Design and Results of a Group Counter-detailing DUR Educational Program

Karen B. Farris,[1,5] Duane M. Kirking,[2] Leslie A. Shimp,[3] and Ruth Ann C. Opdycke[4]

Received March 26, 1996; accepted July 14, 1996

Purpose. The study objectives were to (1) design, (2) implement and (3) evaluate a multi-step educational program as an integral component of a healthcare system's activities to improve medication use quality and control drug costs. Design and implementation of the educational program were based upon established principles of changing prescriber behavior. Two classes of oral medications, antihistamines and antibiotics, were targeted.

Methods. A before-after nonequivalent comparison group design with 2 comparison groups was used for evaluation. Medication claims data from the same time period one year previously were used as historical controls. Prescribing rates, net savings and prescribers' attitudes were assessed.

Results. Prescribing trends in the treatment group but not comparison groups generally reflected changes consistent with the educational message. A net savings of $84 was achieved in the antihistamine program. A net loss of ($2722) was seen in the antibiotic program. Over 75 percent of prescribers agreed or strongly agreed that the educational program was an appropriate mechanism to optimize medication use. Level of exposure and practice years affected perceived knowledge gains.

Conclusion. The group counter-detailing DUR educational program was effective in improving prescribing rates. Prescribing rate changes and economic impacts differed by therapeutic category. The entire program was well accepted among prescribers including physicians and nurse practitioners.

KEY WORDS: health maintenance organization; education models; physician's practice patterns; prescription drugs; comparative study; drug utilization review.

INTRODUCTION

Medications are one of the most cost-effective and frequently used means to cure and treat diseases. However, irrational medication use; generally characterized as overuse, underuse or inappropriate use of medications; can lead to significant health and economic misfortunes. When clinicians are inundated by practice pressure, incomplete and biased information, and patient demand as factors in decision making regarding prescribing, neither drug therapy nor patient utility may be optimized (1–2). One mechanism that may successfully improve prescribing is drug utilization review (DUR). Brodie and Smith defined DUR as an "authorized, structured, and continuing program that reviews, analyzes, and interprets patterns (rates and costs) of drug usage in a given health care delivery system against predetermined standards [3]." The goals of DUR programs include (1) improving quality of care, (2) controlling costs and (3) preventing fraud and abuse [4].

Educational interventions are often a part of DUR programs and have been traditionally directed toward physicians. Several reviews summarize the known effective intervention strategies directed primarily toward physicians for DUR studies (5–7). The individual face-to-face educational encounter was effective in reducing target drug prescribing in several controlled trials (8–10). Providing physicians with feedback of prescription charges and prescribing rates improved their knowledge and also reduced prescribing charges (11–13). Specifically, peer comparison feedback of prescribing trends may be more effective than mere feedback of information [14]. Clinical pharmacists have also improved prescribing patterns (15–17). Reminders have been useful in improving physician behaviors such as prescribing medications and performing preventive care (18–20). Although effects appear to be short lived, the distribution of educational printed materials such as drug bulletins or memoranda have reduced prescribing of target drugs (21–24). These studies establish the efficacy of DUR interventions aimed at prescribers because the results were often gained in controlled trials.

The overall aim of this study was to establish the effectiveness and acceptability of a multi-step educational intervention program as an integral component of a healthcare system's activities. The specific objectives were to (1) design, (2) implement and (3) evaluate a drug utilization review program with the goal of improving medication use quality and controlling medication expenditures. The program incorporates several established methods of prescriber behavior change within a single program to facilitate multiple exposures to the educational material. Participants' subjective assessments also provide useful information for future endeavors.

DESIGN OF EDUCATIONAL PROGRAM

The educational program is outlined in Table 1. Components of the program incorporate previously identified principles useful in improving prescribing trends as illustrated below [25]. The principles are inclusive of the independent findings outlined above and include (1) defining specific problems and objectives, (2) conducting market research, (3) establishing credibility, (4) targeting "high potential" physicians, (5) involving opinion leaders, (6) using two-sided communication, (7) promoting active learner involvement, (8) using repetition and reinforcement, (9) using brief graphic print materials, (10) offering practical alternatives and (11) selecting and training of academic detailers.

Defining specific problems and objectives was accomplished by targeting the educational interventions towards specific prescribing issues of antihistamines and antibiotics. The overall goal of the DUR program was to encourage the appropriate use of the target medications by limiting their prescribing

[1] Assistant Professor, University of Alberta Faculty of Pharmacy and Pharmaceutical Sciences, Edmonton, Alberta T6G 2N8, Canada.
[2] Associate Professor, College of Pharmacy and Health Management & Policy, School of Public Health, The University of Michigan, Ann Arbor, Michigan 48109-1065.
[3] Associate Professor, The University of Michigan College of Pharmacy, Ann Arbor, Michigan 48109-1065.
[4] Director, Drug Utilization Review, ValueRx Pharmacy Program, Incorporation, 1825 South Woodward Avenue, Suite 200, Bloomfield Hills, Michigan 48302.
[5] To whom correspondence should be addressed.

