

Multicenter Study of Family Physician Prescribing

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The objective of this study was to examine differences in prescribing characteristics among four Iowa family practice offices, each associated with family practice residency programs. This prospective study collected data over a four-month period, utilizing duplicate, carbon-copy prescriptions. The prescriptions were tabulated according to individual drug and therapeutic categories. Differences in prescribing frequency among offices were analyzed using chi-square 2×2 contingency tables. The number of prescriptions written at each office (designated A through D) were as follows: A, 1,034; B, 1,449; C, 2,965; and D, 2,335. The most frequently prescribed drug category was systemic antibiotics, followed by cough, cold, or allergy products, analgesic and anti-inflammatory drugs or muscle relaxants, diuretics, and topical anti-infectives. There were statistically significant differences in the frequencies of these categories among offices. The most frequently prescribed drug was amoxicillin at offices A, B, and C, and erythromycin at office D. There were statistically significant differences in the frequencies of the top ten drugs at each office. From these data the family practice faculty and clinical pharmacists can identify therapeutic areas that may require additional educational emphasis for the resident.

Drug use review is an established quality assurance procedure in hospitals¹⁻⁶ and has been expanded into the ambulatory setting.⁷⁻¹¹ Numerous techniques for conducting such reviews have been described and have included examining the frequency of use and the appropriateness of individ-

ual drugs or therapeutic categories.^{10,12-18}

Drug use review has not only been used as a tool for identifying drug use practices, but has also been modified to provide physician continuing education.^{10,11,17,19} Manning et al¹⁰ described a technique for examining prescription copies to identify areas of concern for which physician educational materials were subsequently developed.

The process of prescription review is becoming increasingly useful in family practice residency programs. Continuous feedback to residents is necessary for the development and refinement of prescribing skills. The quantitative drug use review reported here was conducted to provide family practice residents and faculty with the information necessary to make decisions regarding

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educational needs for resident prescribing and to compare them with other published reports¹⁸ and national prescribing patterns.²⁰

The objectives of this study were to create prescribing profiles at four family practice residency training offices, compare prescribing characteristics in these offices, and provide feedback for the development of educational programs.

Methods

Four family practice offices were included in the study and will be designated as A, B, C, and D.

Data consisted of all written prescriptions issued from the four family practice offices from February through June 1981. Data were collected by the use of duplicate carbon-copy prescriptions in all offices. The original prescription was given to the patient and the copy retained by the office for the investigators. This procedure had been used in offices A and B for over six years and was an accepted routine. Because this was a new procedure for offices C and D, prescriptions were consecutively numbered so that the success of capturing the prescription data could later be determined. Telephoned or sampled prescriptions were not included because of the difficulty in effectively capturing these prescriptions.

The prescriptions were tabulated according to individual drug, by therapeutic categories, and by prescribing physician. The 25 therapeutic categories are displayed in Table 1. Generically equivalent, single-entity products were combined unless the product had unique characteristics (ie, liquid vs sustained-release theophylline). Combination products were categorized by brand name. One hundred prescriptions from each office were randomly selected and medical records examined for the diagnosis. Differences among the offices in prescribing frequencies (of individual drugs or therapeutic categories) were tested by a chi-square 4×2 goodness-of-fit method. When overall significance was demonstrated, analysis was further performed by a chi-square 2×2 contingency table to isolate differences in prescribing frequencies at each office. Statistical significance was accepted with a $P < .05$.

Results

The number of prescribers at each office from whom data were collected is as follows: A, 12 residents and 4 staff physicians; B, 12 residents and 5 staff physicians; C, 11 residents, 4 staff physicians, and 1 physician's assistant; and D, 23 residents.

Table 1. Therapeutic Categories for Drug Use Review

Systemic anti-infectives (antibiotics)
Cough, cold, allergy
Analgesic, anti-inflammatory, muscle relaxants
Diuretics
Topical anti-infectives
Sex hormones
Gastrointestinal
Vaginal anti-infectives
Topical anti-inflammatory
Vitamins
Antiasthmatics
Antihypertensives
Antidepressants
Cardiovascular (other than antihypertensive)
Sedative-hypnotic
Otics
Antimigraine (other than β -blocker)
Oral corticosteroids
Anticonvulsants
Diaphragms
Thyroid hormones
Gout medications
Ophthalmics
Antiacne
Other

The prescription capture at offices C and D was 98 percent and 95 percent, respectively. The number of prescriptions collected at each office was: A, 1,034; B, 1,449; C, 2,965; and D, 2,335, resulting in a total of 7,783 prescriptions at the four offices. The faculty physicians infrequently wrote prescriptions at offices A (45) and B (135) compared with office C (1,061). The faculty at offices A and B served primarily to staff residents and cared for their own patients in another office.

Therapeutic Categories

Figure 1 displays the most frequently prescribed therapeutic categories when prescriptions from all four offices were considered. These five categories represented between 59 and 68 percent of all prescriptions at each office. Systemic antibiotics were the most frequently prescribed drugs in all four offices. Cough, cold, or allergy products, diuretics, oral analgesics and anti-inflammatories, and topical anti-infectives were all found in the top ten drug categories for each office. Data displayed in Figure 1 reflect the significant differences in the frequency with which these categories were prescribed at the different offices.

