ORIGINAL ARTICLES

Using Feedback Letters to Influence the Use of Antiulcer Agents in a Medicaid Program

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OBJECTIVE: To determine the impact of printed patient-specific feedback regarding potential misprescribing of antiulcer agents (AUAs). Measures of impact included improvements in patients' dispensing profiles, assessed according to predetermined criteria, and decreases in cost and quantity of AUAs dispensed.

DESIGN: Controlled study. After evaluation for compliance with predetermined criteria, prescribers identified as having one or two patient profiles with potential errors were assigned alternatively to control or experimental groups. An intervention was mailed to the experimental group.

SETTING: Outpatient setting in the New Mexico Medicaid population.

PARTICIPANTS: Patients and prescribers identified as having potential misprescribing of AUAs.

INTERVENTION: The intervention consisted of a cover letter describing the purpose of the drug utilization review program, an educational fact sheet regarding prescribing AUAs, patient profiles with potential misprescribing, and physician response forms.

MEASUREMENTS AND MAIN RESULTS: There were greater improvements in dispensing to patients in the intervention group (χ^2 , $p < .001$). Significant odds ratios for the intervention group were 2.29 for AUAs discontinued, 1.98 for all improvements combined, 13.13 for improvement in listing of proper diagnosis for AUAs, and 2.84 for appropriate indication when prescribing the higher acute daily dosage. Using data from 3 months before and after the intervention, we found greater decreases in mean monthly costs ($p = .044$) and mean monthly quantity of AUAs dispensed ($p = .049$) in the intervention group.

CONCLUSIONS: This intervention significantly decreased AUA dispensing to patients whose prescribers were mailed the patient-specific feedback intervention.

KEY WORDS: drug utilization review; prescribing; antiulcer medications.

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In today's health care system, physicians are seeing a greater volume of patients and have less time to examine and discuss therapy with each patient. This makes it difficult for physicians to have adequate time to discuss medications with patients and monitor each patient's overall medication regimen.¹⁻⁵ At the same time, health care payers (HMOs, government agencies, and insurers) concerned with escalating costs are implementing various strategies and methodologies in an attempt to help control rising medication costs.⁶⁻⁸

An important quality assurance and cost control mechanism currently used in health care systems is drug utilization review (DUR).⁸⁻¹² This is a process involving (1) evaluation of drug therapy on a program-specific or patient-specific basis, (2) implementation of methods to improve drug use when problems are identified, and (3) follow-up assessment of improvements in drug use. In the Omnibus Reconciliation Act of 1990 (Pub L No. 101-508), Medicaid implemented the DUR process by federally mandating that it be performed on all patients receiving benefits.¹³ Medicaid boards composed of physicians and pharmacists who represent their peers conduct DUR at a state level.

Designed to be educational in nature, DUR interventions can benefit physicians who are practicing in busy settings by identifying potential problems in their patients' medication regimens. Methods such as letter interventions, one-on-one academic detailing, and group education through professional meetings, teleconferences, and newsletters have been used by Medicaid DUR programs in an attempt to improve physician prescribing.¹⁴ Soumerai et al. reviewed studies focused on improving prescribing in primary care settings.¹⁰ They concluded that one-on-one academic detailing was effective at improving medication prescribing whereas mailing educational materials alone had a minimal effect on prescribing. However, their review was conducted in the late 1980s.¹⁰ Two studies published in the 1990s found that mailing educational letters to physicians along with specific patient information was effective in improving physician

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prescribing of histamine₂ receptor antagonists (H₂RAs).^{15,16} The effect of a mailed letter intervention on long-term use of H₂RAs was evaluated using a nonrandom design in the Wisconsin Medicaid population. An overall decrease in prescribing was found in the experimental group versus the control group.¹⁵ A significant reduction in duplicative therapy of antiulcer agents (AUAs) resulted from a mailed letter intervention in a randomized study of the Texas Medicaid population.¹⁶

Excess prescribing of AUAs is one of the therapeutic areas that Medicaid DUR programs focus on when designing educational interventions, because the inappropriate use of AUAs can have significant budgetary impacts on Medicaid programs.^{17,18} Often patients are prescribed AUAs for long periods without appropriate diagnoses documented in claims data. Associated negative patient outcomes such as side effects and drug interactions can be frequent, and unnecessary health care costs can be large.