0724-8741/96/1000-1445$09.50/0 © 1996 Plenum Publishing Corporation

to appropriate indications, not necessarily to decrease overall costs.

Market research generally refers to efforts focused upon identifying motivations for prescribing which may include need, habit, patient demand or time constraints [1]. This issue was addressed by including a physician in the planning phases of the educational intervention. Also, one of the researchers had a consultative clinical pharmacy practice and was familiar with motivations for prescribing.

The *credibility* of the program was established using two methods. First, HMO administration endorsement of the program was obtained. Further, the presentation of unbiased medical information from a respected organization, i.e., College of Pharmacy clinical pharmacy faculty, was important in establishing credibility. The fact that a physician opinion leader was involved in the planning stages of the program also ensured that practical prescribing issues were addressed.

Targeting "high potential" physicians was not pursued explicitly in this program as the total number of treatment physicians was manageable in all aspects of the program. However, physicians were provided with anonymous individual peer-comparison feedback so they could identify their position in the prescribing distribution within the entire HMO. As mentioned, a physician *opinion leader* from among the study clinics participated in the design of the educational intervention. This step was also critical to the initial implementation of the program to ensure that program activities were integrated into daily clinic activities.

Two-sided communication was used throughout the program. For example, a face-to-face group detailing session allowed exchanges of ideas between the clinical pharmacist presenters and prescribing physicians and nurse practitioners. The presentations were scheduled during grand rounds or business meetings and used lecture and question/answer formats. The content of the sessions was targeted toward specific classes of medications and discussed therapeutic indications, pharmacology, pharmacokinetics, adverse drug reactions, costs of therapy and therapeutic alternatives. A key factor was the presentation of a rational approach to the selection of drugs of choice designed to overcome objections that might be presented by either prescribers or patients.

Active learner involvement was also integrated into various aspects of the program. For example, the poster display was a presentation of the key clinical and cost implications using a format similar to research posters at professional meetings. The active leaning component of the poster was the interaction between the clinical pharmacist presenters and the prescribers during the initial 2 hour period that the poster was placed in the clinic charting room. A presentation of the study results from the educational programs was also made to the treatment group clinics about 8 months following the initiation of the program. The purpose of this component of the DUR program was to provide the study participants with updated medication information and prescribing rate feedback. The presentation used a 1-hour lecture format and was given during grand rounds.

Repetition and reinforcement were also important components of the program as seen in Table I. For example, a written summary was placed in physicians' clinic mailboxes about 3–6 weeks following the group counter detailing session. The summary was a 1-page document which contained approximately 12 statements emphasizing the key issues from the group counter detailing and poster presentations.

Brief graphic print materials were developed to serve as advance notification of the counter detailing session and as reminders of key quality of care and cost issues. These reminders often used humor to attract attention. Copies of the reminders were posted throughout the clinics on bulletin boards and in staff areas, but not in direct patient care areas. Simple, graphic prescribing profiles were also presented during the group counter detailing sessions. The prescribing rates for each physician were shown on a bar graph using assigned letters which corresponded to individual prescribing rates to allow easy visual comparison. Physicians were given an index card showing their HMO identification number on one side and their assigned letter on the reverse. This mechanism allowed for anonymous peer-comparison feedback in addition to feedback of personal prescribing trends.

Practical alternatives to the target medications were provided during the lecture, poster and summary components of the educational intervention. For example, alternatives to the second and third generation cephalosporins included the limited-spectrum antibiotics such as amoxicillin, co-trimoxazole and erythromycin for many upper respiratory infections.

The *academic detailers* in the project were faculty from the College of Pharmacy. Each individual was a clinical pharmacist by training and one individual had a clinical pharmacy practice at one of the study sites.

IMPLEMENTATION OF PROGRAM

Site Description

The site for project was a southeastern Michigan HMO serving approximately 43,000 persons. The largest member group was University of Michigan employees. A unique characteristic of the HMO population was the low proportion of elderly patients (5 percent). The HMO provider structure included physicians who practiced in facilities that served HMO patients exclusively, others in group practices serving both HMO and non-HMO patients as well as a network of individual providers. There were approximately 352 primary care physicians and 1051 specialists affiliated with the HMO. Prescribing of medical residents and nurse practitioners was attributed to the patient's primary care provider. The drug benefit provided through the HMO was comprehensive although most plans required a prescription co-payment of 3 dollars. Patients were able to obtain their medications from the majority of local pharmacies.

