Reduction of Polypharmacy by Feedback to Clinicians

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Objective: ***To determine whether two different educational interventions would reduce polypharmacy in outpatients receiving ten (10) or more active medications at the Denver Veterans Affairs Center.***

Design: ***292 patients were randomized into three (3) groups: Control (n = 88); simple notification of primary care provider (n = 102); intensive notification, provision of pharmacy profiles, compliance index, and chart review by senior clinician with recommendations (n = 104).***

Setting: ***Veterans Affairs Medical Center affiliated with the University of Colorado Health Sciences Center.***

Patients/Participants: ***All patients receiving greater than ten (10) active medications who are followed by clinic staff at the Denver VAMC. The mean age was 62 years (range 26–88) and 96% were male.***

Interventions: ***The simple notification group received only a single letter recommending that the patient's number of medications be reduced. The intensive notification group received more sophisticated intervention with a chart review, two letters with calculation of patient compliance, and individualized suggestions for reduction in polypharmacy. The control group received no intervention.***

Measurements and main results: ***Control patients had significantly less reduction in polypharmacy then either the simple or intensive intervention groups at four months (p = 0.028). There was no significant difference between the intervention groups (p = 0.189). By six months the difference was no longer significant.***

Conclusions: ***A simple intervention can result in a significant reduction in the number of medications prescribed to patients with polypharmacy. The authors were unable to show that a more complex intervention resulted in a further reduction in polypharmacy.***

Key words: ***polypharmacy; drugs; medications; utilization; interventions; physician behavior.*** J GEN INTERN MED 1991;6:133–136.

THE SPECTER OF POLYPHARMACY haunts our medical centers. The many causes of this phenomenon can be divided into physician-related, system-related, and patient-related. Physician-related causes include multiplicity of care providers prescribing medications, the popularity of "combination chemotherapy" for many illnesses, and doctors pressed for time who prescribe for every symptom. System-related causes include poor records permitting "double prescribing," absence of a primary care provider who will coordinate care, lack of incentives to reduce medication, and even incentives that encourage medication. Patient-related causes include the belief that every symptom requires a new medication, the search for miraculous cures by people with chronic pain or psychiatric disorders, and the diversity of diseases in the elderly.[1] At the Denver VA Medical Center (VAMC), we designed a study to identify patients with polypharmacy and then to intervene to reduce the numbers of their medications.

MATERIALS AND METHODS

The pharmacy computer at the Denver VAMC selected all patients who had ten or more active medications during May 1988 and who were being followed by providers at the medical center. Topicals, supplies, and eye medications were excluded. This search identified 312 patients, representing 4.4% of all patients receiving active medications (Fig. 1). Twenty patients had died between the dates of their last refills of medications and the study initiation date, June 1, 1988. For purposes of calculating death rate, all 312 polypharmacy patients were included. All living patients (n = 292) were then randomly assigned to three study groups. Group I (control) (n = 88) received no intervention. In Group II (simple notification) (n = 102), providers received a letter identifying their patients with 10 or more active prescriptions, stating the potential dangers of overmedication, and requesting that the providers attempt to reduce the numbers of medications. In Group III (intensive intervention) (n = 104), providers received an initial letter similar to that given Group II. This was followed by a review of each "polypharmacy patient's" record by one of the investigators (TJM). Each provider then received a personal letter giving specific recommendations for altering each patient's drug regimen along with an estimate of the patient's compliance with the drug regimen.

We extracted demographic data for each study subject, as well as data on the number of different providers writing prescriptions, the presence of a psychiatric or chronic pain diagnosis, and receipt of nonsteroidal anti-inflammatory drugs, hypnotics, and psychiatric drugs.

The providers were physicians and nurse practitioners who see patients in the outpatient clinics of the Denver VA Medical Center, an affiliated institution of the University of Colorado Health Sciences Center. When a patient had two or more providers, the correspondence was sent to the provider who wrote the most

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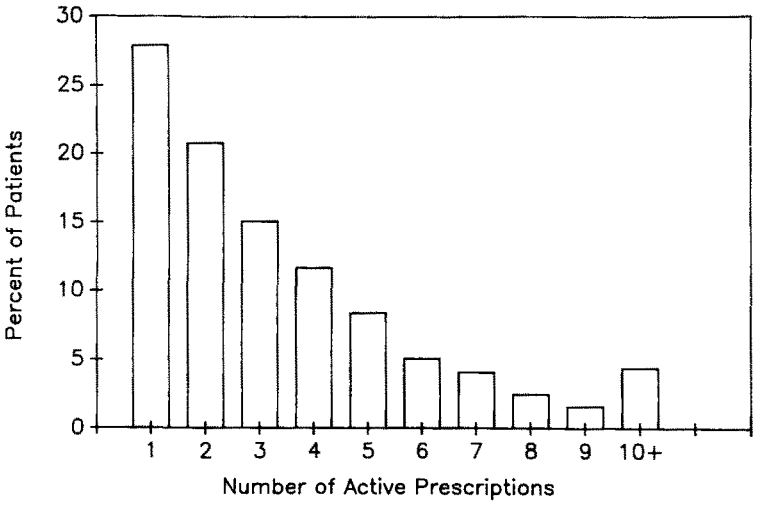

FIGURE 1. Distribution of the numbers of medications being taken by Denver VA Medical Center patients at the time of the study.

prescriptions or was identified as a primary care provider in the chart.

