Therapy Handbook*", and 65% in DTCs (Hedstrand & Iwarsson 1999). The corresponding figures for the GPs included in this sample were 97%, 78%, 91%, and 71% (personal message Sifo Research & Consulting, Toivo Sjörén 1999). Also regarding active use of different information sources, the figures coincide with ours.

The different patterns of reported adoption of hypothetical drugs are likely to have implications also for the adoption of real drugs. Coleman and co-workers (Coleman et al. 1966) first studied the adoption of a real new drug. They found "innovators" and "late adopters" among doctors. Similar results have been seen for different types of drugs, e.g., in the UK (Strickland-Hodge & Jepson 1982) and Australia (Peay & Peay 1984). In this material, the GPs experienced the adoption of drugs differently depending on the drug category. This needs to be further elucidated in order to understand more thoroughly the pattern of adoption of drugs from different drug categories. The assumption that differences in adoption patterns exist depending on drug category needs to be recognised in planning and implementation of drug information/education programmes.

Paper II – *Developing and maintaining an ´Academic drug-detailing´ service*

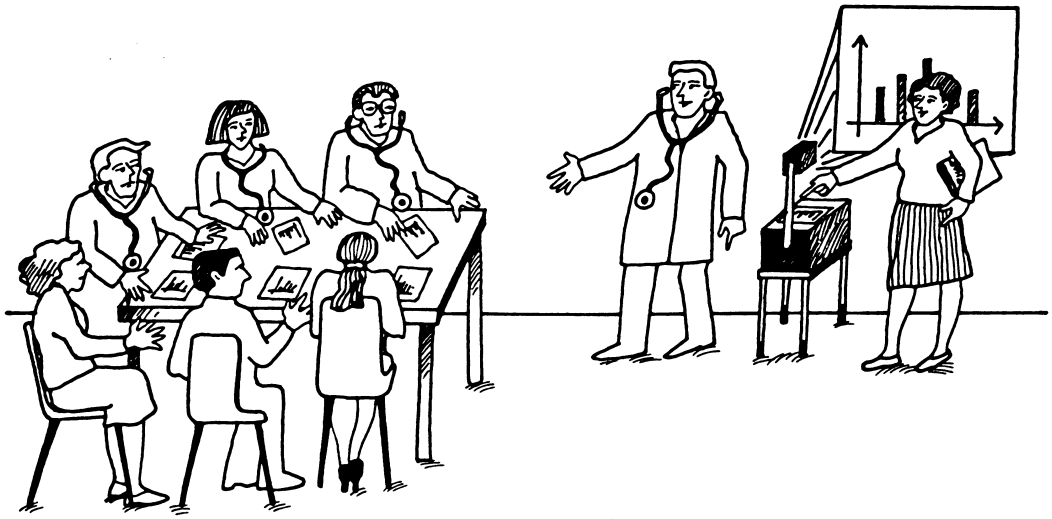
Process, participants and methods

The project, "*Drugwatcher*" (ÖGAT på LÄKEMEDEL), was initiated in 1986. Written information was combined with short, oral information targeting GPs. On two occasions, oral information was provided to half of the health centres (area I), to allow comparisons between these doctors and doctors receiving written information only (area II).

A survey was conducted to explore the GPs' use of, and attitudes towards, the services and the specific case "How to handle UTI". UTI was chosen as an example of a common condition where intensive commercial information had been provided, and where "*Drugwatcher*" had provided both written and oral information. A questionnaire was sent to 163 doctors (including locum doctors and doctors during training) employed at health centres, in the areas of the "*Drugwatcher*". An additional telephone interview followed, focusing on two drugs, norfloxacin and buprenorphine, discussed in the oral and written information. Questions related to our service were included. During 1987-1988, dispensed prescriptions for norfloxacin and buprenorphine were followed for 12 months each.

Results

When the article (Paper II) was written, 75 issues of the bulletin had been published (in April 1999, 90 issues) and oral information had been provided 19 times (in January 1999, 24 times) in each health centre (except for the first two times). The topics of the written and oral information have been co-ordinated to be mutually supportive and reinforcing. Oral information is usually provided twice a year in each health centre. It is given in the form of a dialogue between the "*Drugwatcher*" team (a GP and a pharmacist), on the one hand, and the GPs in the health centres on the other.



Almost all remembered that they had received our bulletin at least once, and more than eight out of ten remembered the name of the bulletin, ("*Drugwatcher*") at least almost correctly. When asked if they could spontaneously mention any drug that had been evaluated in the bulletin, the two drugs dealt with in the verbal information were significantly more often mentioned in the area where verbal information had been provided. One question concerned the importance of different aspects of a drug used for UTI. In treating both young and older women, the lack of side effects (serious and non-serious) was considered most important. A majority of the GPs had prescribed norfloxacin at least once. The proportion of GPs who had prescribed norfloxacin was significantly smaller in area I than in area II. A few GPs (about ten per cent) had issued a majority of the prescriptions in each area. Of these, some doctors were responsible for a very high number.

The total cost of the drug information programme was approximately SEK 685,000 (USD 0.1 million) in 1995, giving an estimated cost per participating GP per year of about SEK 4,500, which is about 0.3% of the average value of the prescribing per GP.

Comments

The developed model has been proven sustainable for more than ten years. Related educational forms have been established or are underway elsewhere in Sweden

(Läkemedelsprojektet 1999). The project had a high scientific standard in clinical pharmacology from the outset, but a rather naive view towards possibilities of evaluation. Unfortunately, the project was initiated without an evaluation component built into it. There were no formal links to researchers familiar with HSR, which could have strengthened the evaluation component. Because of this, we have limited knowledge of actual effects of the "*Drugwatcher*" activities on drug prescribing and drug treatment. This led to a project where the emphasis was put on the evaluation component, Papers IV - VI. Aspects related to adult learning have been increasingly recognised during the course of the project, but was from the beginning not emphasised as in the project presented in Papers IV-VI.

Despite the fact that this was not a randomised controlled trial (RCT), some differences between providing only written as compared to written + verbal information are still of interest. An example is the significantly lower prescribing of norfloxacin (in accordance with information provided) in the area where verbal information had been provided as compared to the area where written information only had been provided; another is the difference in the doctors' higher recollection of the drug bulletins and indications. However, as this was not an RCT, we can not unobtrusively attribute the differences to effects of our education.

Paper III – ***Ways of experiencing asthma management - variations among GPs***

Participants and methods

The research approach in this study was phenomenographic, i.e., identifying and describing qualitatively different ways of understanding or experiencing phenomena in the world (Marton 1986). A strategic sample of GPs (variation in sex, age and geographical location) was recruited. Twenty GPs participated in the semi-structured interviews, focusing on the GPs' experience of asthma management. The analysis was performed, maintaining the context by using whole transcripts throughout the analysis, rather than reducing them to parts (Bowden 1996). No predetermined categories were used.

Results

Four different ways of experiencing asthma management were identified among the GPs interviewed. At least two GPs were assigned to each category.

The category labels were:

A. Conveying information and instructions (for the patient to follow)

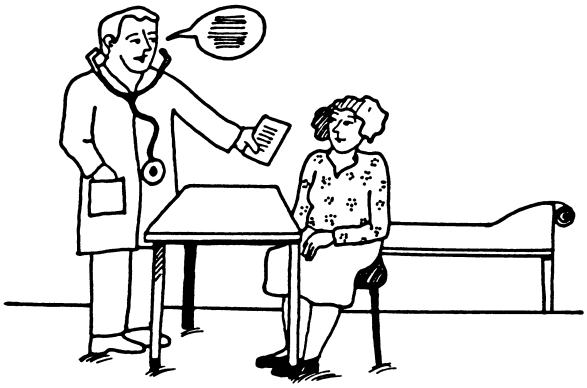
B. Informing, explaining so the patient gains applicable knowledge

C. Facilitating the patient's understanding

D. Listening, giving advice for improved/maintained quality of life

The full presentation of the categories is included (cited from Paper III) in Table 2 For categories A and D, the description is complemented with translated excerpts (below) to illustrate the view[7].

Quotation from Category A



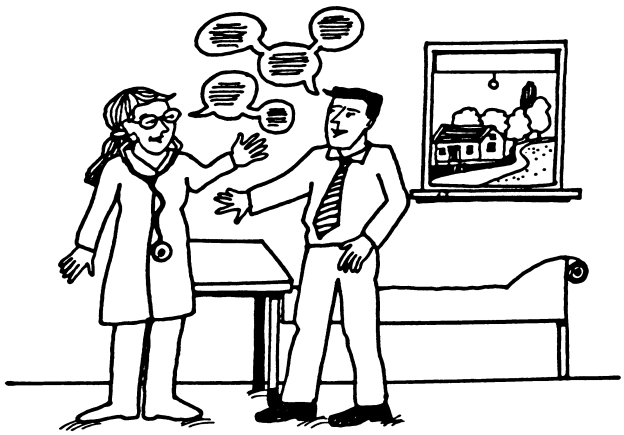
"*It is very important to inform the patients very strictly how to act when it gets worse, give them instructions in advance how to use their medicines so that they have a small programme of things to do at home*. [later in the interview] *They are still left in this old-fashioned way* [of treating asthma] *and that's because we haven't given them enough information.*" (Dr 11, male).

[7] Information added by the authors is included within parenthesis. Excerpts from interviews in the other categories are found in Paper III.

Table 2. Category labels and full descriptions of GPs' ways of experiencing asthma management.

