Changing GPs’ prescription patterns through guidelines and feedback. Intervention study

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SUMMARY

Purpose To investigate whether and how a multi-dimensional intervention including clinical guidelines on the choice of medical treatment in the primary and the secondary health care sector, and individual feedback to general practices about their own and other practices’ prescription patterns in five Anatomical Therapeutic Chemical classification system (ATC)-groups was followed by changes in the practices’ prescription pattern.

Methods Prospective historical registry study and a questionnaire study of GPs’ self-reported use of guidelines and feedback.

Results In every ATC-group the number of prescribed defined daily doses (DDD) kept growing after the intervention, while potential savings by DDD decreased. Individual practices’ changes in the prescription pattern differed by ATC-group and practices with high potential savings/DDD before the intervention showed the greatest relative reduction in potential savings/DDD. The county’s average cost/DDD for the five ATC-groups declined from above the Danish average before the intervention to a level below the average cost/DDD after the intervention. In the questionnaire study (response rate: 79%), 69% of respondents had read the guidelines and 78% reported that the feedback influenced their prescription of drugs.

Conclusions The observed changes in drug costs and potential savings were not due to volume effects but a combination of price effects, including generic substitution and choice of less expensive analogues, demonstrating that it is possible to change GPs’ prescription patterns without interfering with patients’ access to treatment or with GPs’ clinical freedom.

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INTRODUCTION

Increasing drug costs is a matter of concern in many countries, and increased utilisation of less expensive generic and analogue substitutes could probably result in substantial absolute savings.1,2 By law, Danish pharmacies must substitute more expensive brand of drugs with less expensive generic substitutes when
possible, unless the general practitioner (GP) for medical reasons demands that the pharmacy hands out a specific brand of drug by indicating ‘Do Not Substitute’ (DNS) on the prescription form. Much effort has been aimed at counselling GPs to choose the least expensive generic or analogue substitute, but behavioural change is difficult to achieve. We have performed a registry study to investigate how a systematic multi-faceted intervention, including clinical guidelines on prescribing, individual feedback to practices and offers of outreach visits influenced:

- Individual practices’ choice of drugs within five Anatomical Therapeutic Chemical classification system (ATC)-groups.
- Drug costs.
- Potential savings on drug costs.
- Whether changes in costs and potential savings reflected volume or price effects.

A supplementary questionnaire study investigated GPs’ views on the intervention.

The GPs’ representatives and the county agreed on the intervention, and no randomisation took place. The rest of the country was used as a control group. No nationwide intervention was performed to improve the prescribing behaviour.

**Ethics**

The present registry study included no data on individual patients, presented no ethical issues and did not require permission from the Regional Committee on Biomedical Research Ethics.

**SETTING**

*Prescribing and dispensing of drugs*

In Denmark only medical doctors are allowed to prescribe drugs to non-hospitalised patients, and only pharmacies are allowed to dispense prescription drugs. Since 1991 pharmacies have been obliged to offer the patient the least expensive generic equivalent. If the GP marks the prescription form ‘DNS’, the pharmacy must provide the patient with the brand name drug specified by the GP and pharmacies are not allowed to offer a less expensive analogue drug.

Drug companies may change drug prices once every 14 days. The drug which is the least expensive to the county is always the least expensive to the patient. If patient payments exceed an upper yearly limit, the county reimburses the patient’s drug costs above the limit. Patients’ visits to the GP are tax-financed and free of charge for each patient, if the GP has a contract with the county they practice in. In reality, no GP practices without a contract with the county. GPs are self-employed, working single-handedly or as partners, sharing a contract with the county. Because of the partnerships the number of practices, identified by a unique identification number for billing purposes, is smaller than the number of GPs practicing in the county. In the present study, observations were related to each practice’s identification number, not to the individual GP.