All patients were followed for up to 12 months using the VA computer system and chart reviews. The number of active medications in each group was computed from pharmacy drug profiles four, six, and 12 months after the initial study letters were sent. In order to determine whether the polypharmacy group as a whole had a higher death rate than the "average" medical patient, we used a control group of medical patients whom we had been following in detail for ten years. These patients had similar demographic characteristics (mean age 64, 97% male) and were being seen by general internists and nurse practitioners in three VA outreach clinics through the MediVAn service. The characteristics of these patients have been described.[2] To further determine whether medications or a reduction of medications might have adversely affected patient survival, we reviewed the records of the patients who died, using the algorithm described by Kramer et al.[3]

We estimated compliance with drug therapy in the intensive-intervention group using the method developed by Steiner et al.[4] For each drug we calculated a compliance index, which is the ratio of the number of days for which a drug supply was dispensed by the pharmacy divided by the number of days from the first to the last refill. A compliance index of 1.0 implies that the patient ordered medications from the pharmacy at a rate equal to the prescribed dose. Steiner et al. have found that the compliance index relates well to other measures of compliance and predicts patients who can have reductions in the doses of antihypertensive medications. An index <1.0 points to patients requesting medications at less than the prescribed rate and an index >1.0 points to use of medications at a higher-than-prescribed rate.

Prior work suggests that averaging compliance indices across drugs may obscure important degrees of variability in compliance.[4] Therefore, each drug taken by a given patient was rated separately using the compliance index. If the index for a particular drug was ≤ 0.80, the patient was rated hypocompliant; if the index was ≥ 1.10, the patient was hypercompliant for that drug. To summarize a patient's compliance we calculated the proportion of drugs taken by each patient that fell into each compliance category.

Groups were compared at baseline with chi-square tests for dichotomous variables and analysis of variance for continuous variables. The relationship between baseline variables was tested using regression analysis. The effects of the interventions on the numbers of medications at four, six, and 12 months were tested using repeated-measures analysis of variance. Data were analyzed using the SPSS/PC+ (SPSS, Inc., Chicago, IL) and Systat (Systat Inc., Evanston, IL) programs.

RESULTS

The patients were 96% male and averaged 61.6 years of age (SD 10.6, range 26–88 years). Each patient was followed by 2.97 different providers (SD 1.7, range 1–9), received 11.62 prescriptions (SD 2.1, range 10–28), and had an average of 6.5 medical problems (SD 2.3, range 1–12). The most common problems included cardiovascular disease (62%), hypertension (47%), psychiatric illness (29%), emphysema (28%), arthritis (27%), diabetes (25%), and chronic pain syndromes (12%). We examined several drug classes in the polypharmacy patients. Seventy-seven percent (225/292) were on a nonsteroidal anti-inflammatory, 40% (116/292) received a psychiatric drug, 16% (46/292) were taking a sleeping pill, and 11% (34/292) were on narcotics. There was a significant trend for more total medications in those receiving psychiatric medications (11.4, SD 1.69, no psychiatric medications; 12.00, SD 2.54, psychiatric medications, $p = 0.014$, t test). There was a significant positive correlation between the number of providers and the number of active prescriptions ($r = 0.545$, $p < 0.001$). The compliance index for all drugs together was 1.09,

indicating that patients received about the prescribed numbers of pills. The average compliance index, however, obscures important differences in compliance between drugs. Taking all patients together, only 49.7% of all medications had acceptable compliance indexes. Drugs were requested at more than 110% of the prescribed dose 29.4% of the time, while 20.0% of drugs were requested at less than 80% of the prescribed dose. The average percentage of medications on a patient's regimen that fell in the compliance range was negatively correlated with the number of initial medications ($r = 0.326$, $p < 0.001$). The compliance rate was not significantly related to age.

The study groups were comparable on all baseline factors except gender, in that the simple-intervention group had no female patients, while there were two in the control group and nine in the intensive-intervention group (chi-square 11.34, 2 df, $p = 0.004$).

In the polypharmacy group the death rate was 1.5 per 100 patient-months (49 deaths/2,755 patient-months), nearly ten times as high as the death rate for MediVAn patients, which was 0.18 deaths per 100 patient-months (19 deaths/10,530 patient-months) ($p < 0.001$). None of the deaths was classified as being due to a definite adverse drug reaction.