Category labels	Full description
A. Conveying information and instructions (for the patient to follow)	The doctor has the main responsibility for asthma management, conveying information and instructions to the patient. The patient's role is primarily to follow the GP's instructions. The main feature is that the GP takes control and possesses power in terms of having knowledge. The knowledge is in this case looked upon as information (precise, discrete and factual) which is more or less possible to convey as it is. In this view the patient's lived experience of asthma is virtually invisible; it is not described as being important to the doctor
B. Informing, explaining so the patient gains applicable knowledge	The doctor informs and explains management options to the patient, to give the patient an opportunity to learn more about asthma. The patient assumes part of the responsibility for asthma management by applying the knowledge gained. Knowledge is not looked upon as something that can simply be transferred to the patient, but something that the patient applies. When asthma management is experienced in this way, the main focus is still on the doctor who informs and explains. Unlike in A, factual knowledge about asthma management is not seen as the primary solution for asthmatic patients; rather, there is an emphasis on the patient learning to apply the knowledge
C. Facilitating the patient's understanding	The doctor and patient talk interactively to facilitate the patient's understanding about asthma and its management. Co-operation between doctor and patient is stressed. The responsibility for management then rests mainly with the patient. The main feature is the emphasis placed on the patient's own understanding in order to manage asthma. This process may take a long time. In contrast to A, knowledge has to be understood and integrated with the patient's previous knowledge and experience. Unlike in B, understanding is a prerequisite for self-management. In C it is acceptable for the patient to check the benefit of the medication by testing what happens if it is discontinued. The patient also has to understand that medication is not the sole solution
D. Listening, giving advice for improved/ maintained, quality of life	The doctor listens carefully to the patient to appreciate what the disease means in daily life. S/he gives advice on how the patient could manage the asthma in order to improve or maintain a good quality of life. The main feature is the emphasis on the patient as a person with asthma who should have a good quality of life regardless of the disease. In contrast, in categories A-C, the patient was looked upon as an asthmatic patient. Similar to B, emphasis is placed on how the patients act in relation to their illness. Contrary to C, understanding as an end in itself is not stressed. The outcome in terms of quality of life is emphasised

Quotation from Category D



"*The most important thing is that he has a good quality of life. To live a life as normal as possible, although it's difficult to measure. But you can tell from the patient's story if his asthma is stopping him or not. Another goal is for him to have enough knowledge about asthma to be able to modulate the drug doses in a good way. In return visits you should listen more than talk. You try with medicines and other kinds of counselling to get as good a quality of life as possible and to have the patients take as great a responsibility as possible for their disease*." (Dr 15, female)

Comments

In phenomenography an experiential perspective is taken. The researchers identify and describe the variations, from which a phenomenon is understood among the study population (Marton 1986). Phenomenographic research aims specifically to discover categories from the data (Francis 1996). Differences in experiencing a phenomenon have been attributed to people making different experiences in the world, as they have different relations to the world and make different analyses of the world. This is related to the "lifeworld" first described by Husserl and Merlau-Ponty (Bengtsson 1988). The "lifeworld" is the world as it is encountered in everyday life and narrated as a direct and immediate experience, independent of and prior to explanations (Kvale 1996). Through qualitative interviews it is possible to get access to other individuals' descriptions of the "lifeworld". The phenomenographic approach was chosen so as to find out about variations in the GPs' experiences, which was achieved in the study. In the first three categories (A-C) a dualistic view is expressed, where the doctor views the disease as separated from the person, while in D an integrated view, taking account of the patients' lifeworld, was seen. Assuming that the views are related to actual

practice, it could be anticipated that the views A-C are somehow built into D. When expressing D, it is likely to be possible to also include elements from A-C. Although, e.g., understanding is not an endpoint as such in D, it can not be assumed that a positive view towards understanding does not exist.

The number of informants or participants does not have the same meaning in qualitative studies as in quantitative studies, as the generalisability of the results are conceptual, rather than numerical (Fitzpatrick & Boulton 1994). By using a so-called ”strategic sample”, with variation in factors which the researcher thinks may influence the way of experiencing a phenomenon, the possibility of finding various views is probably increased. Crucial is that enough participants are included to capture the variation. In phenomenographic research, about twenty informants are typically regarded as optimal, as experience has shown that the saturation point regarding the number of existing ways of experiencing the phenomenon is then usually reached (Sandberg 1994).

As shown in this study, the participating GPs experienced management of asthma in qualitatively different ways. This was shown also in other countries participating in the Drug Education Project (Veninga et al. 1998, Lagerlöv et al. 1998).

Papers IV-VI - ***Development, implementation and evaluation of a new educational model***

In the studies I-III, experiences and knowledge were gained, of use for the study presented in Papers IV-VI. An example of such an experience is how to work with groups of doctors (II). This is a kind of knowledge which is experiential and context-dependent, ”learning by doing” (Schön 1983) and as such difficult to articulate. However, this knowledge included areas such as how to approach GP groups in order to find time for educational meetings, experience of conducting meetings in GP groups, a basic understanding of GPs’ working situation and what kind of questions and issues GPs are likely to find important and present for discussion. Although this is not explored scientifically in this work, it could be assumed to be of importance. Further, knowledge has been gained on GPs’ reported preference of information sources (I), on doctors attitudes towards UTI management (II), and their ways of

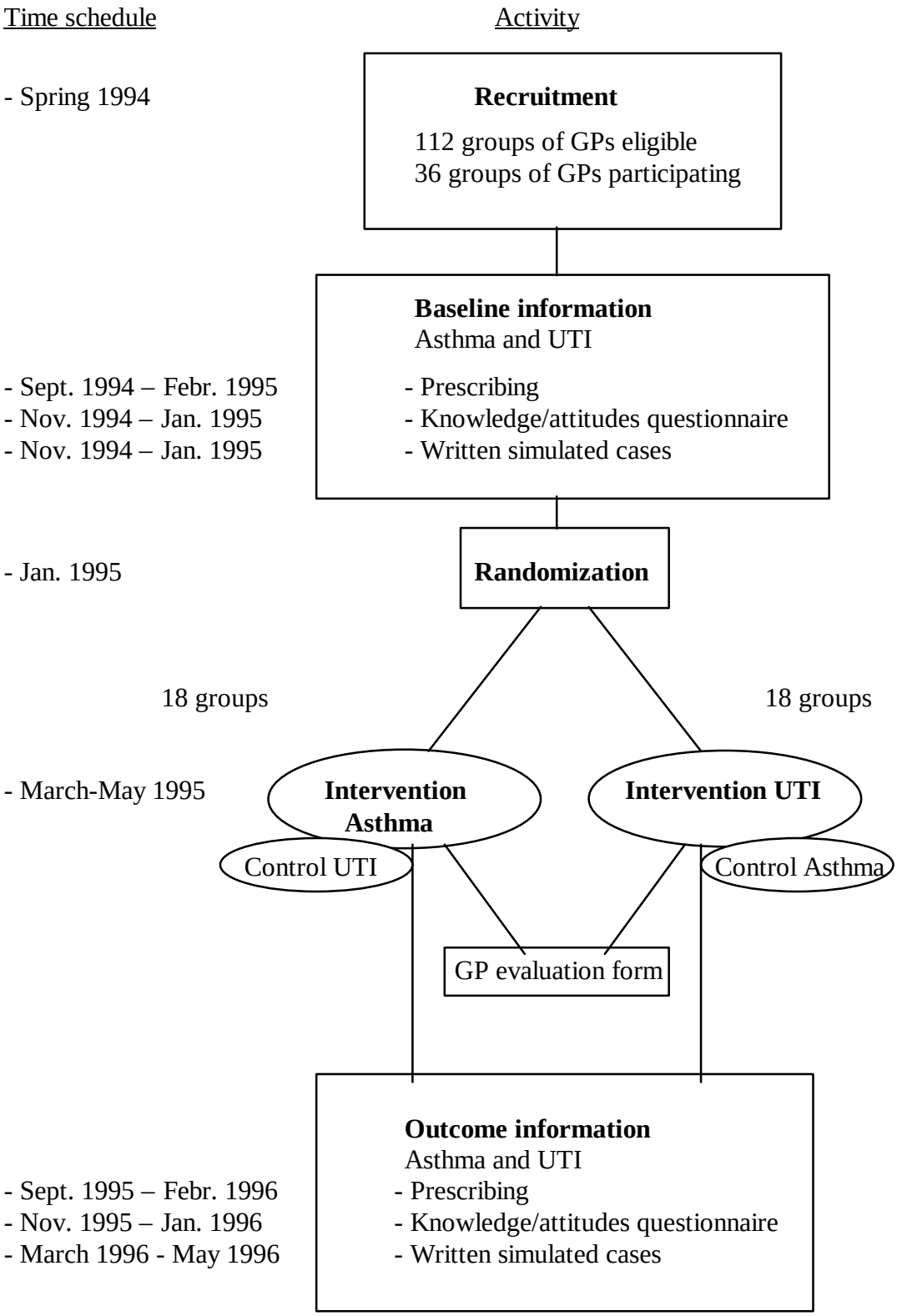
experiencing asthma management (III). Very specific knowledge gained was, e.g., the high use of norfloxacin among some doctors, that adoption patterns for new drugs are likely to vary, and that GPs view asthma management differently. The knowledge of these issues is likely to have increased the awareness and sensitivity towards different views among the GPs, although the analysis for Paper III was not completed at the time of the intervention. It must, however, also be recognised that a number of other previous research findings and experiences were brought into the project (presented, e.g., in Tomson 1990, Diwan 1992a, Denig 1994, Dall'Alba & Sandberg 1996, Wahlström 1997a).

The aim of the project presented in Papers IV-VI was to develop a model for education on drug treatment for GPs. The educational model was evaluated on acceptance by the participants (Paper IV), and in relation to recommendations in available Swedish guidelines on the participants' knowledge and attitudes (Paper V) as well as behaviour, measured as prescribing (Paper VI).

Participants and methods

The study was randomised and controlled, with a two-armed parallel design. Randomisation was performed with the group as unit of randomisation, as the education was to be conducted in GP groups (Diwan 1992b, Cornfield 1978). For testing the educational model, asthma in adults and uncomplicated UTI in adult women were chosen, as (i) both are common diagnosis in primary care, (ii) national treatment guidelines produced by the MPA were available (Strandberg et al. 1990, 1993), and (iii) drug statistics (Nordenstam et al. 1994) indicated that improvements were possible vis-à-vis the recommendations in the guidelines. Half of the participating GP groups were to participate in education on asthma (18 GP groups; 100 GPs) and the other half on UTI (18 GP groups; 104 GPs), the two study arms. The GP groups participating in the asthma education were at the same time control groups for UTI and vice versa. This design was chosen so as to control for the previously discussed Hawthorne effect. The study design, including time schedule, is shown in Figure 2.

Figure 2. Study design including time schedule.



The GP groups were recruited using a procedure with seven inclusion criteria and two exclusion criteria (Table 3).

Table 3. Inclusion and exclusion criteria for recruiting groups of general practitioners.

Inclusion criteria
1. Fully qualified GPs, permanently employed or subject to a long-term contract covering the duration of the project.
2. Doctors must join as groups.
3. Groups should be pre-existing.
4. The preferred group size was 3-6 doctors.
5. The decision to participate had to be reached by group consensus; no GPs should be forced.
6. It should be geographically feasible to visit participating health centres (not too far apart or too far, > 400 km, from our department).
7. It should be feasible to collect prescribing data without involving too many pharmacies (GPs in central Stockholm were not invited to participate, because patients in Sweden are free to visit any pharmacy and have a number of choices in Stockholm).
Exclusion criteria
1. Previous participation in unusually extensive research or educational activities concerning asthma or UTI.
2. Linkage to or geographic proximity to a department of family medicine or general practice.