**MATERIAL AND METHODS**

*Intervention*

The study was performed in a county where expenditures on drugs prescribed by GPs rose by 17% from 2001 to 2002, faster than in the rest of Denmark, and where sex- and age-adjusted drug costs were 2% higher than in the rest of Denmark.

By June 2002, the Danish government decided to reduce its subsidy of drug costs from 100% of the expected growth in 2002 to 50% of the expected growth in 2003; thereby creating an incentive for the counties to reduce the growth in order to avoid cutting expenditures on the counties’ two main areas of responsibility: hospitals and primary care, including GPs. Meanwhile, representatives for the counties and for the GPs negotiated a new GP contract at the national level, taking effect on 1 April 2003. The new contract included a vaguely defined obligation for the GPs to include economic considerations in their prescribing decisions.

In October 2002, Roskilde County Council and representatives for the GPs in the county agreed on an intervention with the twofold objective of securing optimal medical treatment of patients and a reduction in the growth of the county’s drug costs.

Based on reviews of previous interventions to reduce expenditures on drugs and an earlier successful local intervention’ the GPs and the county decided to:
Perform a multi-dimensional intervention study including clinical guidelines, individual feedback to the practices and offers of outreach visits,

Investigate the effect on individual practices’ prescription patterns and

Investigate the effect on the county’s costs and potential savings.

The study included no direct financial incentives for the GPs. However, the GPs probably assumed that, unless the growth in drug costs decreased, the national or local government would probably try to reduce costs by reducing GPs’ clinical freedom or introduce other sanctions which were less acceptable to the GPs than the intervention.

ATC-groups

The county and the GPs’ representatives included the following five ATC-groups of drugs, which were the costliest to the county, and whose volume and cost showed the fastest growth in early 2002, before the intervention. In each of the five groups the number of prescribed defined daily doses (DDDs) and the county’s drug costs were growing rapidly when the intervention was decided upon:

- Anti-inflammatory and anti-rheumatic products, non-steroids ‘NSAIDs’ (M01A).
- Drugs for peptic ulcer and gastro-oesophageal reflux disease (A02B).
- Antidepressants (N06A).
- Blood pressure reducing agents: diuretics (C03), beta-blocking agents (C07), calcium channel blockers (C08) and agents acting on the renin-angiotensin system (C09).
- Serum lipid reducing agents (C10).

Clinical guidelines

From November 2002 to February 2003 each GP received clinical guidelines, developed by the GPs’ representatives, specialists from hospitals and a pharmacist employed by the county, on choice of drug within the five ATC-groups, including:

- Clinical guidelines on treatment prepared in cooperation with specialists from hospitals and general practices: approximately one page with general advice on symptoms and indications for and choice of medical treatment; a short specific recommendation by a pharmacist on which active medical agent (analogue products) was the least expensive at the time of writing; recommendations on which brand name drugs to use, and recommendations on which drugs to avoid for medical or economic reasons.
- General recommendations not to prevent generic substitution when the patient picked up the prescription.
- Guidelines and recommendations were revised once a year. In case of major price changes the GPs were informed about new recommendations by mail.

Individual feedback to GPs

From October 2002 and onwards each practice in the county received feedback four times a year about its prescriptions in the preceding quarter of a year, including:

- The share of prescriptions where the practice and the average practice indicated ‘DNS’.
- The total number of DDDs prescribed in the practice compared with the average practice, after adjustment for patients’ sex and age.
- The county’s expenditures on drugs prescribed in the practice and in the average practice, adjusted for patients’ sex and age.
- The age- and sex-adjusted number of DDDs prescribed in the practice and in the average practice for each of the five ATC-groups.
- The age- and sex-adjusted costs to the county of the DDDs prescribed in the practice and in the average practice for each of the five ATC-groups.
- A short report on which brand drugs were currently the least expensive within each of the five ATC-groups.
- Potential savings in each practice by consistent use of the least expensive analogue for each of the five ATC-groups.
- Recommended and dis-recommended drugs’ share of DDDs prescribed in each practice.

