

## RESEARCH ARTICLES

### Iowa Priority's Brown Bag Medication Reviews: A Comparison of Pharmacy Students and Pharmacists

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**Objective.** To determine the percent of drugs that could have been substituted with a generic product or interchanged with a therapeutic equivalent, and compare the types of recommendations (ie, cost saving vs therapeutic) made by pharmacists and pharmacy students.

**Methods.** A retrospective cohort study of the Iowa Priority Brown Bag Medication Reviews was done. A random sample of 100 reviews performed by pharmacists and 50 reviews performed by pharmacy students was drawn from a pool of 2060 reviews.

**Results.** There were no differences among the study groups in terms of demographics, disease variables, or medication use variables. Pharmacy students made significantly more total recommendations as well as more cost saving, generic substitution, alternate brand, and stop prescription medication recommendations than pharmacists. Over 50% of all medications identified in the medication reviews could have been substituted with a generic product or with a therapeutic equivalent.

**Conclusions.** This study showed that pharmacy students make significantly more recommendations overall, and more recommendations to decrease healthcare expenses when compared with pharmacists, a finding that should encourage other pharmacists and pharmacy settings to utilize pharmacy students.

**Keywords:** medication review, pharmacists, pharmacy students, community pharmacists

## INTRODUCTION

Medication spending continues to increase and third-party payers are seeking mechanisms to reduce drug costs. Brown bag medication reviews are one mechanism for reducing medication costs and improving the safety of medications. In this study, a brown bag medication review was a health care practitioner meeting face-to-face with a patient to review the appropriate use of his or her medications. The reviewer evaluated all of the patient's current prescription, nonprescription, and supplemental/herbal therapies to gain a complete assessment of the patient's overall health and medication issues. The reviewer evaluated the current drug regimen for therapeutic efficacy, safety, cost effectiveness, and generic availability.<sup>1,2</sup> Numbers of medications and numbers of medication errors have been reduced as a result of medication reviews.<sup>1,3-5</sup> In 1995, one of the largest medication review programs was performed in Britain and involved over 200 patients using ~1,300 prescription and nonprescription medications from 23 pharmacies.<sup>6</sup> After a medication

review, pharmacists discovered that 58% of the patients were not using their medications as prescribed, either because they did not know the importance of doing so or they simply did not know the correct way to administer their prescribed regimens. In the end, 65% of the interventions made by pharmacists involved educating patients about the purposes of their medications and the most efficacious way they should be taken. This evidence suggests that medication reviews, especially for individuals who use many medications, may be an important strategy in reducing the number of medications being taken and medication costs, as well as in identifying possible nonadherence issues.

Iowa Priority is a discount prescription program designed to reduce prescription medication costs and improve the safety and cost effectiveness of medication use for Medicare-eligible Iowans who lack prescription medication insurance. The program works to secure discounts from pharmaceutical manufacturers and pass the discounts on to enrollees. Although discounts alone may improve the health of enrollees by helping them afford the prescription medications prescribed by their physicians, the program also includes the innovative medication review program, known as the "brown bag review," to fur-

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ther improve the safety and cost-effectiveness of their medications.

The goals of the review are to (1) increase each member's understanding and awareness of their drug regimen to promote greater compliance and safety, (2) identify potential alternative treatments, ie, substitution with a generic product or a therapeutic equivalent, that may produce similar clinical results at a lower cost to the member, and (3) isolate potential medication use problems. Pharmacists or physicians can complete the Iowa Priority brown bag reviews. In these reviews, substitution with a generic product was defined as the process of a pharmacist filling a prescription with a generic drug that is of equal potency, bioavailability, and dosage form as the brand name drug written in the original prescription.<sup>7</sup> Substitution with a therapeutic equivalent was the substitution of one therapeutically equivalent medication for another.<sup>8</sup>

In the community setting, pharmacists are one resource that Iowa Priority is using to help reduce medication costs. In community pharmacies, there may be pharmacy students who conduct the medication reviews under the direction of pharmacists. The students are Doctor of Pharmacy students participating in advanced practice experiences as part of their final year of pharmacy education. Interventions made by pharmacy students are accepted by physicians between 78.7% and 97% of the time.<sup>9-14</sup> Similarly, practicing pharmacists show intervention acceptance rates by physicians of ~85%.<sup>9</sup> Analysis of pharmacy student interventions has also shown that cost savings can result. Slaughter et al reported that 17 student interventions resulted in an estimated annual savings of \$3,891.<sup>11</sup> Briceland et al also reported that 50.7% of student interventions accepted by physicians resulted in cost savings.<sup>13</sup> Although the data on student interventions are sparse, studies suggest that pharmacy students are providing therapeutic benefits to patients and helping them to save money.<sup>10-13</sup>