The pre-intervention data, collected prior to the randomisation, and the outcome data collected after the intervention consisted of:

1. The GPs' responses to a questionnaire on knowledge and attitudes regarding asthma and UTI.
2. The GPs' prescriptions collected through local pharmacies during six months pre-intervention and post-intervention. Data on prescriptions for defined drug groups were sent to the research team (see Table 6, below). The pre-intervention prescribing data were analysed to prepare individual feedback.
3. The GPs' treatment decisions for series of written simulated cases (see below).

The individual participants' evaluations of the educational intervention were collected after the intervention through a specifically designed questionnaire.

Written simulated cases were used in two ways (i) to prepare individual feedback and (ii) to be used as an outcome instrument. The paper presenting the outcome evaluation on the written simulated cases is under preparation and is not included in the thesis. The series were constructed to be analysed using clinical judgement analysis (CJA) for preparing cognitive feedback, i.e., feedback on factors taken into account when a specific decision is taken (Kirwan et al. 1990, Cocksey 1996). Three series were used to address the messages (see below); one for UTI, dealing with drug choice and duration of treatment, and two series for asthma, one dealing with the treatment of an exacerbation, and the other one with dose adjustments in a patient with maintenance therapy. In each series there were 26 case presentations. The cases (including all cue levels) in an English version and some additional information are found in Appendix 1.

The educational intervention was multifaceted. The major elements being :

1. Use of outreach visits (external facilitators, a GP and a pharmacist, CSL)
2. Provision of individual feedback on:
    a. the series of simulated cases
    b. actual prescribing
3. Peer group discussions with the facilitators included
4. Advocacy of messages from the existing guidelines.

The messages to be delivered during the discussions (Table 4) were based on the content of the national guidelines (Strandberg et al. 1990, 1993).

Table 4. Messages used during the educational intervention (adapted from Table I Paper V)

	Main messages	**Additional messages**
UTI intervention arm	1. Prescribe first choice drugs (nitrofurantoin, pivmecillinam, trimethoprim, some cefalosporins). 2. Prescribe short courses (3-7 days).	Shift between several first-choice antibiotics.
Asthma intervention arm	1. Start/increase inhaled corticosteroids when bronchodilator use is too high (> twice a week). 2. Treat asthma exacerbations with anti-inflammatory treatment. 3. Do not start inhaled long-acting beta-agonists when the patient is at a suboptimal level of inhaled corticosteroids.	1. Use individual treatment plans. 2. Use PEF (peak expiratory flow)-meters.

The guidelines had been developed under the auspices of the MPA, mainly by experts working outside primary care. The recommendations had, as previously described, been published in the most widespread Swedish medical journal and had also before this study been sent twice from the MPA to all practising GPs. For uncomplicated UTI the recommendations were to use a variety of defined first-line antibiotics, not including fluoroquinolones, in courses of 3-7 days, stating that most documentation was available for 7-day courses. For asthma, a step-wise treatment approach was recommended (fig 1 Paper V and fig 1 Paper VI), depending on the symptoms of the patient.

Educational sessions

Each group was to be visited twice by the intervention team. The intention was to have some time between the two meetings, to give the GPs the opportunity to reflect on the first discussion in their patient contacts, before the second meeting.

When presenting the feedback, the GPs were to be identified through code numbers known only to the GP her/himself and to the intervention team. As the feedback presented in the sessions was at the individual GP level, the sessions became especially tailored to each group. The first visit concerned feedback regarding the written simulated cases (asthma or UTI). Material from the cases was presented in several ways, i.e. feedback on actual decisions taken on the simulated cases, the extent of use of information factors (cues) and the agreement on decisions between individual members within the group. The second visit concerned feedback on prescribing data from the pre-intervention period (asthma or UTI). Examples of feedback material for both UTI and asthma groups, for both educational sessions, are presented in Appendix 2. Also other management issues (e.g., use of PEF /peak expiratory flow/ meters and use of individual treatment plans) not dealt with in the feedback were discussed during the asthma educational meetings.

Information (feedback and material from the guidelines) and other input from the facilitators, combined with the group interaction, were aimed at providing a milieu stimulating self-reflection and understanding of one's own prescribing decisions in order to influence prescribing in line with the guideline recommendations.

Results

Response rate

No significant differences between the two study arms in the collected background characteristics or in response rates to the various questionnaires were found (Table 1, Paper IV). The response rates for included questionnaires, calculated at the group level, are shown in Table 1, Paper IV. Prescribing data were captured for 99% of the participating GPs.

The intervention

The intervention was completed for all participating groups, i.e., all groups were visited twice. There was no difference in mean participation rate neither between the two study arms nor between the two meetings. All feedback data were presented at the individual level, and no group means or other aggregated material was presented.

The criterion of three weeks between the two educational sessions was met by 34 of the 36 GP groups. The interval varied between one and 25 weeks with a median of seven weeks. The time spent on the meetings was similar for both meetings and in both study arms (mean 1.4 hrs). In almost all the meetings, the identities of the individual GPs were disclosed on request by the participating GPs.

In decisions regarding the simulated cases and usually in the use of the information factors both for asthma and UTI, there was a wide inter-individual variation within each group. In the discussion of the feedback data, the differences and similarities in decisions and in the use of information factors (cues) were discussed as was the agreement/disagreement between the doctors. Also regarding prescribing there was usually a wide inter-individual variation within each group (Appendix 2). For UTI, e.g., the usually high use of the non-recommended drugs was stressed and related to the similarly high use in the simulated cases and the factors taken into account when these decisions were made. Asthma patients treated by GPs in the asthma intervention arm were categorised according to the steps in the asthma treatment ”staircase” in the guidelines (as presented in Paper VI, fig 1). Some patients, where problems regarding drug treatment according to the research team could be anticipated, were identified from the collected prescriptions. The GPs were asked to bring copies of the records

for these patients to the meeting, and treatment problems in relation to these patients were discussed, especially differences between what was prescribed according to the records and what was actually dispensed.

Comments

Statistical and methodological considerations

The randomisation was done with the group as the unit of allocation. Consequently the group should be used as the unit of analysis. This is something often not adhered to in evaluating the effects of educational interventions. It is common to analyse data at the patient level despite allocation having been made at the physician or group level (Soumerai & Lipton 1994, Campbell & Grimshaw 1998, Thomson et al. 1999a). If the analysis is made at another level than allocation, this violates basic statistical assumptions of independency in the data. When increasing the numbers, the statistical precision in the results will be increased artificially. Alternatively, sufficient independency may be calculated through intra cluster variability, a practice not followed in the studies included in the Cochrane review, in cases where the problem of different unit of analysis and allocation were present (Thomson et al. 1999a).

In order to detect a prescribing difference of 10%, between intervention and control arms with a power of 90% at a significance level of 5%, it was decided to include at least 15 groups of 3-5 GPs, each with at least 25 observations, in each study arm (Diwan 1992a). Data on knowledge and attitudes and prescribing data were analysed descriptively and by multi-level analysis. Multilevel analysis is a regression model for the situation in which a hierarchical (or nesting) structure in the data can be seen. It uses data more ”efficiently”, by maintaining the structure of the data throughout the analysis, compared to when data are aggregated (Rice & Leyland 1996, Goldstein 1995). In the knowledge and attitudes data, two levels are identified; the GP and the group. In the prescribing data, however, four hierarchical levels can be defined: prescriptions are nested within patients, patients are nested within GPs, and GPs are nested within groups of GPs. Multilevel analysis is especially suited when an unbalanced block design, as in this study, is present (Rice & Leyland 1996).

General comments

This study is one of very few (Thomson et al. 1999a) applying what could be considered to be the most unbiased methodology in evaluating effects of outreach educational visits. What is studied could be defined as a mix between efficacy (effect in the ideal research setting) and effectiveness (effect in the real world). The participation was voluntary, which might be seen as a drawback, since those who participate in a research trial are likely to be different from those not participating. The voluntary participation might attract people interested either in the subjects or in educational methods. It could be hyphotesised that they would be generally "well educated" and that their knowledge and performance already are in agreement with accepted treatment guidelines, making it difficult to induce a change. The other possibility is that voluntary participants feel an urgent need of updating, as they correctly consider their knowledge and behaviour not to be in accordance with accepted recommendations. In this study the participants did not know which of the two subjects they were going to receive education in. The participation could be considered to be semi-voluntary as a pre-existing group had to join. In larger health centres there were no problems if some GPs chose to be outside the project, but in smaller health centres the group pressure could be stronger, as we did not allow participation of groups smaller than three GPs. It can be argued that participation in all educational activities is more or less voluntary.

The response rates to the various questionnaires were very high before the intervention, especially for the simulated series (Table 1, Paper IV). This could have several explanations. The most important explanation is probably that these cases were completed at a pre-intervention meeting led by one of the facilitators and that completing the cases was a prerequisite for receiving individual feedback in the first session. After the intervention the response rates dropped. The reason has not be verified but these cases were not intended to be used for feedback and not all groups were visited for a post-intervention meeting to complete these cases (non-visited groups received the cases by mail).

During almost all sessions, the climate in the groups was very open and generous. One indicator of this was the voluntary disclosure of the individual GPs' feedback material (first presented anonymously by the facilitators). Previously, it has been argued that GPs do not want to expose themselves by showing individual prescribing

patterns (Tomson et al. 1994). The experience from this study was completely the opposite. The reason might have been that the facilitators came as representatives of the university and were not seen as, e.g., authority representatives. Also the way the meetings were conducted with the facilitators mixing with the participants around the table led to a relaxed atmosphere. Where meetings are held, the positioning in the room, how participants sit, how facilitators position themselves etc. has been discussed in the literature as important for the group climate when working with groups (Ewels & Simnett 1995).

PAPER IV - *Combining feedback from simulated cases and prescribing data. Design and implementation of an educational intervention in primary care in Sweden*

Specific methods - GP Evaluation form

To evaluate the participants' views on, and experiences of, the education, a specifically designed questionnaire "GP evaluation form" was left with each GP at the second (last) intervention meeting. The evaluation form comprised statements regarding the content and structure of the meetings as well as questions regarding the project (totally 62 items). For each statement the GP had to mark, on a six-point scale, if s/he agreed or disagreed with the statement. The GPs were free to formulate their own main purpose/expectation regarding the project and to indicate if this purpose had been achieved.