Targeted Interventions

Two classes of oral medications, antihistamines and antibiotics, were selected for the educational intervention programs at the suggestion of project staff and with concurrence of the HMO administration after an evaluation of medication use from data developed from the DUR database. In the year before the program, antihistamines accounted for nearly 5 percent of the HMO's total drug budget. The two nonsedating antihistamines, terfenadine and astemizole, were responsible for over 90 percent of the expenditure in this class. Most other antihistamines were available as nonprescription medications and were not covered by the drug benefit. Antibiotics accounted for approximately

10 percent of the drug budget. While economic concerns were a factor, it was important that the medications selected allowed for a balanced presentation of both economic and quality of care issues. For these medications, overuse or inappropriate use were determined to present quality of care considerations.

The interventions were presented at normally high use times of the target medications: the Fall of 1991 for antihistamines and Winter 1991–92 for antibiotics. The time sequence for delivering the various components of the educational programs is outlined in Table I.

For the antihistamine educational intervention, several quality of care issues were addressed. The issues included overuse caused by taking products too frequently because of lack of immediate relief, adverse effects such as sedation and arrhythmias and drug interactions. It was not the purpose of the program to discourage use of nonsedating antihistamines across the board, but rather to promote the use of these medications when best indicated. The program followed criteria that suggested a previous, unsuccessful trial with a traditional antihistamine should precede the prescribing of a nonsedating antihistamine unless contraindicated by a circumstance requiring alertness [26].

The antibiotic intervention concentrated upon oral medications and their indications for otitis media, sinusitis, community-acquired pneumonia and bronchitis. The prevalence of beta-lactamase producing organisms was also discussed. Prescribers were encouraged to prescribe limited spectrum, effective agents such as amoxicillin, co-trimoxazole and erythromycin when indicated.

Table I. Components, Principles, and Time Intervals of Educational Intervention Programs

Components	Principles[a]	Week
Advance posted notices in clinics	Identification of medication use problem Brief graphic print materials	0–2
Face-to-face group counter detailing session including personal and peer-comparison feedback of prescribing trends for target medications	Involve opinion leaders Use 2-sided communication Promote active learner involvement Offer practical alternatives	2–3
Summary poster display	Repetition Use 2-sided communications Promote active learner involvement Offer practical alternatives	4–6
Written presentation summaries	Repetition Use 2-sided communications Offer practical alternative	6–8
Periodic posted reminders	Repetition	
Reminder 1 - quality issue	Brief graphic print materials	8–10
Reminder 2 - cost issue	Brief graphic print materials	10–12
Report of program results	Reinforcement of improved practice Brief graphic print materials Repetition Use 2-sided communications Promote active learner involvement	30–36

[a] Adapted from Soumerai and Avorn, 1990 (reference 31).

METHODS

Study Design

A before-after non-equivalent comparison group design with 2 comparison groups was used for the study to evaluate the educational programs [27]. Two family practice clinics representing 41 HMO physician identification numbers served as the treatment group and received the educational intervention program shown in Table 1. One clinic served HMO patients almost exclusively and was located in an urban area. The other clinic saw a mixture of HMO and nonHMO patients (approximately 30 percent HMO patients) and was located in a rural area about 15 miles away. Both clinics were affiliated with the teaching hospital and were residency sites for family medicine. The outcome measures from these clinics were combined in the analyses.

Comparison group 1, the primary comparison group, consisted of the 7 other HMO family practice or internal medicine clinics located in the same geographic area. Comparison group 2 included physicians in all other clinics and individual practices that provided services for the HMO. The selection of the second comparison group while containing the whole breadth of prescribers servicing the HMO provided a further check on the general nature of the prescribing patterns of the target medications. Medication claims data from the same time period one year previously was used as a historical control for all 3 groups. Ethical review was obtained from the human subjects' review committee at the School of Public Health.

Assessment

The DUR educational program was evaluated using three different assessments including prescribing ratios, economic outcomes and attitudes.

Prescribing Ratios

In the antihistamine program, treatment and comparison prescribing rates for 2 consecutive 3-month study periods following the initiation of the educational intervention were compared to the rates for the same time periods 1 year earlier. Two consecutive study periods were used to examine the duration of the educational intervention's effectiveness. Prescribing rates calculated from HMO prescription claims were defined as the number of target medication prescriptions per 1000 total prescriptions. Prescribing rates were calculated to account for changes in prescription volume and numbers of HMO patients. Percent increases (decreases) were calculated for treatment and comparison groups.

The emphasis of the antibiotic intervention was to increase the appropriate use of the limited spectrum, less expensive antibiotics such as amoxicillin, co-trimoxazole and erythromycin. The proportion of all antibiotic prescribing attributable to these limited spectrum, antibiotics was calculated. A higher proportion was indicative of more appropriate prescribing. The number of amoxicillin prescriptions was compared to the number of amoxicillin-clavulanate prescriptions in each group for the 2 consecutive study periods to produce the amoxicillin

ratio. Again, a higher ratio was indicative of more appropriate prescribing. The latter analysis was selected because of the perceived overuse of amoxicillin-clavulanate when amoxicillin was indicated.