Standardisation for age and sex was performed by calculating the average number of DDDs/patient and cost/patient in 10-year-age groups for men and for women; the expected number of DDDs/practice and cost/practice was calculated by multiplying the number of patients in each age and sex group with the average number of DDDs/patient and the average cost/patient, and the actual numbers and costs were compared with the calculated expected numbers and costs.

Outreach visits

One year after the intervention was implemented, all the practices in Roskilde County were offered...
individual advice on prescription by outreach visits by two persons: a pharmacist employed by the county and a GP elected by the GPs practise in the county. The 10 practices with the highest sex- and age-adjusted total cost/patient on prescription drugs in the five ATC-groups received a personalised invitation to an outreach visit from the GPs’ organisation in the county.

DATA

All prescriptions from 1 January 2000 to 30 September 2004 were included in the study.

By law pharmacies must report data on each prescription picked up at a pharmacy, including ATC-group, number of DDDs, cost and the practice’s identification number to a national administrative database. If a patient picks up drugs at a pharmacy outside the county, the prescription’s data are reported to the database anyway. The data are validated by the government (The Danish Medicines Agency). We obtained data on prescriptions from the database. Data on the number of patients affiliated with each practice and patients’ sex and age were collected from another administrative database.

THE QUESTIONNAIRE STUDY

In January 2005 a questionnaire developed specifically for the present study was sent to all GPs practising in the county. The questionnaire included 15 questions on whether the clinical guidelines and each table and graph in the feedback were considered useful and whether they were actually used by the individual GP. The questionnaire was validated for understanding and content by two GPs. No reminder was sent. The data were entered into a database (Epi Info Version 3.2.2, 14 April 2004).

ANALYSES

Using the software developed specifically for this purpose, we computed the following data for each quarter of a year from 1 October 2002 to 30 September 2004:

- The share of prescriptions from each practice where ‘DNS’ was indicated on the prescription form.
- The total number of DDDs prescribed by GPs in the county of all drugs and in each of the five ATC-groups.
- The cost to the county of DDDs prescribed by GPs in the county of all drugs and in each of the five ATC-groups.
- Total costs to county and patients combined of DDDs prescribed by GPs in the county in each of the five ATC-groups; compared with total costs if GPs had always prescribed the least expensive analogue.
- Potential savings in each practice achievable by persistent use of the least expensive analogue. The calculation was performed for all prescriptions in the five ATC-groups in each practice. Potential savings were calculated for each prescription as the difference between the total cost (to the county and patients combined) and the cost if the GP had always chosen the least expensive analogue available in the quarter. In order to ease the calculations, potential savings were calculated using the price of the least expensive drug at the end of a 3-month period, even if a low drug price only became available late in the period, or if prices were lower at the beginning of the 3-month period. Total potential savings were underestimated because a substitute was not identified for each and every drug. However, the objective of the study was not to quantify potential savings but to study whether potential savings could be reduced and therefore this systematic error did not present a problem.
- The difference between the numbers of DDDs prescribed in the average practice and in each practice after standardisation for the practice’s enrolled patients by sex and age (10-year-age groups). A similar calculation was performed for drug costs in each drug group in each practice.
- Potential savings by DDD in each practice for each of the five ATC-groups. Each practice was compared with itself before and after the intervention.
- Potential savings by DDD across counties was calculated for the five ATC-groups as the sum of prescribed DDDs multiplied by the actual price and subtracting the sum of the prescribed DDDs multiplied by the price of the least expensive drug.
- Recommended drugs’ share of prescribed DDDs within each group of analogues.

RESULTS

The study group in this registry study was similar to the source group, including all the 98 general practices in the county. Data on 3,161,737 prescriptions and 142,092,568 DDDs were included in the study.