The data were analysed at the group level. For each item, a weighted mean (for group size, actual participants) percentage regarding agreement was calculated per GP group. The items were for the analysis separated into two main parts; (i) "content of the meetings" including usefulness for practice, and (ii) "process of the meetings", including the atmosphere in the group.

Results

The overall response rate for the GP evaluation form was 80% (for details see Table 1, Paper IV). For all items a wide range between the GP groups was seen (often 0-100%) in agreement with the statements.

Generally, the meetings on prescribing feedback were valued somewhat (although not significantly) higher than the meetings on the simulated cases. Similarly, the UTI intervention arm was somewhat (although not significantly) more positive towards the education than the asthma arm. The education was considered important both regarding simulated cases and prescribing, and a clear majority considered the education useful. Few saw the education as a ”dictate” for how to work. Between six and seven out of ten doctors thought that the group made use of their knowledge and experience. What we called ”process of the meeting”, such as the structure of the meetings and possibilities to take part in the discussion, received high (>80%) agreement with positive statements. Details are found in Paper IV.

Some items were not directly related to the educational content of the meeting, and it was thus not considered meaningful to separate them per study arm. The percentages agreeing with these general statements are presented in Table 5.

Participants in both study arms thought that the educational project would induce changes in management, both regarding the educational subject and to a lesser extent also regarding the control subject.

Table 5. Agreement with general statements presented in the GP evaluation form.

Statements	**Percentage agreeing**
– Satisfied with the frequency with which patient management questions are professionally discussed in normal practice (referring to outside this project).	25
– The project gave possibilities to discuss issues relevant to daily work.	80
– GPs wanting or probably wanting to participate in the same type of educational intervention for other topics.	87
– GPs achieving the purpose of their participation in the project.	80
– The educational program, including the facilitators, showed a capacity to adjust to the reality in general practice.	80
– Both the GP and the pharmacist functioning as facilitators had the appropriate knowledge.[8]	90
– Both the GP and the pharmacist functioning as facilitators were able to stimulate the discussion in a fruitful way.[8]	>80
– External facilitators are needed in an educational activity like this.	50

Comments

This was the first time an educational intervention based on feedback both on simulated cases and prescribing was conducted. It was also one of the first times that individual prescribing feedback, presented in such a detailed way, has been used in primary care in Sweden. The novelty of the educational model is likely to have affected the responses of the participants. In what direction is impossible to say. On the one hand, they could be expected to be positive, as it was something new. On the other hand, there are always ”teething problems” in new technology. Continued work with the model would certainly sharpen the methodology.

In Table 5 (above) it is seen that almost all the GPs wanted to participate in similar education on other topics, while only about half thought that external facilitators were

needed. This may seem contradictory, but may be explained by an idea we discussed during the meetings, namely that, in the future, some kind of library could be created with series of simulated cases addressing different medical conditions. In the future it would probably also be easier to obtain prescribing feedback data, either through the GPs' own computers or through the pharmacy computer system.

Certainly there is still a wish for increased opportunities for discussions on patient management questions, as only one out of four thought this was done frequently enough outside the project. This figure could be related to the result in Paper I, where 61% thought that verbal drug information was not sufficient. What we did in this project is more than "verbal drug information"; it was discussions on patient management issues reflected in the above response.

The fact that GPs in both study arms thought that their management would be influenced by the project for both conditions is probably a result of both study arms completing simulated cases, and knowledge and attitudes questions regarding both conditions.

Paper V – *GPs' knowledge and attitudes regarding treatment of UTI and asthma*

Specific methods - knowledge and attitudes questionnaire

The questionnaire to assess the respondents' reported agreement with the content of the guidelines was completed individually approximately six months before and after the education. The questions mainly concerned treatment of UTI and asthma. To focus on applied knowledge, the questions were formulated as short case descriptions put as statements with three response alternatives: true/false/don't know. The attitudes questions comprised a statement with four response alternatives (fully agree/partly agree/partly disagree/fully disagree). After each statement a question followed to explore whether the GP reported working according to the statement (four response alternatives (close to) never/sometimes/often/(close to) always). For asthma, questions were also included on material for demonstration, use of information material and the GPs' self-assessment of competence regarding demonstration/ instructions on PEF use and inhalation technique.

[8] The GP and the pharmacist were evaluated separately.

For each statement, one or more of the response alternatives, as appropriate, were coded as agreement with the guideline[9]. Weighted percentages were calculated, where the weighting was performed depending on the number of respondents in each GP group. The intervention effect was assessed for individual statements using a t-test for independent samples. The difference between the weighted percentage before and after the intervention per study arm was compared. Sum-scores (responses in agreement with the respective guideline) were calculated per GP, separately for knowledge and attitudes and separately for UTI and asthma. The intervention effects, on sum-scores, were estimated in a multi-level analysis using the pre-test-post-test model (see Paper V for details)

Results

For UTI, the statements could be separated into three groups regarding the level of agreement with the guidelines before the intervention and change afterwards. The groups were (i) high agreement with little room for improvement, (ii) low to medium agreement, with a significant improvement afterwards and (iii) low to medium agreement with no significant change afterwards. The statements in the first group concern non-controversial issues, important for the safety or well being of the patient. The statements in the second group were related to drug choice, while in the third group, they were related to treatment length.

For the statement explicitly dealing with the choice of a UTI antibiotic in non-pregnant women, the main topic discussed during the education, there was a significant increase in percentage agreeing with the guideline. Also for the statement concerning switching antibiotics in the case of a new episode, the percentage working accordingly increased significantly.

Also for asthma the statements could be separated into three groups regarding the level of agreement with the guidelines before the intervention and change afterwards; (i) high agreement already before the intervention, with no room for improvement, (ii) low or medium agreement before, with improvements although not significant

[9] In case of four response alternatives, these were dichotomised as follows: Fully agree/partly agree respectively partly disagree/fully disagree; and (close to) never/sometimes respectively often/(close to) always.

afterwards, and (iii) one statement with medium agreement before the intervention, with no improvement afterwards. The first group concerned the use of corticosteroids and patient follow-up and the second mainly management of exacerbations. For statements on written instructions, PEF monitoring at home and checking inhalation technique, 90% or more agreed with the guideline, while a lower percentage (40-55%) reported working accordingly. For UTI as well as for asthma there was an increase both in knowledge and attitudes sum-scores in both intervention and control arms, giving insignificant intervention effects. There were significant time trends for UTI knowledge, for asthma knowledge and asthma attitudes (see Paper V for details).

Comments

The results showed a significant effect on knowledge of drug choice for UTI. These items were two among many. A relevant question is therefore if this significance was just a coincidence. I would argue not, as the same pattern of results was achieved in actual behaviour (Paper VI). Also in the analysis of the outcome of the written simulated cases, a significant change in drug choice was seen (unpublished data).

The use of knowledge tests has been questioned as a means of evaluating educational interventions (Dall'Alba & Sandberg 1996, Diwan et al. 1997). However, knowledge tests in the form of questionnaires have the advantage, compared to most other methods, of rather quick and easy data collection. Traditionally, the method most commonly used for evaluating educational efforts, also in the field of clinical competence, has been knowledge tests (Neufeld 1985). There are, however, a number of problems and controversies attached to using tests, also referred to as scales (Streiner & Norman 1995), which will be touched upon in the general discussion.

Further, it must be acknowledged that practical clinical knowledge needs other ways of assessment than questionnaires. However, in this study we aimed at studying applied knowledge, which is viewed to be the step closest to more advanced problem solving skills and to be possible to measure through structured questions (Imrie 1995).

Paper VI - *Influencing GPs' prescribing for urinary tract infection and asthma*

Specific methods - prescribing data

Data on the participating GPs' dispensed prescriptions were collected from 70 pharmacies, for two six-month periods, one year apart, before and after the intervention. Data for selected drug groups were compared for the two periods to estimate the intervention effect. For UTI, prescriptions for defined UTI drugs (a drug with the main indication UTI[10]) were selected. For asthma, prescriptions were selected for young adults receiving an anti-asthmatic drug (R03). These patients were defined as "asthma patients". For included drugs and patients' sex and age limit, see Table 6.

Table 6. Criteria used for selecting prescriptions for asthma and UTI, respectively.

	Asthma	**UTI**
Sex of patient	Men and women	Women
Age groups	18-49[11]	18-75
Included drugs and their ATC-code[12]	- Drugs for asthma treatment (R03)[13] - For patients with an anti-asthmatic drug, also; (i) oral corticosteroids (H02AB) (ii) oral antibiotics (J01[14])	- Trimethoprim (J01EA01) - Pivmecillinam (J01CA08) - Nitrofurantoin (G04AC01) - Fluoroquinolones norfloxacin (J01MA06) ciprofloxacin (J01MA02) ofloxacin (J01MA01)

[10] Cephalosporins were included in the data collection, but not in the effect analysis, as they are mainly used for other indications than UTI.
[11] The age limit for asthma was set to minimise inclusion of patients with chronic obstructive pulmonary disease.
[12] ATC=Anatomical, Therapeutic, Chemical classification according to WHO Collaborating Centre on Drug Statistics, Oslo, Norway, 1996.
[13] Patients receieving an R03-drug were defined as asthma patients.
[14] Only those commonly used for respiratory tract infections. Included are; tetracyclines (J01AA), penicillins (J01C) (excluding pivmecillinam or a combination with pivmecillinam), J01DA (cefalosporins), macrolides (J01FA).

Prescribing indicators were developed for both conditions. The indicators were developed in order to detect changes in prescribing behaviour relevant to the messages advocated during the educational intervention. The indicators are presented related to the educational messages in Appendix 1, Paper VI.

Descriptive statistics of the collected prescriptions were analysed as number of prescriptions per drug group or individual drug, as appropriate. The number of defined asthma patients was calculated. A multilevel analysis was performed for the prescribing indicators. Data were grouped per patient for asthma and per prescription for UTI (for details on analysis, see Paper VI).

Results

In the pre- and post-intervention period, 4,535 and 3,737 prescriptions, respectively, were dispensed for defined UTI drugs for women aged 18-75. Of these prescriptions, 8,114 fulfilled inclusion criteria for the analysis. In total, 7,850 prescriptions were dispensed to 2,454 defined asthma patients in the pre-intervention period, and 7,844 prescriptions to 2,267 defined asthma patients in the post-intervention period. Aggregated data on main UTI drugs used in the analysis of the UTI prescribing indicators are presented in Table 7 (based on Table 2, Paper VI).

Table 7. Prescriptions for drugs[15] included in the analysis of the UTI prescribing indicators. The total number of prescriptions, for pre[16]- and post[17]-intervention period.