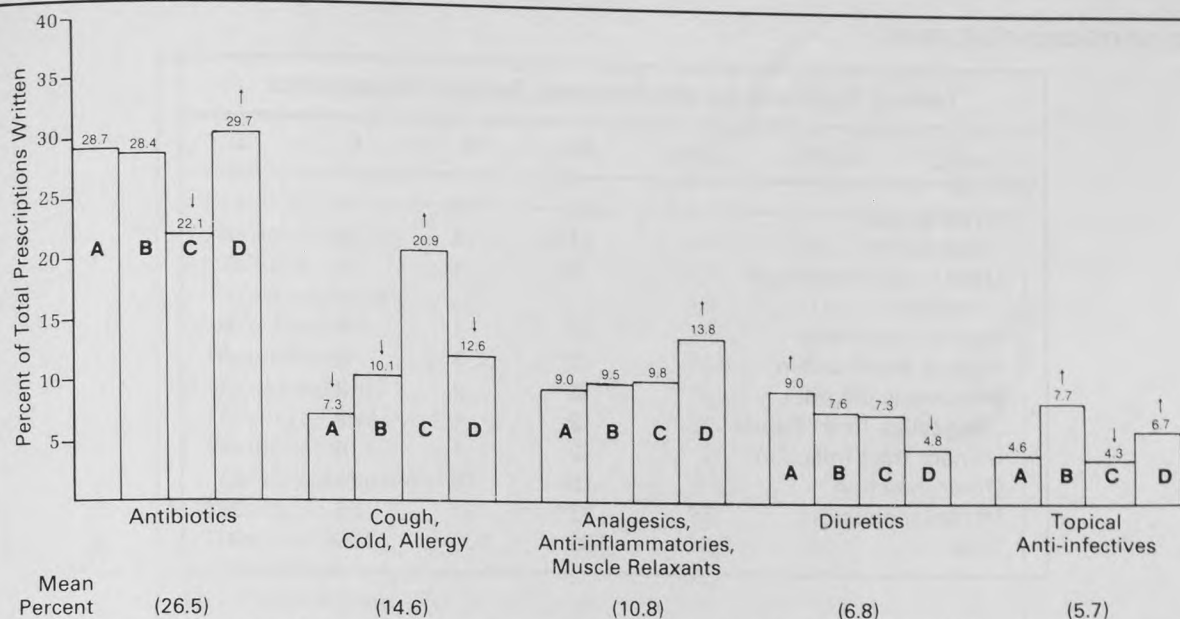


Figure 1. The five most frequently prescribed therapeutic categories at offices A, B, C, and D. ↑ indicates significantly greater and ↓ significantly fewer numbers compared with the other offices (chi-square 2×2 contingency table)

Table 2. Ten Most Frequently Prescribed Drugs At Each Office*

	Office A (n = 1,034)	Office B (n = 1,449)	Office C (n = 2,965)	Office D (n = 2,335)
1.	Amoxicillin (6.7)	Amoxicillin ↑ (8.7)	Amoxicillin ↓ (5.2)	Erythromycin ↑ (7.6)
2.	Hydrochlorothiazide ↑ (5.5)	Penicillin V ↑ (4.9)	Actifed ↑ (4.8)	Penicillin V ↑ (4.8)
3.	Penicillin V (4.5)	Hydrochlorothiazide ↑ (4.2)	Erythromycin ↓ (3.8)	Amoxicillin ↓ (4.1)
4.	Erythromycin (4.2)	Erythromycin ↓ (3.7)	Dimetapp ↑ (3.7)	Ibuprofen ↑ (4.0)
5.	Trimethoprim- Sulfamethoxazole (3.4)	Sulfacetamide ↑ (3.5)	Hydrochlorothiazide (3.7)	Ampicillin (3.6)
6.	Ampicillin (2.9)	Trimethoprim- Sulfamethoxazole (3.0)	Ampicillin (2.9)	Acetaminophen with Codeine ↑ (2.9)
7.	Naproxen ↑ (2.9)	Ibuprofen (2.4)	Naldecon ↑ (2.5)	Dyazide ↑ (2.3)
8.	Ibuprofen (2.5)	Dimetapp (2.4)	Phenergan(s) ↑ (2.3)	Sulfacetamide (2.1)
9.	Propranolol (2.5)	Acetaminophen with Codeine (2.1)	Trimethoprim- Sulfamethoxazole (2.3)	Tetracycline (1.9)
10.	Metronidazole ↑ (1.8)	Tetracycline (2.1)	Penicillin V ↓ (2.1)	Trimethoprim- Sulfamethoxazole (1.9)
CP**	36.9	37.0	33.3	35.2

*Rank and percent of prescriptions at each office for the ten most frequently prescribed drugs in offices A, B, C, and D

↑ Indicates significantly greater and ↓ indicates significantly fewer prescriptions compared with the other offices (chi-square 2 × 2 contingency table).