Sixty percent of the practices requested an educational outreach visit individually or in groups. Practises’ use of ‘DNS’ decreased by 37% from 10.6% in the fourth quarter of 2002 to 6.7% in the third quarter of 2004. Average potential savings by DDD
were not associated with practices’ use of ‘DNS’ (Figure 1). Roskilde County’s average cost/DDD for all drugs decreased by 22% from DKK 4.08 in the fourth quarter of 2002 to DKK 3.17 in the third quarter of 2004. The number of prescribed DDDs increased in every ATC-group after the intervention (Figure 2). The development in potential savings by DDD differed by ATC-group. However, potential savings by DDD decreased in all five ATC-groups (Figure 3). A sudden increase in potential savings by DDD for A02BC was due to the introduction of inexpensive analogues late in the quarter.

Figure 1. Practices’ utilisation of ‘Do Not Substitute’ (percentage of prescriptions where substitution was possible) and average potential savings/DDD, July–October 2002

Figure 2. Number of DDDs prescribed by quarter, five ATC-groups, 1st quarter 2000 to 3rd quarter 2004

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After the intervention, the two least expensive proton pump inhibitors’ share of A02BC rose from 27% to 39%, while the least expensive C10-analogue’s (Simvastatin\textsuperscript{R}) share rose from less than 38% to more than 76% (Figure 4). A large majority of the practices reduced their potential savings by DDD in all the five ATC-groups but individual practices’ changes differed strongly by ATC-group and by the practice’s potential savings by DDD before the intervention. Practices with potential savings/DDD above the average generally showed a greater absolute and relative reduction of potential savings by DDD than practices with a low potential savings/DDD. Two ATC-groups presenting this pattern are A02BC (Figure 5) and C10 (Figure 6). One ATC-group differed markedly from the general pattern: in N06A potential savings by DDD rose a little in practices with low pre-intervention potential savings.

After the intervention the county’s average cost/DDD for the five ATC-groups in total decreased from above the average of other Danish counties’ cost/DDD to below the average (Figure 7).

Figure 3. Potential savings (DKK) by DDD by quarter, five ATC-groups, 1st quarter 2000 to 3rd quarter 2004

Figure 4. Recommended analogues’ share of total number of DDDs in two ATC-groups (C10 and A02BC), 1st quarter 2000 to 3rd quarter 2004

The questionnaire was filled in by 119 GPs (response rate: 79%). Sixty-nine percent of respondents had read the guidelines on prescription. Ninety percent of the respondents found that the feedback contained useful information about their prescriptions. Seventy-eight percent of respondents found that the feedback influenced their prescription of drugs, and 81% reported that drug prices had become important for their choice of drugs after the intervention was introduced. Fifty-eight percent of respondents reported that they had been surprised by the results of comparisons of their own and the average practice’s prescription pattern.

**DISCUSSION**

Increasing drug costs is a major issue in public and private health services, but attempts to limit the growth...
through various cost-control policies have caused concern about negative unintended side effects like restrictions on access to needed drugs. Generics and analogues provide the same clinical effect at a different cost without restricting access to treatment. The present study was based on the assumption that a change in clinical practice towards more widespread use of generics and less expensive analogues represents an important potential for a more efficient use of the health services’ resources by reducing the growth in drug costs without compromising patients’ access to treatment.

**Changing clinical practice**

Educational materials may have small effect on clinical practice like prescribing behaviour, but clinical practice may be changed by use of clinical guidelines, if they are developed, disseminated and implemented appropriately. In one study of guidelines and feedback, behaviour change was maintained in the intervention group 5 years after the intervention. The evidence on whether multi-dimensional interventions are more effective than single interventions is weak and inconsistent.

Most interventions to change GPs’ prescription behaviour can lead to change under some but not all circumstances. Four interventions have been consistently effective:

- Educational outreach visits.
- Reminders.
- Multi-faceted interventions (combinations that include two or more of the following): audit and feedback; reminders; local consensus processes, or marketing.
- Interactive education meetings.

In the present study a systematic multi-faceted intervention replaced several years’ unsystematic attempts to develop prescribing behaviour in general practice.