	UTI intervention arm[18] **Percentage of prescriptions per period**	**Control arm[18]** **Percentage of prescriptions per period**
Pre-intervention period	n = 2,315	n = 2,137
- Trimethoprim (J01EA01)	39	45
- Nitrofurantoin (G04AC01)	3	1
- Pivmecillinam (J01CA08)	11	10
- Fluoroquinolones (J01MA)	47	44
Ciprofloxacin (J01MA02)	4	2
Norfloxacin (J01MA06)	43	42
Total:	100	100
Post-intervention period	n = 1,817	n = 1,847
- Trimethoprim (J01EA01)	52	43
- Nitrofurantoin (G04AC01)	3	3
- Pivmecillinam (J01CA08)	13	9
- Fluoroquinolones (J01MA)	32	45
Ciprofloxacin (J01MA02)	2	2
Norfloxacin (J01MA06)	30	43
Total:	100	100

[15] A few drugs with a very low number of prescriptions are not included in the table.
[16] September 1, 1994 - February 28, 1995.
[17] September 1, 1995 - February 29, 1996.
[18] 18 GP groups were included.

For the UTI prescribing indicator UI, the proportion of first choice drugs showed a statistically highly significant intervention effect in the desired direction (Table 8). For the indicator on duration of treatment, there was a decrease in treatment time in both the intervention and control arms, giving a significant period effect (see Table 4, Paper VI).

Table 8. Effects of the educational programme on the prescribing indicators for UTI

	UTI intervention arm n=18 Period		**Control groups n=18 Period**		**Intervention effect**
	Pre-intervention	**Post-intervention**	**Pre-intervention**	**Post-intervention**	
Per cent first choice drugs (UI)	52	70	57	58	t=6.85[19], p<0.001

The aggregated data on the prescriptions for asthma drugs used in the analysis of the prescribing indicators for asthma are presented in Table 9 (based on Table 3, Paper VI).

[19] D.f.=32, critical t-value=2.03 for 0.05-level two-sided test.

Table 9. Prescriptions to defined asthma patients[20] regarding asthma drugs included in the analysis of the asthma indicators. The percentages of prescriptions are presented for pre[21]- and post[22]- intervention period.

	Asthma intervention arm[23] **Percentage of prescriptions per period**	**Control arm**[23] **Percentage of prescriptions per period**
Pre-intervention period	n = 2,908	n = 4,586
- Selective b-2 agonists, inhaled (R03AC)	62	69
- Glucocorticoids, inhaled (R03BA)	30	25
- Ipratropium (R03BB)	2	1.5
- Sodiumcromoglycate (R03BC)	2	1
- Selective b-2 agonists, oral (R03CC)	3	2.5
- Xantines (R03DA)	1	1
Total:	100	100
Post-intervention period	n = 3,032	n = 3,824
- Selective b-2 agonists, inhaled (R03AC)	60	61
- Glucocorticoids, inhaled (R03BA)	33	33
- Ipratropium (R03BB)	3	2
- Sodiumcromoglycate (R03BC)	1	1.5
- Selective b-2 agonists, oral (R03CC)	2	1.5
- Xantines (R03DA)	1	1
Total:	100	100

[20] An asthma patient was defined as a person in the age-group 18-49 who had a prescription dispensed for an anti-asthmatic drug.
[21] September 1, 1994 - February 28, 1995.
[22] September 1, 1995 - February 29, 1996.
[23] 18 GP groups were included.

Three of the six prescribing indicators for asthma (AI, AIa, AIb, see Table 10) showed a trend in the desired direction. However, this trend was present also in the control group, giving an insignificant intervention effect. For indicator AIa, a significant period effect was present (see Table 5, Paper VI).

Table 10. Effects of the educational programme on the prescribing indicators for asthma.

	Asthma study arm (n = 18) **Period**		**Control arm (n = 18)** **Period**		**Intervention effect**[24]
	Pre-inter-vention	**Post-inter-vention**	**Pre-inter-vention**	**Post-inter-vention**	
Patients (%) on inhaled corticosteroids (AI)	46	53	46	49	t=0.92 p>0.2
Patients (%), high level mono use of bronchodilators (AIa)	45	36	50	39	t=0.53 p>0.2
Patients (%), suboptimal inhaled corticosteroids and high level bronchodilator (AIb)	11	7	15	13	t=-0.91 p>0.2

Comments

The UTI indicators were based on number of prescriptions, as this is a short-term treatment, with each prescription usually referring to one treatment period. For a chronic disease such as asthma, it was found more appropriate to use the patient as level of analysis, as there are variations in, e.g., for which time period a medication given in one prescription is supposed to last. Change in asthma prescribing indicators is thus measured as change at the patient level, although in our case not within a specific patient but regarding numbers of defined patients fulfilling certain criteria.

[24] D.f.=32, critical t-value=2.03 for 0.05-level two-sided test.

The absolute number of prescriptions of the main fluoroquinolones decreased to half the pre-intervention value in the post-intervention period in the UTI intervention arm. No such dramatic change was seen in the control arm. However, there is only a marginal increase in the absolute number of first choice drugs in the intervention arm and a decrease in the control arm, resulting in a total decrease, in both study arms, in the numbers of UTI prescriptions from the pre- to the post-intervention period. The percentages of the different UTI drugs were similar in the two periods in the control arm.

The main drug groups for asthma were inhaled selective short-acting beta-agonists and inhaled glucocorticoids, while other anti-asthmatic drugs had a marginal use, defined as dispensing of the drug. The actual use by the patients is unknown. The difference in results when comparing aggregated data on number of prescriptions with the results from the multi-level analysis, using the patient as unit of analysis, illustrates how different means of measuring might give different impressions.

The results regarding prescribing are similar to those regarding knowledge. There was a change in drug choice for UTI and in the trends, but no significant effects for asthma.

GENERAL DISCUSSION

The two models

Two educational models, focusing on doctors' prescribing in primary care in Sweden were successfully developed. The "*Drugwatcher*" model (II) was intended for direct use in practice in a predetermined geographical area. In conjunction with its development, a study was performed elucidating GPs' attitudes towards various drug information sources (I). The other model (IV-VI) was developed with the aim of evaluating a new educational model in a practice based randomised controlled study prior to possible later use in actual practice. The educational intervention was here complemented with a qualitative interview study (III), concerning ways of experiencing the management of asthma, one of the target educational areas in the intervention study. The qualitative study was not fully analysed before the intervention study (IV-VI) and, consequently, full advantage of the results could not be taken in the planning and performance of the education. However, general experiences concerning GPs and asthma management were gained from conducting the interviews and brought into the educational sessions.

The comparative advantage of using both a GP and a pharmacist in the educational intervention, as we have done (II and IV-VI) is that the two professional competencies complement each other and that being two, it facilitates group interaction (Ewles & Simnet 1996). However, comparison between using one or two persons or comparing professional backgrounds was not an aim in the studies for this thesis. The implications of my background both as a former pharmaceutical company representative and of having worked with academic detailing in "*Drugwatcher*" for some years prior to the study presented in papers IV-VI are not possible to assess. The GP facilitators in studies II and IV-VI were experienced GPs, however not previously involved in performing similar educational activities. In the study presented in Papers IV-VI we used one information team, despite that the study was performed in seven counties, as our intention was to keep all meetings as similar as possible. The alternative had been to use local trained teams or single persons, as previously done in an educational outreach study covering a wide geographical area (Wahlström 1997a).

The GPs appreciated both models. For the "*Drugwatcher*" this is seen indirectly in its sustainability, i.e., that education following the original ideas has continued for more than 10 years. Regarding the new model, a vast majority of the GPs reported that they would like to use the same educational model also for other diseases.

Contextualisation of the models

The two models illustrate two problems in conducting research on educational interventions, (i) research in practice as compared to research in a controlled situation and (ii) description and understanding as opposed to performing an intervention. Regarding the first issue, this relates to effectiveness and efficacy. Effectiveness is defined as "the extent to which a specific intervention, procedure, regimen, or service, when deployed in the field, does what it is intended to do for a defined population" and efficacy as "the extent to which a specific intervention, procedure, regimen, or service produces a beneficial result under ideal conditions. Ideally, the determinants of efficacy are based on the results of randomised controlled trials" (Last 1988). Efficacy should preferably be established before effectiveness, as an intervention not producing beneficial results under ideal conditions is not likely to do so in reality. Regarding "new technology", which a new educational model may be defined as, it is common that it is introduced directly into the health service without evaluation, a practice which is less common regarding, e.g., new therapies (Gray 1997). The "*Drugwatcher*" may be seen as an illustration of this. The provision of information as such was considered beneficial by the third party payers. Thus, even with more competence in HSR, a controlled study might have been seen as ethically problematic. Assuming information is beneficial, would it be ethical to withhold information from some potential beneficiaries? This has been discussed, as have factors such as costs of performing studies and the relevance of RCTs to a real world setting (e.g., Stephenson & Imrie 1998, Daly et al. 1997). Alternatives to randomised controlled studies have been proposed, when such studies for some reason are not considered feasible. Such alternatives are, e.g., time-series analysis or staged implementation, where the control population receives the intervention after data collection for the study (Stephenson & Imrie 1998, Soumerai & Lipton 1994). A variant of a staged implementation was sought in "*Drugwatcher*" by providing oral information to one area, while one area received only written information regarding the first two educational subjects. This

was accepted as being within the development phase of the information service. Previous results seen in other contexts on the benefit of providing oral information (Avorn et al. 1983, Schaffner et al. 1983, Ray et al. 1985, Soumerai & Avorn 1986) were confirmed also in this specific context. Another ethical aspect is when to seek informed consent from participants in information experiments (Diwan 1992a). In a previous study, consent from participants was sought after the completion of the study to minimise the expectancy effect (Wahlström 1997a). In the studies presented here, consent was sought in advance. One argument being that the expectancy effect could be considered to always be present in educational activities (although perhaps stronger in a study). Regarding the model presented in papers IV-VI, the participants completed several questionnaires on both educational areas, and the facilitators came from outside the local context. Thus it was not possible to conceal that it was a study. The results from the study presented in papers IV-VI could be seen as a mixture of efficacy and effectiveness. It was a controlled study, with random allocation of study units. At the same time it was conducted in such a way that it as much as possible should copy the situation in reality.

Regarding description and understanding, as opposed to performing an intervention, it is necessary to strike a balance between collecting background data and starting the intervention. Since it is probably never possible to collect complete background data, the question is where to put the limit. In health systems research, the focus is on action for improvement, rather than description, although sufficient background data are necessary to conduct meaningful interventions (Varkevisser et al. 1991, Daly et al. 1997). It is also a question of resources. When working with limited resources, a main direction has to be decided, in this case the development and assessment of educational models. An alternative way would have been to focus more, e.g., on understanding various aspects before the intervention by concentrating more on qualitative background information.