Thus, the New Mexico Medicaid DUR board chose to provide an educational intervention to physicians who may have misprescribed AUAs. The mailed intervention included patient-specific prescribing feedback and recommendations for appropriate use of AUAs. We assessed its impact by examining dispensing profiles of patients for compliance with predetermined criteria and analyzing overall dispensing data regarding AUAs.

METHODS

This was a controlled trial of an intervention sent to prescribers to improve prescribing of AUAs. The intervention and its evaluation were considered part of the New Mexico DUR board's charge; therefore, it was not submitted for Institutional Review Board approval.

Identification and Selection of Patients

All of the state's Medicaid patients receiving AUAs (H₂RAs, sucralfate, and prostaglandin-type gastric acid antisecretory agents) were included in the initial assessment. In November 1994, we examined patient-specific profiles of claims data over 6 months (March–September 1994). The computerized profiles included all documented diagnoses, all claims for medical treatments, complete drug-dispensing histories, and provider identification numbers. We identified patients who did not meet standard, current criteria for AUAs predetermined by the Medicaid DUR board, as follows: (1) use of H₂RAs or other AUAs for more than 60 days unless indication was gastroesophageal reflux disorder (GERD), chronic peptic ulcer disease, gastric hypersecretory conditions, or concurrent prescribing of long-term nonsteroidal anti-inflammatory drugs (NSAIDs); (2) acute dosage levels of H₂RAs or sucralfate for more than 60 days for peptic ulcer; (3) two or more AUAs prescribed concurrently; and (4) no appropriate indication listed in the Medicaid claims data. Appropriate indications were peptic

ulcer disease, gastric hypersecretory conditions, GERD, and chronic NSAID use. Historical and current Medicaid claims data were used to identify diagnoses.

Prescribers for patients identified as potentially not meeting DUR guidelines were divided into two groups, those having one or two patients not meeting the guidelines and those having three or more patients. The DUR board mandated that we send interventions to all prescribers with three or more patients who received potentially inappropriate prescriptions. However, patients of prescribers with one or two patient profiles not meeting guidelines were assigned, by ordering them numerically by provider number and selecting every other one, to intervention or control groups. Provider numbers are assigned randomly by the New Mexico Medicaid program. The prescribers for the selected patients were mailed the intervention in late December 1994.

Intervention

The educational intervention included a cover letter describing the purpose of the DUR program, an educational fact sheet regarding prescribing H₂RAs and other AUAs, patient profiles with potential misprescribing, and physician response forms. The 1-page fact sheet presented (1) the recommended duration of H₂RA therapy, (2) indications for long-term use, (3) discussion regarding prescribing combinations of AUAs, (4) age and renal function considerations for H₂RAs, and (5) acute care dosage and monthly costs of AUAs. The patient profiles contained diagnostic information from physician outpatient visits and hospital claims, dates of service, drug names, quantity, strength, and physician identifiers from pharmacy claims. The response forms requested feedback regarding whether the prescriber planned to act on the intervention and what action was intended.

Determination of Outcomes

The primary outcomes assessed were improvement in compliance with DUR criteria within patient-specific profiles and decreases in dispensing of AUAs. Because the intervention involved patient-specific feedback, the patient was the unit of analysis. Data were collected for 3 months prior to the intervention, October through December 1994, and 3 months after the intervention, February through April 1995. Data from January 1995 were excluded because most intervention letters were received during this month.

We examined Medicaid patient profiles before and after the intervention, assessed whether improvements occurred, and categorized the types of improvement in dispensing. We included all patients in two analyses: (1) whether or not AUAs were dispensed during the postintervention period, and (2) all types of improvement in therapy. We also determined improvements in therapy among patients who, in the preintervention period, (1) received duplicative therapy, (2) had no diagnoses for AUAs in

claims data, (3) received an acute dosage when not justified by diagnosis, and (4) had diagnoses for AUAs considered inappropriate by preestablished criteria.

Measures of dispensing were quantity, days of supply, and cost to the Medicaid program for AUAs per patient per month. Dispensing data were limited to 3 months before and 3 months after the intervention so that we could provide an assessment to the DUR board in a relatively short time.

To adjust quantity of liquid dosages, we converted to a solid dosage equivalent by dividing the total number of milliliters dispensed by the usual dosage in milliliters. For example, milliliters of cimetidine hydrochloride oral solution were divided by 5 mL/dose and milliliters of sucralate suspension were divided by 10 mL/dose.

