

Changes in reimbursement policy for antibiotics and prescribing patterns in general practice

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Objective: To study the effect of a reduction in reimbursement of the cost of antibiotics on the prescribing pattern in primary care in Denmark.

Method: We analyzed the general practitioners' prescriptions of antibiotics during 1993–96 in relation to a reduction in reimbursement on the basis of national health service data in the county of North Jutland (population 488 000). On 1 January 1996 the reimbursement for tetracyclines was withdrawn, and for other antibiotics reimbursement was reduced from 75% to 50%.

Results: The total consumption of all antibiotic groups increased steadily in the county until 1995, and in 1996 a decrease of 13% was seen. A very marked reduction was noticed immediately after 1 January 1996 for the more expensive broad-spectrum antibiotics. The use of tetracyclines dropped by 42% during the first 3 months of 1996 after withdrawal of reimbursement.

Conclusions: It is reasonable to assume that the new reimbursement policy has initiated a reduction and caused a shift in general practitioners' prescribing of antibiotics. Thus a differential reimbursement policy might influence general practitioners' prescribing behavior towards antibiotics, with desirable ecological consequences.

Key words: Antibiotics, reimbursement, prescribing, primary health care, drug utilization

INTRODUCTION

Increases in antibiotic resistance and spread of multi-resistant microorganisms are matters of increasing concern worldwide. A high consumption of antibiotics has been identified as the decisive factor in this development in the hospital setting [1], but there is also compelling evidence of its importance in primary

care [2]. Thus, in the Scandinavian countries epidemic spread of penicillin-resistant pneumococci, ampicillin-resistant *Haemophilus influenzae* and erythromycin-resistant group A streptococci has been linked to high local levels of antibiotic prescribing [3–5].

Antibiotics are not sold over the counter in Denmark, but have to be prescribed by a doctor. Denmark thus has the lowest use of antibiotics among the Nordic countries [6]. Approximately 90% of the antibiotics sold in Denmark are prescribed by general practitioners [7], and their level of prescribing has been shown to vary widely [8]. There are strong incentives to restrict the consumption of antibiotics in primary care, and many methods for achieving this have been proposed [9]. One of these is the reimbursement policy, and on 1 January 1996 major reductions in reimbursement for antibiotics were put into force by the Danish

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national health service. Since such attempts to control the use of antibiotics have great economic, ecological, and public-health implications, we analyzed the immediate effect of the reductions in reimbursement on the use of antibiotics in a Danish county with nearly 500 000 inhabitants.

MATERIALS AND METHODS

The study was conducted in the county of North Jutland (population 488 000, approximately 9% of the total Danish population) from 1 January 1993 to 31 December 1996. The national health service provides tax-supported health care for all inhabitants in the county. Besides free access to hospitals, specialists and general practitioners, the national health service refunds part of the costs associated with most drugs on prescription.

The county is served by 33 pharmacies, which are equipped with a computerized accounting system from which data are sent to the health insurance

administration of the Danish national health service. Antibiotics can only be purchased on prescription, and only drugs on prescription have their costs reimbursed by the health insurance program [10]. The information in the accounting system includes the type of drug prescribed according to the anatomic therapeutic chemical (ATC) commodity number, amount of drug prescribed, the defined daily dose (DDD) [11], and date of purchase. A DDD is the average maintenance dose for the main indication of a particular drug and it allows a comparison between groups of antibiotics.

Until 1 January 1996 a 75% reimbursement was provided for antibiotics, except for tetracyclines (50% reimbursement), and cephalosporins, chloramphenicol and sulfonamide in combination with trimethoprim, which were not subsidized. On 1 January 1996 the reimbursement for tetracyclines was withdrawn, and the reimbursement was reduced to 50% for all other subsidized antibiotics. The present study covered all prescriptions of antibiotics (ATC J01), and the use of antibiotics in the county was calculated for each 3-month period from 1993 to 1996.

Table 1 Consumption of antibiotics (in defined daily doses) in the county of North Jutland from 1993 to 1996

	Tetracyclines ^a (J01AA)	Penicillins, narrow spectrum ^b (J01CE)	Penicillins, broad spectrum ^b (J01CA)	Trimethoprim and sulfonamides ^b (J01E)	Macrolides ^b (J01FA)	Fluoro- quinolones ^b (J01MA)	Cephalo- sporins ^c	Total (J01)	Increase (%)
1993	249 537	688 473	639 694	137 809	279 766	44 425	3049	2 087 504	
1994	254 585	709 566	653 960	150 715	296 157	55 122	4135	2 191 319	4.7%
1995	243 331	721 587	647 205	143 135	310 767	48 752	4119	2 195 631	0.2%
1996	156 898	688 113	555 475	138 707	265 999	36 904	3853	1 914 943	-12.8%

^aReimbursement withdrawn 1 January 1996. ^bReimbursement reduced from 75% to 50% 1 January 1996. ^cNot subsidized. ATC code in parenthesis.