Economic

Economic evaluations of the educational programs from the HMO's perspective were considered. Total projected savings for the antihistamine intervention were determined by including both the savings from the actual reduction in medication use in the treatment group and the avoided increase in the treatment group based upon the increase seen in comparison group 1. The rate from comparison group 1 was selected for the cost comparisons because of its similarity in terms of prescribers and patients to the treatment group. Total projected savings for the antibiotic intervention were determined by the avoided increased in the treatment group based upon the increase seen in comparison group 1. Net savings were calculated for each educational intervention. Economic analysis of the substitution of amoxicillin for amoxicillin-clavulanate was completed. These estimates used average prescription costs for amoxicillin and amoxicillin/clavulanate of $4.75 and $42.53, respectively, obtained over the six month study period from the HMO drug utilization database.

Researchers estimated that it required approximately 59 hours to prepare and present the antihistamine educational intervention: meetings with HMO administration - 8 hours, preparing advance notices - 2 hours, literature search - 5 hours, reading literature - 16 hours, preparing presentation - 16 hours, preparing feedback prescribing trends - 4 hours, summary poster display - 2 hours, written summaries - 2 hours and reminders - 4 hours. Using a compensation rate of $50 per hour makes the personnel costs for the antihistamine educational intervention $2950. Data management for the program intervention was approximately $500 requiring about 20 hours of programming. An estimation of supplies including photocopies, printing, posters and catering was $250. The total cost was approximately $3700 for the antihistamine educational intervention. A similar cost was applicable to the antibiotic educational intervention.

Attitudinal

Treatment group prescribers were surveyed to examine their responses towards the educational programs. A 2-page survey with cover letter and return envelope was sent to treatment group prescribers approximately 2 months after the posted reminders of the educational interventions. Follow-up surveys were sent to nonrespondents about 3 weeks later. Survey items included measures of exposure to educational program components, perception of knowledge gained from educational program, perception of prescribing behavior after educational program, attitude toward educational program and demographics. Descriptive statistics were calculated and analysis examining the effects of exposure and practice years was conducted.

Exposure to the educational interventions was weighted to reflect the amount of therapeutic information presented to prescribers. Each member of the research team independently ranked the components and subsequently met to establish consensus about the weights. For example, the lecture and poster sessions presented much information and were weighted three, and the flyers and personal prescribing profiles contained less information and were weighted one. Physicians were asked to indicate whether they recalled attending or viewing the various components of the program and a weighted average was calculated. The maximum total exposure to the antihistamine intervention had a score of 15, and exposure to the antibiotic intervention had a score of 11.

RESULTS

Prescribing Rates

Table II shows the antihistamine prescribing rates for the two study periods and the previous year's historical data. Within the study periods, substantial increases in antihistamine prescribing rates were seen for both comparison groups while the treatment group had modest reductions in both time periods. Generally, antihistamine prescribing rates were twice as high during the first study period as during the second study period. Percent changes over the 6 months were −2.8, 11.2 and 30.1 for treatment, comparison group 1 and comparison group 2, respectively.

Table III shows the antibiotic prescribing ratios for the two consecutive study periods. All ratios in the treatment group showed improvement (i.e., reduction in use) except the amoxicillin ratio during the second study period. The largest change in the percent of limited-spectrum agents prescribed occurred in the treatment group during the second study period. Percent changes over the 6 months in the percent of limited-spectrum antibiotics/total antibiotics prescribed were 8.0, 3.4 and −3.7 for treatment, comparison group 1 and comparison group 2, respectively. A similar trend was found in the percent change in the 6-month amoxicillin ratios was 27.2, 7.1 and −10.5 for treatment, comparison group 1 and comparison group 2, respectively.

Economic

The projected product cost savings in the treatment group and the net savings (loss) achieved from the antihistamine

Table II. Antihistamine Prescribing Rates[a]

	First study period			Second study period		
Study Group	Before	After	Percent Change	Before	After	Percent Change[e]
Treatment[b]	37.9	37.1	−2.1	18.8	18.2	−3.2
Comparison 1[c]	43.8	51.3	17.1	24.5	26.3	7.3
Comparison 2[d]	27.4	32.3	17.9	14.1	14.8	5.0

[a] Rates are the number of terfenadine and astemizole prescriptions per 1000 clinic prescriptions. Study periods were Fall 1991 and Winter 91–92. Before periods were historical, equivalent controls one year earlier.
[b] Two HMO family practice clinics.
[c] Seven HMO ambulatory clinics.
[d] Remainder of HMO physicians.
[e] During the second 3-month study period, a new terfenadine-psuedoephedrine combination prescription product became available for the first time. Percent changes during the second study period were 8.0, 15.1 and 58.9 for treatment, comparison group 1 and comparison group 2, respectively, when the combination product was included in the post-intervention prescribing rates.