Statistical Analyses

Data reported here and statistical comparisons are limited to patients who were assigned to the control or experimental groups—that is, those whose prescribers had one or two patient profiles with potential AUA misprescribing. Data were also collected for a third group, patients with prescribers who had three or more patient profiles identified, and are available from the authors on request.

Data from patients who received no Medicaid prescriptions during the data collection period were eliminated because potential confounding variables, such as loss of eligibility or death, would result in dispensing changes. We also eliminated data from patients who had prescribers in both intervention groups because of inability to attribute changes to a particular intervention group. Thus, an intention-to-treat analysis was not applied for these data.

We assessed patient profiles by categorizing patients according to whether improvements in dispensing had occurred in general or in relation to specific criteria. We then performed χ^2 analyses of the 2×2 frequency tables (improvement vs no change, control vs intervention group). We also calculated odds ratios (ORs) and 95% confidence intervals (CIs), comparing the intervention group with the control group; ORs greater than 1 with 95% CIs not including 1 indicate significantly greater likelihood of improvement among patients whose prescribers received the intervention.

Statistical analysis of dispensing data consisted of analysis of covariance (ANCOVA) of each outcome variable (days of supply, quantity, and cost) in the postintervention period, with the preintervention data used as the covariate and the assigned group as the categorical variable. If there were no prescriptions in the database for a patient in a month, 0 was entered for days of supply, quantity, and cost for that month. Cost adjustments were made to eliminate the impact of price changes during the study. All cost data were converted to December 1994 costs. The cost per tablet (capsule), or per dosage unit for liquids, in December was calculated by summing the cost per National Drug Code number (a number specific to each drug

and strength) and dividing by the quantity dispensed. The cost of each prescription was then determined by multiplying the quantity by the cost per tablet (capsule), or per dosage unit for liquids.

Initially we included the interaction term (intervention group by preintervention data) in the ANCOVA. If the interaction term was significant, subsequent analyses were conducted using a Student's *t* test of change scores (preintervention minus postintervention). When the Bartlett test for homogeneity of variance was significant or data were skewed, nonparametric analysis (Mann Whitney *U*) was applied.¹⁹ This test ranks the measures and assesses differences in medians rather than means; thus, it is not affected by skewed data or lack of homogeneity of variance.

The one-tailed, *a priori* level of statistical significance was $\alpha = .05$. We decided one-tailed tests were adequate, because previously reported studies with similar interventions had shown significant improvements in prescribing.

RESULTS

There were 761 patients identified as having potential prescribing errors, 171 control patients, 169 intervention patients whose prescribers had one or two potential prescribing errors, and 421 intervention patients whose prescribers had three or more potential prescribing errors. In 28 cases, patients had two different prescribers, and a letter was sent to both prescribers. Thus, 618 intervention letters were sent to 228 prescribers regarding 590 patients. Of these letters, 437 were sent to 84 prescribers who had three or more patients who met screening criteria for potential errors. The remaining 181 letters were sent to 144 prescribers who had one or two patients whose medication profiles indicated potential problems. Prescribers who had several patients with potential prescribing errors received several letters in the same envelope. The maximum number of intervention letters for a prescriber was 18; the mean number for prescribers with 3 or more letters was 5.13.

We eliminated 17 patients who had prescribers in both intervention groups (prescribers with one or two potential errors and those with three or more) and 51 patients who received no Medicaid prescriptions for any drug during the postintervention data collection period. This left 693 total patients. There were 156 patients in the control group and 156 in the intervention group. The remaining 381 patients were those whose prescribers had three or more potential errors, with no control comparison group assigned. There were 137 prescribers represented among patients in the control group, and 143 prescribers were represented among patients in the intervention group.

Analyses of Patient Profiles

Results from review of patient profiles are shown in Table 1, indicating the percentage of therapies improved and odds ratios for improvements in the intervention

Table 1. Results of Patient Dispensing Profile Analyses

Criteria	Therapies Improved			Odds Ratio (95% CI)
	Treatment, n (%)	Control, n (%)	Difference, %	
No antiulcer agent dispensed	52 (33.3)*	28 (17.9)	15.4	2.29 (1.35, 3.87)
All improvements combined	67 (42.9) [†]	43 (27.6)	15.3	1.98 (1.23, 3.18)
Duplicative antiulcer agents [‡]	8 (24.2)	6 (23.1)	1.1	1.07 (0.32, 3.58)
No diagnosis for antiulcer agents [‡]	11 (9.8) [§]	0 (0)	9.8	13.13 (1.67, 103.82)
Acute dosage not justified by diagnosis [‡]	52 (47.3)	24 (24)	23.3	2.84 (1.57, 5.13)
Inappropriate diagnosis [‡]	3 (15.8)	3 (18.8)	-3	0.81 (0.14, 4.72)

*Significantly different from control, χ^2 statistic 9.68, df = 1, $p < .01$.