In HSR, the participatory and context-specific approach is emphasised (Varkevisser et al. 1991, Diwan 1992a). In both models the approach was contextualised in the sense that GPs working in primary care were actively involved in the development of the models as well as took part in conducting the educational sessions. In "*Drugwatcher*" (II), a more geographically contextualised approach was possible to apply, in contrast to the new model, which was developed for application in

various geographical areas (IV-VI). In the first case, links were established with local DTCs and local experts (II) from the outset, giving credibility with a local touch to the educational content, a kind of geographical ”ownership” of the material, described as important (Soumerai & Avorn 1990, Fresle et al. 1996, Soumerai et al. 1998, Thomson et al. 1999d). In the second case, national guidelines from the MPA (Strandberg et al. 1990, 1993) were used to give credibility to the content of the education (IV-VI). This difference is likely to have had some influence on the ”susceptibility” to the education among the doctors as well as on educational outcomes, although not the object of study here. However, high confidence in information from the MPA has been demonstrated (Paper I, Hedstrand & Ivarsson 1999), indicating that using these recommendations as common guidelines is probably relatively non-controversial among GPs. For pragmatic reasons, it was important to use a guideline that could be regarded as common for the seven counties participating in the study. To increase the geographical contextualisation, an alternative could have been to use recommendations by local DTCs and/or local therapy recommendations. However, local guidelines were not always available, and their use would probably have introduced complications in the development of the evaluation instruments, as all aspects we wanted to include would probably not have been addressed. The studies III-VI were conducted within a European concerted action project (Drug Education Project 1998). This was advantageous in terms of possibilities to critically discuss and develop the methods both for education and for evaluation, while on the other hand a number of minor adjustments had to be made throughout the project to enable comparison of results. This might have had a negative effect in terms of contextualisation as, for example, the knowledge and attitude questions were not designed independently in the different countries. Another example of the importance of the context is the analysis of the intervention effect regarding, e.g., percentage of defined patients dispensed inhalation steroids, where a significant effect was seen in the Netherlands (unpublished data, Veninga et al. 1999). A clear practical difference in the Netherlands as compared to Sweden (where prescriptions are valid 12 months after issuing) is that all prescriptions have a limited duration of three months and that, after that, the patients need to contact the GP for a new prescription. The consequence being that, in the Netherlands, all prescriptions collected in the post-intervention period were issued after the intervention, while in Sweden a number of prescriptions collected

during the outcome period were issued prior to the intervention. In Sweden, we could have chosen to add an additional post-intervention collection period to include only post intervention prescriptions, or to postpone the post-intervention collection. These alternatives were, however, for practical and financial resource reasons not available.

Qualitative studies in HSR of relevance for this research

The value of using qualitative methods in HSR has increasingly been recognised (Green & Britten 1998, Mays & Pope 1996, Segesten 1992, Daly et al. 1997, Alderson 1998, Buchanan 1998, Pendleton & Hasler 1983, Pendleton et al. 1986, Fitzpatrick & Boulton 1994). Qualitative methods have been regarded as a means of helping to bridge the gap between scientific evidence and clinical practice (Green & Britten 1998). They allow investigation of research questions not possible to capture by quantitative methods, typically questions on human thoughts, experiences or attitudes. They may be practically useful in educational intervention studies through exploring factors of importance for the content and/or the way of intervening. They may also help to understand, e.g., patients' or doctors' behaviour. An example of a qualitative study of relevance for this research is the "Physician change study" (Fox et al. 1989, cited in Bashook 1993) where the aim was, to understand how change occurs and how learning is involved, from the physicians' perspective. As a result of the study, a theory presenting change and learning as a process was developed. In the model, four key components were included; (i) forces for change (personal, professional, social), (ii) a process clarifying the role of learning in the change process, (iii) a process where the present skills and competencies are compared with required knowledge/skills, and (iv) a process, initiated through the physicians' personal effort, to acquire skills or to make a re-assessment of existing knowledge/skills, with the intent of making a change. The application of this theory to continuing medical education (CME) has been emphasised (Fox 1991) and CME has been defined as "a systematic attempt to facilitate change in doctors' practice" (Fox & Bennett 1998).

An example of phenomenographic research in this area is a study where it was first shown that GPs experience the management of hyperlipidemia in different ways (Dahlgren et al. 1992). Later, also changes in conceptions (a word sometimes used in phenomenographic research, having the same meaning as ways of experiencing, Marton 1995) of doctors participating in an educational intervention regarding

management of hyperlipidemia were demonstrated (Wahlström et al. 1997b). It is not unlikely that the same could be true also for management of other diseases. As has been shown, doctors have a limited number of different ways of performing consultations, and they tend to be consistent in their behaviour towards patients regardless of the patients' problem (Byrne & Long 1989). The consultation styles described ranged from doctor-centred, based only on the doctors' knowledge, to patient-centred, incorporating the patients' experience. The relation between "ways of experiencing" and actual behaviour has not been established, although a relation could be anticipated. The different ways of experiencing asthma management found in study III are likely to influence doctors' relation to patients. Various ways of experiencing diseases have been found also among patients (Fallsberg 1991, Hansson Scherman 1994). This was, however, not a focus in the study reported here. A general remark is that the communication process between patient and doctor is likely to be affected by the ways in which both the patient and the doctor experience the disease and its management. It could be hypothesised that some combinations of patients' ways of experiencing a disease are more compatible with some doctors' ways of experiencing the disease and less compatible with other ways. It is therefore important to recognise the existence of qualitatively different ways of experiencing disease management among both patients and doctors and to incorporate this into educational discussions on management. It is, however, probably more important to be aware of this variation than the exact nature and distribution of the various ways. The various ways of experiencing asthma management are likely to be of importance also in relation to the GPs' interpretation of new knowledge and experience.

As mentioned, the results of the qualitative study (III) were not available in time to be fully used for the intervention study (IV-VI). This might be seen as an illustration of a not uncommon phenomenon in multi- or inter-disciplinary work that involves qualitative research. Qualitative studies seem to often be used in a stage too late to enable optimal use in studies aiming at change. Ideally, qualitative research should start well in advance of the intervention in order to be useful. Two relevant questions are (i) why this time problem seems to be common, and (ii) what could be done to ensure that qualitative studies are initiated at an earlier stage in research involving a wish for change? These are questions with no simple answers. And they lie outside the scope of this thesis. However, although the timing of this qualitative study (III) may have been

sub-optimal, information received during the interviews was still of some direct or indirect use in the intervention. Examples are, e.g., the importance of the inhalation device, when deciding which drug to prescribe (depending upon the preference of the patient), problems in resource allocation leading to few doctors working with asthma nurses (despite the GP preference), and that oral treatment with betamethason at the surgery in case of an exacerbation, without further use of oral corticosteroids, was reported.

The educational models in relation to theories on behavioural change

Coles and Holm have, in their presentation, ”*Toward a theory of medical education*” (Coles & Holm 1993) criticised the common methods of CME, which often consists of ”information passing” (described as pouring or pot filling) from teacher to student. This linear communication is not seen as optimal in the communication with GPs, as their experiences and expectations are important to incorporate in educational sessions. Coles and Holm argue in favour of educational methods, encouraging reflection on practice, the use of feedback and small group learning including discussions. Their work reflects the same ideas as guided the development of the intervention (Schön 1983, 1987, Mann 1994, Ramsden 1992) in the study presented in Papers IV-VI.

Of the communication models presented in the introduction, a model approaching the ”Feedforward-feedback model”, sometimes moving towards the interactive model, was applied in this work (II, IV-VI). Studying and describing the communication processes lie, however, outside the scope of this thesis. Here communication in educational sessions was used as a means to elicit behavioural change. As presented in the introduction, education is one way of introducing change in relation to drug prescribing. For behaviour and behavioural change more generally, a number of theories and models have been put forward (Graeff et al. 1993). It has been argued that it is often clarifying to attach practice to models (Alderson 1998, Buchanan 1998, Lilja et al. 1996). If not done consciously, the work done would probably still be possible to describe using previously formulated theories or models. The ”theory of reasoned action” emphasises, e.g., ”normative” beliefs, i.e., what people think ”influential others”, such as their peers, would do in a similar situation (Fishbein & Ajzen 1975, cited in Graeff 1993). Using feedback, as we did in the study presented in Papers IV-

VI, and relating the discussions to national guidelines, introduced this normative aspect. When participating in the group discussions, each individual GP was aware both of what they themselves had done, what their colleagues had done and what the guidelines considered as ”correct behaviour”. For UTI this was particularly clear. For example, in the session on feedback on the written simulated cases, a GP having ”prescribed” fluoroquinolones in 87% of the cases, and discussing with colleagues having a far lower proportion of fluoroquinolones, and being faced with the guidelines' non supportive view on this practice would probably feel a rather strong normative pressure. The ”stages of change theory” or ”the transtheoretical model” was originally developed, describing the process a person goes through when giving up drinking and later smoking (Proschaska 1979 cited in Graeff 1993, Proschaska et al. 1992). However, the four stages in this theory, pre-contemplation (not thinking about change), contemplation (considering change, but not ready for action), action (change is initiated) and maintenance of changed behaviour, could equally well be applied to a change in prescribing behaviour (Thomson et al. 1999a). Change in prescribing behaviour could be related to the concept of the doctor's ”evoked set” of drugs (Denig 1994) and the process it takes to introduce a new drug within the evoked set. The so-called Precede/Proceed model was developed for adult health education programs (Green et al. 1980 cited in Graeff 1993, Green et al. 1988). In this model, predisposing, enabling and reinforcing factors are discussed in relation to behavioural change. A predisposing factor could be, e.g., the awareness of a guideline, while enabling factors could be various practicalities facilitating the introduction of a new practice. When a new behavioural pattern is tried, e.g., prescribing in a different way than before, reinforcing factors (e.g., through positive comments on the new therapy by peers or positive feedback from patients) may be necessary to establish the new behaviour (Tamlyn & Battista 1993, Soumerai & Lipton 1994). These kinds of factors are related to motivation and overcoming barriers to change, as described by Gray (1997). In the study here, again taking a UTI example, this could be described as follows; A predisposing factor for change to recommended UTI drugs was awareness of the recommendations. An enabling factor was, e.g., that individual doctors added the recommended drugs to their so-called ”favourites” in the computerised record system. Reinforcing factors were comments by peers that the recommended drugs were effective also in practice.