Table III. Selected Antibiotic Prescribing Ratios[a]

Study Group	First study period Before	After	Percent Change	Second study period Before	After	Percent Change
Percent limited spectrum agents/total antibiotics in group						
Treatment[b]	66.1	67.8	2.6	58.9	66.9	13.6
Comparison 1[c]	57.5	60.6	5.4	58.9	59.7	1.4
Comparison 2[d]	67.2	60.8	−9.5	62.5	60.5	−3.2
Amoxicillin ratio						
Treatment[b]	6.9	11.8	71.0	14.2	12.4	−12.7
Comparison 1[c]	4.1	4.4	7.3	4.2	4.5	7.1
Comparison 2[d]	5.5	5.2	−5.5	5.8	5.1	−12.1

[a] Study periods were Fall 1991 and Winter 91–92. Before periods were historical, equivalent controls one year earlier. Amoxicillin ratio = number of amoxicillin prescriptions in group ÷ number of amoxicillin/clavulanate prescriptions in group.
[b] Two HMO family practice clinics.
[c] Seven HMO ambulatory clinics.
[d] Remainder of HMO physicians.

program during the study periods are shown in Table IV. The antihistamine educational intervention produced a small net savings, although greater savings were realized during the first study period.

Over the six month study period, total antibiotic costs increased 2, 6 and 11 percent in treatment, comparison group 1 and comparison group 2, respectively. Actual total antibiotic cost were $47,146 in the treatment group. The projected total antibiotic costs based upon the increase seen in comparison group 1 was $48,124. Assuming direct costs of $3,700, a net loss of ($2,722) was realized by the antibiotic program. Table V shows projected savings of $896 in drug expenditures for the treatment group by improving the ratio of amoxicillin and amoxicillin/clavulanate prescriptions during the study period.

Attitudinal

Completed attitudinal surveys were received from 29 (71 percent) and 31 (72 percent) of prescribers for the antihistamine (n = 41) and antibiotic (n = 43) interventions, respectively.

Table IV. Projected Savings from Antihistamine Educational Program

	First study period	Second study period
Actual treatment group use	401 Rx[a]	216 Rx
Projected treatment group use[b]	479.6 Rx	232 Rx
Calculated reduction in treatment group use (projected − actual)	78.6 Rx	17 Rx
Average cost per prescription	$40.54	$41.08
Calculated savings in treatment group (calculated reduction X average cost/Rx)	$3186	$698
Net savings	Savings − Costs = Net Savings $3784 − $3700 = $84.00	

[a] Prescriptions.
[b] Based upon percent increase in comparison group 1.

Respondents had generally practiced about 8 years and 93 percent were physicians. Generally, gender and treatment clinic were equally distributed among the respondents. Respondents reported being exposed to 66 percent of the total weighted components of the antihistamine intervention. Specifically, 66 percent of respondents attended the poster session and 31 percent attended the noon lecture. The antibiotic intervention had somewhat less exposure (59 percent) than the antihistamine intervention. Specifically, 24 percent of respondents attended the poster session while 47 percent attended the noon lecture. A reminder poster containing comparative antibiotic costs had the highest prescriber exposure at 84 percent.

Table VI shows the results from the attitudinal evaluation of the education programs. Physicians perceived they gained medication knowledge from the educational interventions. Sixty-six and 70 percent of prescribers agreed/strongly agreed that their knowledge about side effects and dosing had improved, respectively. Level of exposure moderated the perceived knowledge gain in the antihistamine educational intervention. Weighted exposure was dichotomized at the median value (<10, ≥ 10), and prescribers with an exposure level ≥ 10 reported higher knowledge gains for side effects ($p = 0.002$), effectiveness ($p = 0.05$) and dosing ($p = 0.01$) [t-tests]. Over half of respondents (55.1 percent), agreed or strongly agreed that they prescribed fewer non-sedating antihistamines.

Results were less positive for the antibiotic intervention. Only 45 percent of respondents agreed or strongly agreed that their knowledge about the effectiveness of antibiotics improved after the educational intervention. In regards to antibiotic resistance, only 14 percent of respondents agreed that the intervention improved their knowledge. Only 38.2 percent of antibiotic survey respondents agreed or strongly agreed that they prescribed fewer antibiotics for bronchitis after the educational intervention. Twenty-eight percent of antibiotic survey respondents agreed or strongly agreed that they prescribed more amoxicillin for otitis media after the educational intervention.