Table 2 Changes in consumption of antibiotics 1994–96 compared to the same period the year before (%)

	Tetracyclines ^a (J01AA)	Penicillins, narrow spectrum ^b (J01CE)	Penicillins, broad-spectrum ^b (J01CA)	Trimethoprim and sulfonamides ^b (J01E)	Macrolides ^b (J01FA)	Fluoro- quinolones ^b (J01MA)	Total (J01)
1994–5							
1–3 months	5.2	6.8	10.8	-2.7	24.1	14.5	10.3
4–6 months	-1.8	1.1	-1.0	-3.8	4.8	-11.2	0.6
7–9 months	-11.3	-11.8	-15.7	-9.4	-13.4	-27.3	-12.7
10–12 months	-10.6	9.8	-1.4	-4.0	2.9	-19.6	1.2
1995–1996							
1–3 months	-42.2	6.6	-20.2	-7.6	-13.1	-41.9	-13.0
4–6 months	-33.5	2.1	-6.9	-0.9	-8.6	-23.0	-7.4
7–9 months	-26.5	-6.9	-4.8	-1.8	-7.7	1.7	-7.9
10–12 months	-37.0	-19.9	-19.6	-2.0	-24.7	-25.8	-20.5

^aReimbursement withdrawn 1 January 1996. ^bReimbursement reduced from 75% to 50% 1 January 1996. ATC code in parentheses.

RESULTS

The consumption of the different antibiotic groups during 1993 to 1996 is presented in Table 1. The total consumption of antibiotics in the county increased steadily until the second half of 1995, and 1995 was the year when the total consumption peaked. Total consumption showed a 13% decrease in 1996 compared to 1995. Some seasonal variations were seen, reflecting the winter periods, and this pattern was consistent for all antibiotic subgroups apart from sulfonamides and fluoroquinolones. The decrease was largest during the winter months.

The decrease in consumption differed between the antibiotic groups, with the broad-spectrum antibiotics showing the steepest decline. For most of the groups there was a small decline during the last 6 months of 1995, but a very marked reduction was noticed immediately after 1 January 1996, as shown in Table 2. After withdrawal of reimbursement for tetracyclines, the use dropped by 42% during the first 3 months of 1996. This tendency persisted during 1996. Although less marked, the same pattern was observed for fluoroquinolones, macrolides and broad-spectrum penicillins but not for the cheaper narrow-spectrum penicillins. The consumption of penicillins, macrolides and tetracyclines in 1994–6 compared with 1993 (index=100) is shown in Figure 1.

DISCUSSION

We found a major decrease in the prescription of antibiotics after the change in reimbursement policy. The decline started in the second half of 1995, but the prescription rate of antibiotics was considerably diminished from the beginning of 1996, when the new reimbursement policy was put into action. The reduction was most pronounced for the broad-spectrum antibiotics, especially for tetracyclines, for which reimbursement was cut off. It seems prudent to assume that the change in reimbursement policy at least prompted the reduction in prescriptions of antibiotics. The intended changes attracted great attention from the public, and the mass media supported restrictive use of antibiotics. A change in the public opinion of what is good clinical practice has previously been shown to influence doctors' behavior, and this might have enhanced the effect of the change in reimbursement [12]. The general practitioners were informed by the Danish National Board of Health prior to the reduction in reimbursement for antibiotics. This, together with the mass media attention, might explain the decrease in prescriptions of antibiotics prior to 1 January 1996, when the reimbursement was reduced.

In this observational study without randomization, it is possible that not all the observed changes are caused by the intervention, and there is a risk of overestimating