”The diffusions of innovation” model (Rogers & Shoemaker 1971 cited in Graeff 1993), describes five steps in the adoption process of a new practice. These steps are knowledge (earlier called awareness), persuasion, decision, implementation and confirmation (earlier described as adoption). The importance of change agents in the social environment is stressed. In relation to adoption of new drugs this was first observed by Coleman et al. (Coleman et al. 1966) and later by Greer (1988). The importance of these so-called ”social ties” was recognised in the studies II and IV-VI, by using peer group discussions, where the peers could be expected to be part of each other’s social environment and influence the adoption practice of a new prescribing pattern, e.g., to use the recommended UTI drugs. The relationship between the person, the behaviour and the environment and an emphasis on self-directed learning as a natural process was described in the ”Social learning theory” (Bandura 1977). Further, awareness of a problem or a need on the part of the prospective adopter of a new technology was seen as important in a study on physicians’ views of change processes (Geertsma et al. 1982). Common themes in all these models are the importance of other persons for inducing change and that change is a multi-factorial event, complex to elicit.

”Academic detailing” is a concept introduced in the beginning of the 80s in the area of educational outreach to improve drug prescribing (Avorn & Soumerai 1983). ”Academic detailing”, originally based in the social marketing approach, includes elements of most of the above mentioned theories. Theories on adult learning are, however, not explicitly addressed. ”Academic detailing” has been summarised as follows (Soumerai & Avorn 1990); (i) assessment of motivation for current practices and barriers to change, (ii) focusing on specific physician categories, (iii) developing objectives for the education, (iv) establishing credibility (v) encouraging participation, (vi) using concise educational material, (vii) repeating key messages, and (viii) ideally providing reinforcement through more than one visit.

In the studies here, academic detailing was the dominating framework in study II, while in the study presented in papers IV-VI, theories on adult learning were emphasised together with the use of educational outreach visits. The first point in academic detailing, given above, was partly addressed through the studies I and III. In addition, the feedback material used during the intervention (IV-VI) provided insight into current practices and was, during the sessions, used to discuss motivation of

current practices as well as barriers to change. One specific example was that many GPs thought that norfloxacin was a first choice drug for uncomplicated UTI, despite the contrary view in the guidelines (Strandberg et al. 1990). The focus on one physician category, GPs, was clear. The objectives of the education were clear in both educational models and can be described as prescribing according to recommendations for specified disease areas. The content credibility has been discussed previously. The source and facilitator credibility was in the "*Drugwatcher*" model achieved through the local department of clinical pharmacology, where the GP and pharmacist were employed part-time. As a member of a local DTC, the GP had high credibility among his colleagues in the drug therapy field. In the second case, a medical university, Karolinska Institutet, was the source, likely to provide credibility. However, as has been pointed out, it is not necessarily the case that researchers are perceived as credible by practitioners (Sanson-Fisher & Cockburn 1993). In our case, the facilitators were both experienced practitioners in their respective fields. Active participation in the educational meetings was encouraged through an open atmosphere in the meetings. The participation was essential, especially in the study reported in papers IV-VI, where peer group discussions approaching peer review (Grol & Lawrence 1995) constituted a main component. The educational material was concise and not superfluous. In the first model, repetition of key messages was provided through the combination of written and oral information, while in the new model two visits were made repeating the same message, using different feedback material as the basis.

Evaluation of the educational models

Design and analytical considerations

Two partly conflicting views have been presented in the literature on the design of studies dealing with educational influence. One view is critical towards using experimental designs, which assume that learning is a discrete event, where change is considered measurable in observable practice or knowledge, and where self-directed CME as a factor in maintaining competence is usually not emphasised. More qualitative studies are called for to increase understanding (Bashook 1993). The other view calls for increased research using proper designs to evaluate effects, i.e.,

preferably RCT, (Soumerai & Lipton 1994). As mentioned, a common problem in studies concerning influence of physician behaviour is the use of incorrect units of analysis (Soumerai & Lipton 1994), e.g., analysis at the patient level, when intervention was at the doctor level, or analysis at the doctor level, when intervention was at the group level. GPs in Sweden usually work in group practices, and therefore education is most often performed in groups (Wahlström et al. 1995, Tomson et al. 1994, 1997, Ekedahl et al. 1994, 1995), giving rise to dependencies within the groups. When education is performed in groups, the group should ideally be treated as one unit (cluster) in the design (e.g., in the randomisation process if applicable) and subsequently in the analysis (Diwan et al. 1992b). After data have been aggregated to the correct level for analysis, the analysis might be carried out with weighted or unweighted data. In cases of unbalanced data sets, weighting is theoretically preferred, so as not to overestimate the contribution of smaller clusters (Kerry & Bland 1998). Common in health services research is an hierarchical structure of the data. Methods for analysing hierarchical clustered data, such as multilevel models, allow aggregation at the various levels, by controlling for correlations, e.g., between individual patients belonging to the same doctor, but without losing the individual data point from each patient. Due to the clustering, dependencies arise between the individual observations at each level. Because of these dependencies and the often unbalanced data sets, it has been increasingly recognised that multi-level techniques are appropriate when analysing health care data (Rice & Leyland 1996). In the studies here, the study for Papers IV-VI were randomised and analysed at the group level, with the analysis performed through multi-level analysis in Papers V and VI. In Paper IV, a weighted group mean was applied to take the various group sizes into account. In study I, data were collected and analysed at the individual level (no intervention). In study II, intervention for norfloxacin and buprenorfin was conducted in groups, while the other intervention was only written and thus could be regarded as an individual intervention. The data in this study was analysed at the doctor level. An overestimation of the difference between the two study areas is therefore likely.

Questionnaires as evaluation tools

A central theme in this thesis is evaluation of the developed educational models. The educational influence has been measured by knowledge and attitudes related to

prescribing (II, V) and by practice measured through dispensed prescriptions (II, VI). This work was carried out with the view that it was possible to determine certain answers to knowledge and attitude questions and certain prescribing behaviours as desirable or in accordance with recommendations in guidelines. Besides this evaluation of a more objective nature, the participants' subjective evaluations of the models have been included (II, IV).

Knowledge and attitude questions have been used to explore attitudes, e.g., in Paper I, regarding various drug information sources and hypothetical drugs, and as an instrument to evaluate the educational influence (V). Responses to knowledge and attitude questions may also be used for understanding barriers to change (van der Weijden et al. 1998), such as lack of knowledge or conflicting attitudes, or for detecting knowledge gaps, complementing GPs' self-assessment of educational needs (Tracey et al. 1997). In the study presented in Papers IV-VI, each GP group's responses to the knowledge and attitude questionnaire were examined prior to the intervention sessions to find specific knowledge gaps in each GP group (see Tables 2 and 3, Paper V for general knowledge gaps). The result of this was not explicitly stated during the educational sessions, as such a practice was thought to lower the value of using the same questions as outcome measures.

Practices following the so-called KAP-model, knowledge-attitudes-practice, are often implicitly used when developing (Kanouse & Jacoby 1988) or evaluating (Diwan et al. 1997) educational interventions. This practice implies that knowledge could be used as a surrogate variable for competence or practice, which has been questioned (Dall'Alba & Sandberg 1996, Diwan et al. 1997), indicating that knowledge tests alone are a less meaningful way of evaluating educational interventions. Knowledge has, on the other hand, been described as a predisposing factor, although not sufficient, for individual behavioural change (Green et al. 1988).

Working with this type of education, where the ultimate aim is to influence practice, it must, however, be acknowledged that practical clinical competence is not possible to evaluate by using knowledge tests. Some kind of practice measure is then needed. In the studies here we used prescribing. However, also studying practice has limitations as, e.g., all participants in a study will not encounter exactly the same patients, unless, e.g., simulated patients are used (Rethans et al. 1996). Applied knowledge is, according to the so-called RECAP-model (Recall, Comprehension,

Application, Problem solving), the step closest to practice and has been considered measurable through structured questions (Imrie 1995), as done here.

Face validity (the instrument appears to be assessing the desired qualities) and content validity (whether the instrument includes all the relevant or important content or domains) of the scales (Streiner & Norman 1995) were obtained by presenting the instruments to practising GPs and experts in the respective fields. A slightly different version of the scale for subjective evaluation of the meeting presented in Paper IV has been successfully validated regarding construct validity in the Netherlands (de Vries 1998).

Prescribing as an evaluation tool

Prescribing might be measured in volume, cost or quality (de Vries C 1998). In the studies here we have used variants of volume (II, VI) and quality (VI). The variant of volume used in Paper II was the percentage of doctors, prescribing a certain drug during a certain period of time. In Paper VI the number of prescriptions used in calculating the prescribing indicators was presented. As was elucidated in study II the prescribing pattern might vary immensely between individual prescribers. This was later confirmed in the feedback used in the educational meeting in the study presented in Papers IV-VI. Various units (Lee & Bergman 1994) at various levels of data aggregation (Lee & Bergman 1994, Soumerai & Lipton 1994) might be used when describing or comparing prescribing patterns. Units were compared in a review article (Merlo et al. 1996). The authors recommended the continued use of DDD in favour of other proposed units, indicating, however, that, e.g., prescribed daily dose might be used in a second step to explain differences. To enable comparisons, it is common to present DDD per 1000 inhabitants and day (e.g., Drug statistics 1997). Data aggregated in this way provide an overview of prescribing patterns, and differences in various geographical areas might be detected (e.g., WHO Drug Utilization Research Group 1986, Drug Statistics 1997, Larsson et al. 1993). Recently, the term DU90 has been introduced as a way of focusing the further analysis on the drugs representing 90% of prescribing in, e.g., one health facility (Bergman et al. 1998). DU90 could be related to the recommended drugs list and shown graphically as green (on the list) or red staples. However, it says nothing about the quality of prescribing with regard to individual patients.