**CP = cumulative percent

Table 3. Diagnoses for 400 Randomly Selected Prescriptions

	A	B	C	D
Hypertension	16	16	19	11
Otitis media	11	14	9	8
Upper respiratory tract infection	8	4	8	7
Allergic disorders	10	4	7	9
Muscle strain/sprain	2	7	9	6
Rheumatic disorder	6	2	3	4
Congestive heart failure	3	4	2	3
Urinary tract infection	2	3	4	1
Other infection	19	15	13	25
Miscellaneous	23	31	26	26
Total	100	100	100	100

Individual Drugs

The ten most frequently prescribed drugs for each family practice office are displayed in Table 2. Statistical differences in prescribing frequencies are indicated. Although the rankings differ, amoxicillin, penicillin V, erythromycin, and trimethoprim-sulfamethoxazole appear on this list for each office. At office C, four of the top ten drugs were cough, cold, or allergy products. As noted in Figure 1, office C issued significantly more prescriptions for this therapeutic category. The rankings in Table 2 differ from the top ten new prescriptions nationally during 1981, which were (1) Tylenol with codeine, (2) ampicillin, (3) Valium, (4) penicillin VK, (5) amoxicillin, (6) tetracycline, (7) Keflex, (8) Motrin, (9) erythromycin, and (10) erythromycin ethyl succinate (EES).²⁰ The diagnoses for the 400 randomly selected prescriptions are listed in Table 3 and demonstrate similar frequencies among the four offices.

Table 4 displays a comparison of selected drugs. These were chosen for comparison as a result of the concern expressed about overutilization of cimetidine, benzodiazepines, and cephalosporins in some institutions. The remaining agents were chosen as examples of how differences among offices might be compared. In these four offices there was low utilization of cephalosporins (0.4 to 1.8 percent), cimetidine (1 to 1.2 percent), and benzodiazepines (1.4 to 3.2 percent). In contrast, new prescriptions for Keflex, Tagamet, and Valium ranked, respectively, 7, 16, and 3 nationally.²⁰

Discussion

This study compared and contrasted prescribing patterns at four Iowa family practice offices.

The frequencies of individual drugs differed considerably among offices and when compared with national statistics. In addition, some of the top ten drugs were found to be different from a previous study from a single family practice residency reported in 1979.¹⁸ In this report, AVC, Darvon products, Valium, and prenatal vitamins ranked 4, 6, 9, and 10, respectively.

Individual profiles were prepared for each physician, and these data were shared with faculty and residents. The family practice faculty and clinical pharmacists found the prescribing profiles useful in identifying unexpected prescribing frequencies for some drugs. This data base provided an additional mechanism for conducting audits and for developing educational conferences.

Although this report concentrated on frequently prescribed drugs, perhaps as important are the infrequently used drugs. The low frequencies of cephalosporins, benzodiazepines, and cimetidine were noteworthy. However, closer examination of the data is necessary to determine, for instance, whether a minority of physicians are prescribing a majority of these preparations, perhaps necessitating an individualized educational approach, which can be accomplished by examining the individual physician's profile.

Although this study has proven useful in identifying prescribing practices that may require further review, the limitation of this type of evaluation must be appreciated. Quality of prescribing cannot be directly evaluated from these data and is currently being investigated. This study cannot adequately explain the observed differences among offices. As a result of this report, future studies of these sites will focus on the relative

Table 4. Site Comparison of Selected Drugs

	Office A	Office B	Office C	Office D
Total prescriptions	1,034	1,449	2,965	2,335
Antibiotics	297	411	655	693
Cephalosporins*	4	18	18	44 ↑
Gastrointestinal	30	40	125	81
Cimetidine**	11	14	35	22
Benzodiazepines†	27	34	94 ↑	33 ↓
Antihypertensives	57	54	171	48
Combination antihypertensives††	3	7	28	4
Diuretics	110	93	216	111
Combination diuretics†	10 ↓	3 ↓	64	57 ↑
Oxyphenbutazone	0	0	45 ↑	0

Numbers indicate the number of prescriptions for each drug or therapeutic category
 *P < .005 compared with all antibiotics (4 × 2 contingency analysis)
 **Not significantly different when compared with total drugs or all gastrointestinal drugs (4 × 2 contingency analysis)
 †P < .005 compared with total drugs (4 × 2 contingency analysis)
 ††Not significantly different compared with all antihypertensives (4 × 2 contingency analysis)
 ↑ Indicates significantly more prescribed and ↓ indicates significantly fewer prescribed by chi-square 2 × 2 analysis

importance of variables that might contribute to these differences.

The prescription review described is well suited for family practice residency programs, as the physician faculty or clinical pharmacist cannot be available during each prescribing event in a busy office practice. Reviewing prescription copies retrospectively reveals the general prescribing practice of the office. Residents in training should receive feedback on prescribing habits to encourage refinement in their drug use practices.

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