[†]Significantly different from control, χ^2 statistic 8.09, df = 1, $p < .01$.

[‡]Only those patient profiles with potential errors are included in this analysis.

[§]Significantly different from control, χ^2 statistic 9.73, df = 1, $p < .01$.

^{||}Significantly different from control, χ^2 statistic 12.29, df = 1, $p < .001$.

group. Significantly more patients in the intervention group were not dispensed AUAs during the postintervention period (OR 2.29), and a higher percentage of patients had some type of improvement in dispensing of AUAs (OR 1.98). Fewer patients in the intervention group were dispensed AUAs without a diagnosis listed in the Medicaid claims data during the postintervention period (OR 13.13). An improvement in the percentage of patients receiving acute therapy dosages without justification by diagnosis was also found in the intervention group (OR 2.84). Improvements in duplicative therapy were not significant between the intervention and control groups.

Analysis of Dispensing Data

Data for mean days of supply, cost, and quantity per patient are displayed in Table 2. These variables decreased for both groups. Using ANCOVA, we found a significant interaction term, with the amount of decrease in dispensing greater among the intervention group (14.2% vs 9.5% in the control group). Therefore we applied statistical tests other than ANCOVA, including t tests and Mann Whitney U tests. The one-tailed p values were significant for quantity dispensed and cost of AUAs, and approached significance for days of supply dispensed (Table 3).

DISCUSSION

Greater decreases in AUA dispensing were identified in the intervention group than in the control group (Table

3). The control group also had decreases in dispensing, but this is statistically predictable because the control group had been identified as having some misprescribing; they would also tend toward fewer errors as time passed (regression to the mean). For example, because we preselected patients whose prescribers potentially misprescribed, some of these patients would randomly be expected to discontinue medication or change prescribers. Thus, dispensing data would be expected to decrease regardless of an intervention. Indeed, our patient profile analysis showed improvement for 27.6% of patients in the control group (Table 1).

A more complete research design, particularly assignment of all prescribers of AUAs with potential prescribing errors to treatment and control groups, would have improved the study. Many patients with potential errors ($n = 381$) were not included in the analysis because of requirements specified by the DUR board. This precluded the selection of all potential patients eligible for the intervention. This is a common problem when performing research in a "natural setting." That is, DUR boards or HMO managers may be reluctant to administer a potentially beneficial intervention to only a subset of prescribers for the purpose of optimal research design. An alternative might be to delay an intervention, implementing it in a stepped manner. This was not politically feasible for this study.

Days of supply was less impacted by the intervention than cost or quantity (Table 3). This suggests that changes in dispensing associated with the intervention were related to decreases in dosage rather than discontinuance of

Table 2. Dispensing Measures per Patient-Month (Mean $\pm$ SD)*

Measure	Data Collection Period	Control (n = 156)	Intervention (n = 156)
Costs, \$	Preintervention	71.01 $\pm$ 41.42	70.20 $\pm$ 42.78
	Postintervention	61.48 $\pm$ 47.69	56.00 $\pm$ 47.69
Quantity	Preintervention	50.0 $\pm$ 35.7	48.9 $\pm$ 36.4
	Postintervention	43.6 $\pm$ 36.5	38.2 $\pm$ 39.5
Days of supply	Preintervention	25.6 $\pm$ 12.8	26.4 $\pm$ 14.2
	Postintervention	22.2 $\pm$ 14.1	20.9 $\pm$ 16.5

*For each measure, postintervention values are significantly lower than preintervention values within each group (paired t test, $p \leq .012$, df = 155).

Table 3. Amount of Change in Dispensing per Patient

Change in Variable	Control Group	Intervention Group	One-Tailed p Value*
Cost			
Mean $\pm$ SD	9.5 $\pm$ 46.6	14.2 $\pm$ 41.6	
Median	0	5.2	.044
Quantity			
Mean $\pm$ SD	6.4 $\pm$ 32.0	10.7 $\pm$ 26.1	
Median	0	8.8	.049
Days of supply			
Mean $\pm$ SD	3.4 $\pm$ 14.5	5.6 $\pm$ 13.9	
Median	0	0.7	.080

*Result of nonparametric Mann-Whitney U test.