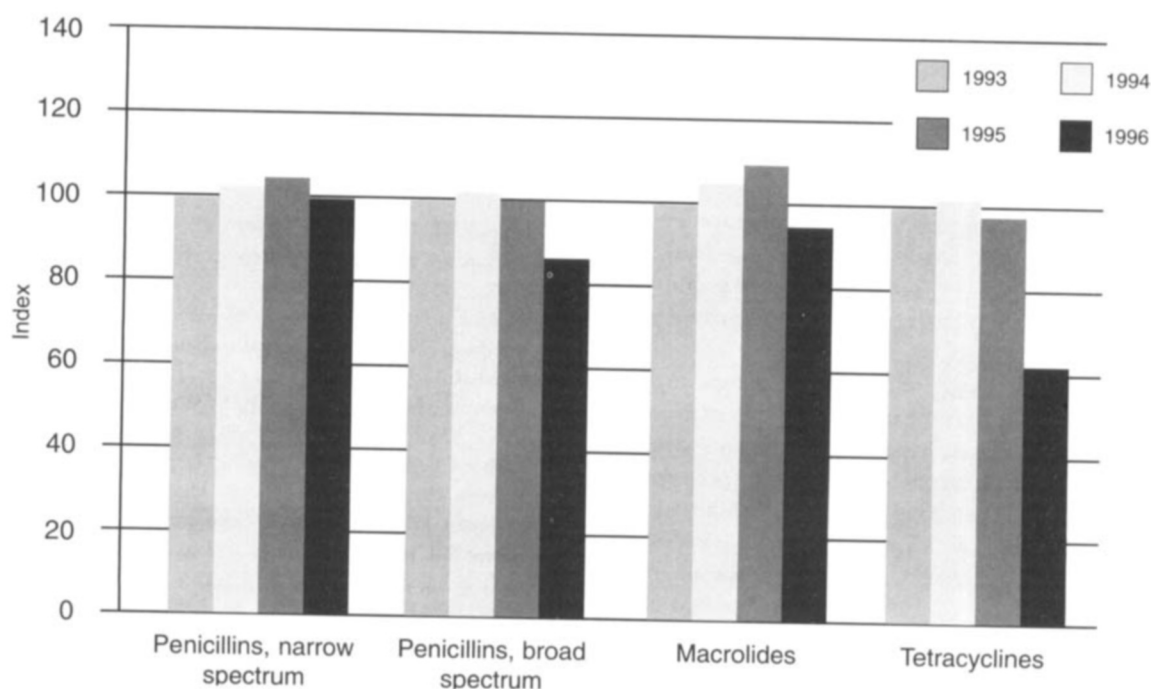


Figure 1 Index for use of antibiotics 1994–6 compared with 1993 (index 1993=100)

the impact on prescribing [13]. However, the abrupt decrease in use of expensive broad-spectrum antibiotics by 1 January 1996, when reimbursement was reduced, indicates that the change in reimbursement policy is responsible. Our study is strengthened by complete coverage of a population's use of antibiotics in a community. Theoretically, the observed more restrictive use of antibiotics could have resulted in hospitalization and consequently an increased inpatient consumption of antibiotics, but the hospitals' use of antibiotics did not increase from 1995 to 1996.

In Iceland, increased costs of antibiotics for patients have also proven effective in reducing consumption when connected with a campaign against misuse of antibiotics aimed at both physicians and the public [14]. The introduction of general limitations on reimbursement for drugs has also proven effective in reducing the consumption of antibiotics and at the same time introducing a shift from the more expensive broad-spectrum antibiotics to the cheaper narrow-spectrum penicillins, as we observe here [15]. The differential reimbursement policy instituted in Denmark may further enhance the shift in prescribing options which is desirable not only for economic reasons but also from an antibiotic resistance point of view.

A number of strategies have been adopted to influence general practitioners' prescribing behavior with regard to antibiotics in Denmark. Since the 1970s, continuous medical educational programs and the medical press have advocated restrictive antibiotic usage. As part of this policy, broad-spectrum penicillins, tetracyclines, cephalosporins and fluoroquinolones have been reserved as secondary or tertiary choices. Ampicillin and trimethoprim-sulfamethoxazole have been targeted for campaigns emphasizing the risk of development of antibiotic resistance and side effects, respectively [16]. Increasing erythromycin resistance among *Staphylococcus aureus* strains at a national level has been responded to by educational efforts and the introduction of reimbursement for β -lactamase-stable penicillins in 1991 [17].

The relative usage of antibiotic groups in this county reassures us that the national strategy of keeping consumption of newer, expensive and broad-spectrum antibiotics at a low level has been a success; for example, cephalosporins, which have never been subsidized, are hardly ever used in Danish primary care. Nevertheless, a steady annual increase was registered for all other antibiotic groups up to 1995. The increase had been especially marked for the macrolides, probably due to the introduction of a number of new macrolide drugs and a shift in preferences for the drugs. The adoption of new indications for antibiotics, such as combination therapy for treatment of *Helicobacter pylori*, may also

seriously affect current patterns of antibiotic usage in primary care. What this means for the level of antibiotic resistance is difficult to monitor using surveillance data from hospital-based laboratories. General practitioners perform the majority of susceptibility tests in their offices, and submission of specimens is infrequent [8]. Hence, it is important to survey prescribing patterns of antibiotics in primary care but also to implement prospective surveillance of antibiotic resistance and be ready to take action in the case of unfavorable developments.

In conclusion, it seems reasonable to take reimbursement policies into consideration when trying to reduce the total consumption of antibiotics. When it is considered to be rational, a differential reimbursement might influence general practitioners' prescribing behavior towards antibiotics, with desirable ecological consequences.

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