Figure 2 shows the effects of the interventions on the numbers of prescriptions in the three study groups. A total of 24 patients died from June 1, 1988, to May 31, 1989, and 20 patients left the Denver VA system. There was no significant difference in the death rates or drop-out rates by study group. The numbers of medications were reduced in all groups ($p = 0.001$) at four, six, and 12 months. There was no significant difference between the prescription rates in the two intervention groups. However, the reduction in number of drugs in the two intervention groups combined compared with the control group was significant at four months ($p = 0.028$), had borderline significance at six months ($p = 0.099$), and was no different by 12 months ($p = 0.230$).

DISCUSSION

At the Denver VA Medical Center 28,000 patients are followed with 200,000 outpatient visits per year. A large percentage of these patients are elderly with several medical problems, receive many medications, and are followed by two or more care providers. The high death rate further confirms that this is a very sick population. Our control group of MediVAn patients represents a typical VA population of internal medicine patients with a death rate 10% of that of the polypharmacy group. A chart review of the deaths did not identify any definite drug-related mortality; thus, we feel that polypharmacy is probably a marker for poor prognosis and is not causative. In Group III, despite chart reviews by a skeptical clinician (TJM), it was often difficult to suggest more than two or three medications for elimination or consolidation. Although patients took more of some medications and less of others, the overall analysis indicated these patients were taking about the numbers of pills prescribed. The percentage data, however, show that only half of all drugs were taken in a compliant manner. The reasons for this high level of medicine consumption may be that this is a very sick population of patients, and since veterans receive all drugs free there is no financial disincentive to taking many medications. Not surprisingly, as the number of providers following the patient increased, so did the number of active prescriptions. This may be due to either the complexity of the cases or the feeling of each provider that he or she must contribute something unique to the care of the patient.

All groups experienced significant reductions in polypharmacy (Fig. 2). The reason for the reduction in the control population is probably threefold. First, the statistical phenomenon of regression to the mean may have been operating, since we studied patients who were at one extreme of the prescribing scale. They were certainly taking a variety of "acute" medications as well as "chronic" ones. As the "acute" medications

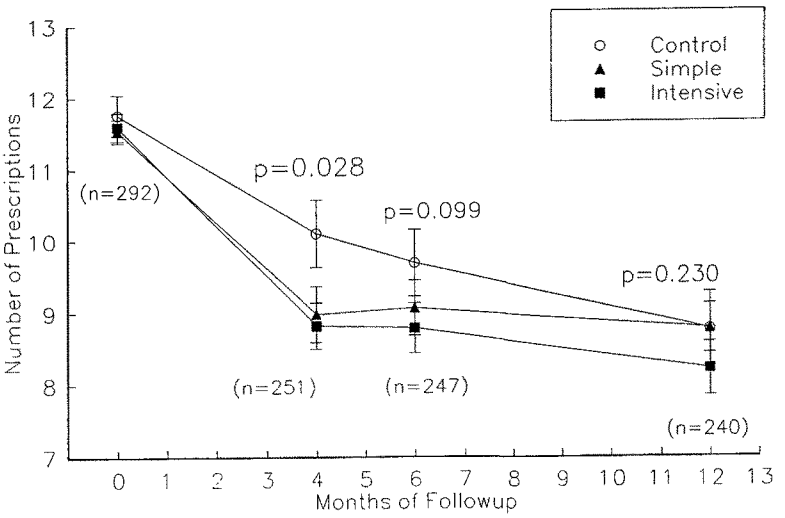

FIGURE 2. Effects of interventions on polypharmacy rates. P values are derived from a repeated-measures analysis of variance and represent the effects of the interventions at each time point. The only statistically significant time was four months after intervention. At this point there was no difference between the two study groups in mean numbers of medications.

were reduced, the patients regressed toward the mean number of prescriptions. Second, many patients in the control group were followed by a provider who was also following patients in Groups II or III. Thus, communications to reduce medications in the latter groups may have had a cross-over effect in patients of the control group. The third probability is that providers were influenced by other concurrent efforts to reduce polypharmacy. Audit sheets for all primary care providers include a section that deals specifically with reduction of unnecessary medications.

There have been other intervention trials in polypharmacy with even more intense interventions, such as personal interviews with pharmacists.[5,6] Although these interventions showed reductions in medications, they were more expensive and time-consuming than a simple letter. Our study did not show any further reduction in medications with the more intensive intervention in Group III than a letter. Future studies are planned to evaluate whether personal intervention by a pharmacist will reduce polypharmacy to a greater extent than our simple letter.

Our study showed an effect four months after the intervention, but by six months there was no significant difference from the controls. The reasons for this may be related to other ongoing efforts to reduce polypharmacy in our patient population, since the number of medications in the control group continued to fall. This effect is similar to those of other physician interventions, which tend to be short-lived.[7,8] We have very little data on the relationship between the clinical outcome and the reduction in polypharmacy. We cannot be certain that the reduction in medications benefited the patients; however, there was no difference in the death rates among the three groups. Others have emphasized that multiple medications may be more harmful than helpful.[1,9-11]

In conclusion, a simple intervention resulted in a reduction in prescribed medications in a group of patients with polypharmacy. Whether more time-consuming and complex interventions will reduce medications further remains to be demonstrated.

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