DISCUSSION

There was evidence for a positive effect for the antihistamine educational intervention in terms of improvements in prescribing rates, economic outcomes and physicians' perceptions of the program. The antibiotic educational intervention was also indicative of improvements in the prescribing of selected antibiotics, although the economic analysis showed a net loss. Both educational interventions were well accepted, but the antibiotic intervention did not appear as useful to the prescribers as the antihistamine intervention, perhaps because of an initially higher level of appropriate use of antibiotics for upper respiratory infections.

Changes in antihistamine prescribing rates indicated the intervention was effective in reducing the prescribing of nonsedating antihistamines. While reductions in use by the treatment group were modest, increases in the comparison groups show the continued increased use of these products which were still relatively new at the time of the study. The treatment group avoided this increase suggesting that the reduced prescribing of nonsedating antihistamines may have been directed toward new patients as opposed to changing therapy in patients established on antihistamine therapy, which was the message consistent with the educational program. Reduction of use in groups

Table V. Partial Savings Projected from Antibiotic Educational Program[a]

		First study period	Second study period
Before	Amoxicillin	381 Rx * $4.75 = $1810	553 Rx * $4.75 = $2627
	Amoxicillin/clavulanate	55 Rx * $42.53 = $2339	39 Rx * $42.53 = $1659
	Total	436 Rx for $4149	592 Rx for $4286
	Average weighted prescription cost	$9.52	$7.24
Study	Amoxicillin	568 Rx * $4.75 = $2698	618 Rx * $4.75 = $2936
	Amoxicillin/clavulanate	48 Rx * $42.53 = $2041	50 Rx * $42.53 = $2127
	Total	616 Rx for $4739	668 Rx for $5063
	Average weighted prescription cost	$7.69	$7.58
	Difference	$9.52 − $7.69 = $1.82	$7.24 − $7.58 = −$0.34
	Projected savings	$1.82 * 616 Rx = $1122	−$0.34 * 668 Rx = −$226
	Projected percent of total cost saved	$1122/$4739 = 24%	−$226/$5063 = −4%

[a] Total costs for each drug product equals the number of prescriptions (Rx) multiplied by the average prescription cost based upon six months of utilization during the study period of 1990–91. Projected savings (shortfalls) equals difference in average weighted prescription cost during the historical comparison and study periods multiplied by the number of prescriptions during the study period.

during second time periods was indicative of the seasonal variation in antihistamine use. The new terfenadine/pseudoephedrine product was not specifically included in the antihistamine intervention because it was not available at the time of the initial program. However, it is logical to assume that the principles of antihistamine use were transferred by prescribers to this new, related product. The exact duration of the educational program's effect is not known although it appears to persists through the six month study period.

The antibiotic educational intervention served primarily to reinforce appropriate prescribing habits. The amoxicillin ratio was high during the second study period in the treatment group prior to the study and additional improvement may not have been likely. Consistency of both antibiotic ratios in comparison group 1 suggests that prescribing changed little in this group and prescribing did not improve in comparison group 2 according to the study criteria. The intervention was somewhat effective in changing prescriber behavior in the treatment group, although different effects were identified over time.

Table VI. Attitudinal Evaluation of Education Programs

	Mean[a] ± standard deviation
Anithistamines (n = 29)	
Increased knowledge about effectiveness	4.0 ± 1.0
Increased knowledge about side effects	3.8 ± 1.0
Increased knowledge about dosing	3.9 ± 1.0
Prescribed fewer non-sedating anithistamines	3.3 ± 1.1
Viewed as appropriate mechanism to optimize medication use	4.2 ± 0.9
Would support similar programs in future	4.3 ± 0.9
Antibiotics (n = 31)	
Increased knowledge about effectiveness[b]	
≤ 3 practice years	3.5 ± 0.3
4–9 practice years	3.5 ± 0.6
≥ 10 practice years	2.0 ± 1.1
Increased knowledge about side effects	2.7 ± 1.0
Increased knowledge about resistance development	2.4 ± 1.0
Prescribed more amoxicillin for otitis media	2.5 ± 1.3
Prescribed fewer antibiotics for bronchitis	2.8 ± 1.2
Viewed as appropriate mechanism to optimize medication use	4.0 ± 1.0

[a] Likert scale anchored by 1 = strongly disagree and 5 = strongly agree.
[b] ANOVA, p = 0.003

Two additional items related to the findings should be noted. First, the fact that qualitatively similar findings in the prescribing rates were found for two different therapeutic classes suggests that the overall educational program was effective. However, the magnitude of the effect differed between the two therapeutic categories. This finding is not unexpected because the target medications are used to treat different conditions. The goal of both interventions was to encourage the appropriate use of the target medications by limiting their prescribing to appropriate indications, not necessarily to decrease overall costs. Second, the consistency across the comparison groups also strengthens the findings in that comparison group 1 generally performed better than comparison group 2.