AUA therapy. This would occur if patients' therapies were changed from acute to chronic dosage levels. Maintenance dosage for H₂RAs is usually one third to one half the acute treatment dosage once the ulcer has healed. The intervention may have reminded prescribers to decrease these dosages. Furthermore, the intervention may have served to remind prescribers to decrease dosages in the elderly or in patients with renal disease. Our finding of significant impact on dosage, but not on duplicative therapy (Table 1), supports this assumption.

There were three limitations to the patient profile review process. First, Medicaid records for some patients may not have included all diagnoses. When no appropriate diagnoses were listed, the patient's AUA prescription was considered potentially incorrect. Another limitation was that, because of processing delays, the only complete records available in November 1994 covered the period from March through September 1994. Thus, there was a lag period between prescribing decisions and the intervention. Finally, some patients may have had AUA prescriptions filled privately, making the Medicaid records incomplete. This could have resulted in fewer Medicaid patients identified as not meeting guidelines than actually existed. We consider this an infrequent occurrence owing to the lack of expendable income available to our Medicaid patient population and the high cost of AUAs.

A limitation of DUR in general is incomplete data. Because DUR is usually conducted using billing data, the records may not be adequate for drawing clinically based conclusions. Furthermore, a comprehensive picture of prescribing is not obtained from dispensing data alone, as they include preauthorized refills as well as new prescriptions. These limitations are prevalent in research conducted in natural settings.

Another limitation of the study is the lack of an intention-to-treat analysis owing to the elimination of 51 patients who were selected for intervention but received no Medicaid prescriptions during the study and 17 who had prescribers in both intervention groups. Intention-to-treat analysis protects against differential dropout rates in intervention and control groups. However, dropout rates

were not affected by our intervention, because dropouts occurred before data collection began, 3 months before the intervention. Initial selection was based on patient dispensing profiles from March through September, whereas data collection began in October. Regarding the 17 patients whose prescribers were in both intervention groups, we considered it conservative to delete their data because prescribing changes from the group with (≤ 3 potential errors) may have then been attributed to the assigned intervention group, which was compared to the control group (1–2 potential errors), thus overstating our results.

When applying this study to other settings, it should be noted that the study focuses on the impact of the intervention. Our study was dependent on the criteria established regarding this drug class by the New Mexico DUR board. Criteria for DUR interventions must be revisited and revised to meet current practice standards that are relevant for the patients. This is a key step in ensuring that interventions are relevant and applicable to the target population.

We found that the DUR letter intervention was well received by prescribers, which is similar to previous research.^{15,16} Our finding of significant decreases in dispensing of H₂RAs from a mailed intervention is also similar to previous research.¹⁵ However, our study examined specific reasons for decreases through patient profile reviews. The previous study was limited because a quasi-experimental, noncontrolled design was used; it focused only on excessive duration of full-dose H₂RAs; and outcome data were limited to average dose and costs.¹⁵

In the other published study, the mailed intervention was directed only at duplicative therapy, which was not significantly impacted by our intervention.¹⁶ This finding may have been due to the broader focus of our intervention. Our intervention increased the number of patients discontinued from AUAs, decreased the use of AUAs without an appropriate diagnosis in Medicaid billing records, and decreased the inappropriate use of acute doses of AUAs, according to Medicaid billing diagnoses. Thus, our results extend beyond those of previous studies because a full patient billing profile was evaluated and other types of AUA misprescribing were addressed. Our findings illustrate the potential usefulness of individualized feedback with prescribing criteria to point out potential drug therapy problems to physicians so that unnecessary prescribing can be reduced.

Future research on feedback intervention letters should examine the impact of the DUR intervention over time. Longer assessment periods should be considered in assessing educational interventions to determine when follow-up mailed interventions may be necessary. The intervention techniques that are being used by Medicaid DUR programs could be adapted and used in future studies within managed care. Letter interventions are less costly and easier for DUR programs to administer than one-on-one academic detailing. The current study, as well as other recent research, has demonstrated the effectiveness

of using DUR letter interventions to improve physician prescribing of AUAs.^{15,16}

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