**Generic substitution**

After the intervention, the practices on average became more likely to allow generic substitution in accordance with the recommendations. However, neither before nor after the intervention, practices’ willingness to allow generic substitution was associated with their potential savings by DDD. One possible explanation for the lack of association may be that GPs do not prevent generic substitution in order to prescribe expensive brand drugs but to avoid changes in the drug brand and visual characteristics each time a patient picks up a prescription at the pharmacy. However, the present study does not provide any evidence on GPs’ motives for the use of DNS.

**Analogue substitution**

Before the intervention the number of prescribed DDDs was growing in each of the five ATC-groups. After the start of the intervention the number of prescribed DDDs kept growing in each of the five ATC-groups, indicating that the intervention’s design was successful in not barring patients from access to...
treatment and that the economic consequences of the intervention were entirely due to price effects like falling prices for specific brand drugs or GPs’ choice of less expensive analogues, while the intervention had no volume-limiting effects. The present study provides no information on practices’ actual indications for prescribing of drugs in the five ATC-groups, or on whether these drugs should be prescribed to more or fewer patients in the study area.

*Individual practices’ response*

In four of the five ATC-groups practices with high potential savings by DDD showed the largest relative reduction in potential savings. However, in one ATC-group, N06A (antidepressants) potential savings by DDD showed little change, and practices with small pre-intervention savings potentials even increased their potential savings by DDD. There may be two reasons for this development. First, two patents expired followed by the introduction of several inexpensive generic equivalents in the study period. Second, GPs may be less likely to change medical treatment for depression than for somatic conditions. If so, it is likely that GPs continue medications with drugs in use at the beginning of the study period, while only new patients receive the new less expensive drugs. A Danish study found that GPs’ assistants issue 2/3 of prescriptions, most of which are repeat prescriptions, and assistants may be less likely than GPs to consider change or suspension of treatment, thereby contributing to a time-lag in practices’ response to the intervention.

Traditionally, Roskilde County’s cost by DDD was higher than in the rest of the country. After the intervention the county’s cost by DDD decreased to a level below the average in the rest of the country, and the study area was the only Danish county which experienced a decline in total drug costs during the study period. In the absence of a randomised control group it was not possible to quantify the savings attributable to the intervention.

It was not possible to quantify the influence of each intervention in the present study. The effect of the intervention may be attributed to the following factors:

- An agreement between the GPs’ representatives and the county instead of a top-down initiative by the county.
- A multi-dimensional intervention.
- Specific recommendations on the choice of drugs.
- Regular individualised feedback to each practice on its prescription patterns.

**CONCLUSION**

After the introduction of a systematic intervention including clinical guidelines and feedback on prescribing patterns, general practices became more likely to prescribe less expensive analogues and specific brands recommended in the guidelines resulting in less variation in prescribing behaviour and a slower growth in the county’s drugs expenditures. Cost/DDD fell below the average in the rest of the country where no systematic nationwide intervention was performed. Apparently the intervention did not influence the growth in prescription volume, the observed changes in drug costs and potential savings being due to price effects (falling prices, generic substitution and choice of less expensive analogues), demonstrating that it is possible to change GPs’ prescription patterns without interfering with patients’ access to treatment or limiting GPs’ freedom of prescribing. Growing use of generic substitutes

**KEY POINTS**

- ‘Potential savings by DDD’ is a useful indicator in feedback to general practices on the economic consequences of prescribing the least expensive analogue drug.
- It is possible to reduce the growth in drug costs by the use of less expensive analogues without a reduction in the utilisation of drugs.
- It is possible to reduce potential savings/DDD without a reduction in growth in the utilisation of drugs.
- Drug costs/DDD in general practices with high use of DNS were not higher than in general practices with low use of DNS.
appeared to have much less influence on cost than growing use of analogues. The effect of the intervention differed markedly by ATC-group. Further research on the reasons for these differences is warranted.

REFERENCES