Prescribing ratios were used to assess overall prescribing trends. This approach to analysis does not provide an indication of the quality and/or appropriateness of care at the individual patient-level nor does it examine patient outcomes. Conclusions from this portion of the study were based upon the general distributions of antihistamine and antibiotic prescribing. However, such macro medication use data are informative to policy makers for decision-making and indicate patterns of drug use for which educational interventions may be needed and evaluated. Improved utilization trends may be indicative of better overall prescribing where the costs are balanced with the benefits.

Net savings for the antihistamine program were low. However, the calculations used the comparison group that resulted in the lowest projected savings. The treatment group in the antibiotic program showed a lower increase in total antibiotic drug costs than the two comparison groups, yet the program costs exceeded savings in the direct drug costs. Although formal cost-benefit analysis was not performed, the start-up costs of the program did not appear high. Further, these costs should be extended over the HMO clinics who may receive the educational interventions in the future where minimal additional preparation time may be necessary. Also, patients seen at one of the treatment clinics were not exclusively HMO patients, and overall

savings attributable to the intervention were not reflected in this analysis from the HMO's perspective.

As more educational interventions are conducted, it is increasingly important to determine how prescribers view these interventions. Results from this study were encouraging in that prescribers seemed receptive and possessed positive attitudes towards a multi-faceted pharmacist-conducted educational intervention. Over 75 percent of all participants viewed the educational intervention as an appropriate mechanism to optimize medication use. This perception did not vary with prescriber characteristics or degree of exposure to the intervention.

Prescribers appeared to benefit in terms of perceived knowledge gained more from the antihistamine intervention than the antibiotic intervention. Antibiotic prescribing was generally good in the treatment group prior to the intervention and may account for this finding. That is, prescribers were more knowledgeable and familiar with the antibiotics than with the non-sedating antihistamines at the outset. These findings suggest that inappropriate antibiotic prescribing may not result from knowledge inadequacies but may be influenced to a greater extent by patient demand or other factors. Interventions directed toward patients or pharmacists may be useful to modify antibiotic utilization.

Based upon the results of this educational program, the HMO administration changed their medication policy regarding the coverage of nonprescription antihistamines and implemented coverage for three, less-expensive, nonprescription antihistamines. This action indicates that dialog between DUR program educators and prescribers can identify and address prescribers' barriers to rational drug therapy. Specifically, the barrier in this instance was that the HMO did not pay for traditional antihistamines, and patients may have insisted upon utilizing drug coverage rather than pay out-of-pocket for the traditional antihistamines. The relationship established by the researchers with HMO administration at the outset of the project may also explain their willingness to adopt policy changes which constrained prescribers' abilities to provide rational, low-cost drug therapy.

The results of this program may be compared to other educational interventions to the extent that the objectives of the interventions are similar. Decreased utilization of medications of questionable efficacy such as cerebral vasodilators or contraindicated medications such as tetracyclines in children represent objectives indicative of clinical reasoning (8,9). Decreasing utilization of expensive medications when effective, lower cost alternatives are available represents an objective indicative of both quality and cost issues (10,15,17,24). This study sought to achieve the latter and did so with moderate success and high acceptability.

This study did not seek to establish the effectiveness of the individual intervention components. The intervention was provided over a 12 week period using a maximum of 1 hour face-to-face contact in a group setting and not more than 15 minutes in a one-on-one situation during the poster session. This mechanism was viewed as one way of improving the efficiency of the face-to-face academic detailing session and was possible in the HMO environment (8–10). This intervention is clearly less efficient than a one-time mailed or distributed memoranda (21–23). However, the multistep educational program may possess tangible and intangible benefits in addition to changing prescriber behavior such as prescribers' improved knowledge of therapeutic agents, development and/or maintenance of prescriber-pharmacist relationships and changes in HMO drug policy.

The comparison groups were not formed by randomization introducing possible bias into the study. However, comparison group 1 was comprised of HMO clinics similar to those in the treatment groups in different geographic locations. The clinics were HMO-based constituting similar policies regarding physician recruitment and operations. Contamination via physicians was not likely because physicians in the treatment group did not work in the comparison groups clinics.

Additional work included provision of these interventions to other HMO clinics with an emphasis on pediatric clinics as well as developing similar interventions for other target medications. The inclusion of patient outcomes should be considered in future work as well as more detailed economic evaluation. Providing educational interventions to pharmacists and consumers are also being considered.

CONCLUSIONS

The group counter-detailing DUR educational program was effective in improving prescribing rates according to the educational message, although the magnitude of the effect differed by therapeutic category. There was a modest reduction in the prescribing rate of the target medications in the treatment groups. More importantly, the major increases seen in all comparison group times for antihistamines rates were avoided. Over the 6 month study period, antibiotic utilization improved to a greater degree in the treatment group than in comparison group 1 and declined slightly in comparison group 2. The economic impact of the program differed by therapeutic category, and net savings were achieved only in the antihistamine program. The entire program was well accepted among prescribers including physicians and nurse practitioners.