When examining the quality of prescribing, the number of patients or proportion of patients in a certain population receiving a certain drug is often reported (e.g., Larsson 1995). Sometimes ratios are presented, e.g., between beta-agonists and steroids (Tomson et al. 1997) or between recommended and non-recommended drugs (Peterson et al. 1997). Changes in ratios are, however, difficult to interpret as they could be due to either a change in the numerator or denominator or both, and the ratio does not tell which. Nor does it examine the quality of prescribing with regard to individual patients. Often, not only the overall prescribing or dispensing of a drug is of interest, but also combinations of various drugs for individual patients. Within this approach the use of prescribing indicators, where one data point is attributed to individual patients, has been developed (e.g., Oborne 1997). Indicators in general have been defined as definable and measurable, important in determining the outcome of care or a desired outcome itself, and something that can be changed (Grol & Lawrence 1995). For the analysis in Paper VI, prescribing indicators were developed and used (described in detail in the appendix to Paper VI). Dispensed drugs were aggregated to individual patients for the asthma indicators. For UTI each prescription was analysed separately, as only short-term, single treatments were considered. A full patient identification number was not available, but we used year, month and date of birth, combined with sex and prescribing doctor, to get as good a patient identification as possible. Through this procedure, a few prescriptions have been miss-classified. Examining this problem in some GP groups through the use of the name of the patients, it was seen that only very few patients were miss-classified. This problem was thus small, compared to the advantage of being able to use the indicators. The medical relevance of the indicators has been assessed thoroughly in Paper VI.

Results of the evaluation

The results from the randomised controlled educational study (Paper VI), confirm previous findings that educational outreach may be effective in changing practice also in well controlled studies (e.g., Soumerai et al. 1989, Denig 1994, Thomson 1999a, Davis et al. 1992, Davis et al. 1995). The unique strength of the study presented in Papers IV-VI is the simultaneous testing of a new educational model for two different conditions in a parallel study, i.e., controlling for the attention effect created by the educational sessions. We saw statistically significant, and potentially clinically

important, changes in prescribing as well as in knowledge for one of the educational areas (UTI), but not for the other one (asthma). There are a number of differences between the two conditions, which together might explain this. For asthma, major changes in treatment had occurred (Diagnosis and Therapy Survey 1990-1997) in connection with as well as after the publication of international (International consensus 1992) and national guidelines (Strandberg et al. 1993) emphasising continuous inflammatory treatment. This was also reflected in our data. A significant time trend was found regarding decrease in the percentage of patients dispensed ”high-level short-acting inhaled bronchodilator” (defined as more than a mean of ¼ DDD per day during a six-month period). No similar time trend was seen regarding increasing use of recommended drugs for uncomplicated UTI (Diagnosis and Therapy Survey 1990-1997). Regarding uncomplicated UTI, many GPs wrongly believed flouroquinolones to be first choice drugs. Also practical methodological aspects having methodological consequences are involved, such as the time-span between the prescribing and dispensing of prescriptions. For UTI this time is usually short, while for asthma it could be up to one year. We included a period between the intervention and the outcome registration period in order to minimise the effect of this difference, but still many prescriptions for asthma collected during the outcome period were prescribed already before the intervention. Another methodological aspect relates to the concordance between the pre-determined messages, the tailoring of the education, and the outcome measures; for UTI there was a clear concordance between these three entities, while for asthma there was not. The main message for UTI was ”Use first choice drugs”. This was discussed during the intervention, and one of the prescribing indicators related directly to this issue. For asthma the messages were more complex as was the development of relevant prescribing indicators. For asthma, one of the main messages was to use inhaled corticosteroids when needed (i.e., when a bronchodilator on average is estimated to be used more than twice a week). Almost all GPs already agreed to this practice in theory, and many discussions came to focus on the problem with patients not adhering to an agreed treatment, an issue not captured in the outcome measures. Further, treatment for a chronic condition is likely to be more dependent on factors such as, e.g., the views and ideas of the patients, compared to a short-term treatment (Daly et al. 1997). Altogether, these are some reasons that might

explain why the education (assessed and evaluated in papers IV-VI) was effective for UTI but not for asthma, using the defined outcome measures, in the Swedish context.

CONCLUSIONS AND FUTURE RESEARCH

It was found that GPs appreciated the types of non-commercial education on drug treatment developed in this work, i.e., education in small peer groups, facilitated by an external team of one GP and one pharmacist. For the new model presented in Papers IV-VI, individual feedback was used as one of the main educational components. Use of individual feedback has previously been considered to constitute a threat to GPs' integrity and thereby not optimal to use (Tomson et al. 1994). In this study, however, it was highly appreciated. As prescribing is an individual decision, the use of aggregated feedback data, often used, could be questioned, based on the wide inter-individual prescribing patterns also among GPs working together, e.g., in the same health facility. To compare the effectiveness of different kinds of feedback (e.g., feedback on written simulated cases as compared to prescribing feedback or various models for prescribing feedback) is an area in need of future research.

The outcome result (Papers V-VI) in the intervention study is promising. A potentially clinically important increase in prescribing of first choice drugs for UTI was found (Paper VI). It was also possible to show an important increase regarding knowledge of first choice drugs for UTI (Paper V). This consistency in changes in knowledge, measured through a test of applied knowledge, and changes in practice, measured through prescribing, is an indication that tests measuring applied knowledge sometimes could be used as a proxy for practice. The outcome in terms of changed prescribing patterns is especially convincing, as the attention effect was controlled for. Further, the results indicate that effects of an education may be specific to a certain condition in a certain context. In this study, the education was effective in changing prescribing for UTI - but not for asthma - in the Swedish context. In other countries in the DEP, e.g., in the Netherlands, effect was shown for asthma but not for choice of UTI drugs (Drug Education Project 1998). This makes it necessary to be careful in generalising the conclusions from educational outreach studies concerning one disease in one context to other conditions in other contexts. On the other hand, it is not possible to make experiments on every possible educational model for all possible disease conditions in every context. The pragmatic conclusion is that the best way probably is to be aware of the existing scientific knowledge base of relevance for educational outreach. That is, to acknowledge previous research regarding educational

outreach as well as theories on adult learning and behavioural change, when developing new educational packages for prescribing influence, and to evaluate new educational models for at least some condition in the context in question, before application in practice.

The use of a qualitative study (III) gave results important for understanding doctors' ways of experiencing their role in the doctor-patient relationship in management of asthma and is highly relevant for incorporation in future work on education in asthma treatment among GPs. One possible use would be to in advance map out the views of GPs participating in an educational activity and to focus the intervention, accordingly. Further it would be relevant to study GPs' ways of experiencing some other diseases and to compare those results with the results concerning asthma, to establish whether or not a general pattern is observable. The following area of research could be to develop targeted educational activities (using an instrument to map participants different ways of understanding management of the educational area in advance) and to compare such targeted activities with "ordinary outreach". This would mean that questionnaire instruments had to be developed to map out the views, as interviews, being very time-consuming, are not suitable for routine use. The instrument development would however take substantial time, again an illustration of the balance between understanding, description and intervention.

The financial aspect of continuing education on drug treatment was not included in this work. However, an estimated cost of the "*Drugwatcher*" model, in routine use, was 0.3% of the average value of each participating GPs' prescribing per year (Paper II). For the model in Papers IV-VI, a crude estimate of the developmental cost including the evaluation component was, per GP in the study, 1% of the average value of each GP's prescribing per year. In this estimation, the total project cost is allocated to one year. If also the GP's time for participating in meetings and completing questionnaires is included, the figure becomes roughly 1.3%. These figures should be seen as equivalent to an investment cost. If the model were to be introduced in practice, this percentage would decrease substantially; to what level would depend on the frequency of the education. If the investment cost is related to all practising GPs in Sweden, this cost per GP would be 0.05% of the prescribing cost per year. Resource allocation in this area is important and in need of further research. It is obviously important to study and compare the cost-effectiveness of different models of CME.

Related to this is that, when the county councils take full financial responsibility for the reimbursed part of the drug bill, they will indirectly pay also a substantial part of the commercial information (included in the drug price) without really being able to influence its messages.

An issue not addressed here is the consequence of the outreach person also being one of the investigators. This was the case in the studies presented here (II, IV-VI) as well as in other studies (e.g., van der Weijden, Ekedahl et al. 1995), but not in all (e.g., Wahlström 1997a, Tomson et al. 1997). Preference is probably often decided on a pragmatic basis. A more thorough analysis of the issue has not been found in the literature and is suggested for further studies. A related question is to compare the effectiveness of external facilitators with internal facilitators in educational activities for GPs.

Another issue concerns the influence on individual prescribers. A comment often made when presenting the analysis for the study presented in papers IV-VI is that ”prescribing does not occur in groups, it is an individual decision”. This is partly true. The writing of a prescription with a pen or a computer is an individual decision but, as has been presented here, many factors influence this final decision - it is not done in ”splendid isolation”. This does not mean that individual group members may not be influenced by educational activities to various degrees (there are certainly individual GPs who participated in the asthma intervention where a substantial change in individual prescribing indicators was seen). To somehow map out factors determining this individual change is a topic for future research.

Some issues have been raised and discussed during this work but not yet completed, e.g., to finalise the outcome presentation of the written simulated cases. In these cases, factors contributing to the decisions are estimated, in addition to the decision as such. Does this add important understanding compared to the use of more common outcome measures such as prescribing or tests measuring applied knowledge? And, in addition, to evaluate the effectiveness of a practice when GPs themselves use written simulated cases as educational material in GP groups without external facilitators. Another issue is to analyse the importance of the gender of the doctor for variations in prescribing patterns. In a sub-study regarding the responses to the simulated cases, we made some analysis of drug choice, depending on the GP’s sex, and found some differences that warrant further analysis (Wahlström et al. 1996).

Further, to perform qualitative interviews with doctors who have participated in the "*Drugwatcher*" activity since the outset and doctors who have not. The aim would be to identify differences in views on drug treatment and views on education on drug treatment. The hypothesis would be that the doctors participating in the "*Drug-watcher*" have a more critical view, e.g., towards quick introduction of new drugs.

EPILOGUE

The work resulting in this thesis has been carried out over a number of years and in several places, although mainly at IHCAR. Here, and also during my time at the Division of Clinical Pharmacology at Huddinge University Hospital and Södersjukhuset a long time ago, I have met people from many different countries, e.g., Thailand, Vietnam, and Zimbabwe. More than once I have been struck by the similarity in the types of drug use problems, although the magnitude of the problems is much greater in many other countries compared to Sweden. Drug use in Sweden, however, is not always as optimal as we sometimes tend to believe, and many things could be learned from other countries. This thesis is hopefully an inspiration and appetiser for those working in the area of non-commercial continuing education on drug treatment in many countries, especially for those in primary care. This type of health technology assessment is an area of international interest. Having reached this point, I see that theories on adult education and behavioural change could generally have a much more prominent place in continuing education on drug treatment. With this in mind, I want to use my experiences in continuing education on drug treatment in future studies. During the realisation of the studies presented here, I have learned a lot and become increasingly interested in development and evaluation work in this area. In many ways I see the completion of my thesis as a starting point.

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[25] Acronym for the new educational model project, the Swedish study within DEP.

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[26] My Tibetanian spaniel.
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