ACKNOWLEDGMENTS

Presented in part at the American Pharmaceutical Association 1993 Annual Meeting and Exposition. The authors acknowledge the contributions of Karen Imm, Pharm. D., and Ken Guire, M.S. and Lee Green, M.D. for their insight and work on this project. The authors appreciate the continued financial support of M-Care, Ann Arbor, MI. At the time of this work, Drs. Farris and Opdycke were graduate student and assistant professor, respectively, at The University of Michigan College of Pharmacy. Dr. Farris was also supported by an American Foundation for Pharmaceutical Education Fellowship and the College of Pharmacy's Annual Fund and Harry Helfman Fund.

REFERENCES

1. R. K. Schwartz, S. B. Soumerai and J. Avorn. *Soc. Sci. Med.* **28**:577–582 (1989).
2. G. Carrin. *Health Policy* 7:73–94 (1987).
3. D. C. Brodie and W. E. Smith. review. *Hospitals* **50**:143–144,146,148,150 (1976).
4. T. D. Rucker. In J. P. Morgan, D. C. Kagen (eds.), *Society and Medication: Conflicting Signals for Prescribers and Patients.* Lexington, MA, Lexington Books 1983, pp. 25–51.

5. S. B. Soumerai, T. J. McLaughlin and J. Avorn. *Milbank Quart.* **67**:268–317 (1990).
6. H. L. Lipton and J. A. Bird. *Med. Care* **31**:1069–1082 (1993).
7. D. H. Kreling and D. A. Mott. *PharmacoEconomics* **4**:414–436 (1993).
8. J. Avorn and S. B. Soumerai. *N. Engl. J. Med.* **308**:1457–1463 (1983).
9. W. Schaffner, W. A. Ray, C. F. Federspiel C. F. and W. O. Miller. *JAMA* **250**:2718–2732 (1983).
10. W. A. Ray, D. B. Blazer II, W. Schaffner, C. Federspiel and R. Fink. *JAMA* **256**:2536–2539 (2986).
11. C. O. Hershey, D. K. Porter, D. Breslau and D. I. Cohen. *Med. Care* **24**:472–481 (1986).
12. C. O. Hershey, H. I. Goldberg and D. I. Cohen. *Med. Care* **26**:88–93 (1988).
13. S. H. Gehlbach, W. E. Wilkinson, W. E. Hammond, N. E. Clapp, A. L. Finn, W. J. Taylor and M. Rodell. *Med. Care* **22**:193–201 (1984).
14. R. N. Winickoff, K. L. Coltin, M. M. Morgan, R. C. Buxbaum and G. O. Burnett. *Med. Care* **22**:527–534 (1984).
15. A. Stergachis, M. Fors, E. H. Wagner, D. D. Sims and P. Penna. *Am. J. Hosp. Pharm.* **44**:525–529 (1987).
16. I. Y. Tamai, L. Z. Rubenstein, K. R. Josephson and J. A. Yamauchi. *Drug Intell. Clin. Pharm.* **21**:890–895 (1987).
17. H. L. Lipton, L. A. Bero, J. A. Bird and S. J. McPhee. *Med. Care* **30**:646–658 (1992).
18. C. J. McDonald. *N. Engl. J. Med.* **295**:1351–1355 (1976).
19. C. J. McDonald, S. L. Hui, D. M. Smith, W. M. Tierney, S. J. Cohen, M. Weinberger and G. P. McCabe. *Ann. Intern. Med.* **100**:130–138 (1984).
20. W. M. Tierney, S. L. Hui and C. J. McDonald. *Med. Care* **24**:659–666 (1986).
21. C. G. Berbatis, M. J. Maher, R. J. Plumridge, J. W. Stoelwinder and S. R. Zubrick. *Am. J. Hosp. Pharm.* **39**:98–100 (1982).
22. K. J. Fendler, A. K. Gumbhir and K. Sall. *Drug Intell. Clin. Pharm.* **18**:627–631 (1984).
23. P. Denig, F. M. Haaijer-Ruskamp and D. H. Zijsling. *DICP* **24**:87–93 (1990).
24. J. M. Schectman, N. K. Kanwal, W. S. Schroth and E. G. Elinsky. *Med. Care* **33**:139–144 (1995).
25. S. B. Soumerai and J. Avorn. *JAMA* **263**:549–556 (1990).
26. C. Kirkwood, C. Womble, C. Pigg, J. Ostrosky and W. Munroe. In *Criteria for Drug Use Evaluation*. Volume I. American Society of Hospital Pharmacists, Inc., Bethesda, MA, 1989, pp. 3–7.
27. D. T. Campbell and J. C. Stanley. Houghton Mifflin Co., Boston, MA, 1963.