The purpose of this study was to examine the recommendations in the Iowa Priority Brown Bag Medication Reviews. The specific objectives were: (1) to determine the percent of drugs that could have been substituted with a generic product or interchanged with a therapeutic equivalent, and (2) to compare types of recommendations, ie, cost saving vs therapeutic, made by pharmacists and pharmacy students.

## **METHODS**

### **Design**

During 2002, 3071 brown bag reviews were completed. At the time of this study, 2060 were available for

analysis, of which 70 had been completed by pharmacy students, 66 had been completed by physicians, and 1924 had been completed by pharmacists. Studies about the Iowa Priority Brown Bag Reviews have been reported elsewhere.<sup>15-18</sup> A retrospective cohort study was conducted comparing recommendations of pharmacy students to pharmacists. Fifty brown bag reviews completed by pharmacy students and 100 brown bag reviews conducted by pharmacists were randomly selected. Twice as many pharmacists were sampled in comparison to pharmacy students to improve the power of the study. Previous analysis of all 2060 brown bag medication reviews showed that 50% of reviews included a recommendation and ~60% of the recommendations were related to cost savings.<sup>15</sup> Analysis of the 150 reviews in this study allowed us to detect a difference of 20% between the pharmacists and pharmacy students. The Institutional Review Board of the University of Iowa approved the evaluation of the brown bag medication reviews.

### **Brown Bag Medication Review Documentation**

The documentation form for the brown bag review included areas for medication lists, potential drug interactions, potential medication duplications, other findings (any other drug therapy problems identified by the reviewer), recommendations, and physician comments about any recommendations. These forms were submitted for payment to the adjudicator. A unique identifier kept on file by Iowa Priority was added to the documentation form. The adjudicator forwarded the documentation forms to the researchers with all identifying information deleted. Research assistants entered these data into a Microsoft Access database. The unique identifier allowed researchers to link the individuals who received medication review with enrollment data that were obtained from all Iowa Priority members. These data included age, gender, self-reported diseases, self-rated health, number and cost of prescriptions in the past month, and prescription drug insurance status.

### **Variable Definition**

The first study objective was to determine what percent of medications could have been substituted with a generic product or a therapeutic equivalent. To calculate the percentage of medications that could have been substituted with a generic product or interchanged with a therapeutic equivalent, all medications from the 150 brown bag reviews were identified and each medication was coded based upon the availability of a generic substitute or therapeutic equivalent. Determination of generic avail-

ability was done via the Multum Lexicon database updated as of March 2003 and through use of DrugStore.com. To be considered a therapeutic equivalent, drugs needed to be in the same medication class and available generically. The reason for only using medications within the same class was that researchers were unaware of the indications for each drug. In addition, this approach is consistent with other third party payer policies.<sup>19</sup>

Next, the medications were divided by prescription or nonprescription status. Herbal therapies were excluded from this analysis because few were reported (16 of 1220 drugs among the group studied) and because of the difficulty in identifying whether herbal manufacturers are brand-name or generic manufacturers. For prescription and nonprescription medications, the following variables were recorded for each patient: (1) number of medications used at the time of the brown bag review, (2) number of current medications that were generic, (3) number of brand name medications currently used that could be substituted with a generic product, (4) number of brand name medications currently used that could be interchanged with a therapeutic equivalent. The percent of medications that could have been substituted with a generic equivalent was found by dividing the number of brand name medications available as generic products by the total number of brown bag medications for each patient. The percent of drugs that could be interchanged with a therapeutic equivalent was found by dividing the number of brand name medications that could be interchanged with a therapeutic equivalent by the total number of medications reviewed in each patient's bag. If a medication could be substituted or interchanged, it was recorded only in the generic substitution category. From these data we were able to determine the percentage of medications that could be substituted or interchanged.

The second objective was to compare the types of recommendations, ie, cost saving vs therapeutic, based on whether the review was conducted by pharmacists or pharmacy students. All recommendations from the 150 brown bag reviews were examined. Each of the following recommendation types was counted for each patient: (1) stop prescription medication, (2) stop nonprescription medication, (3) change dose, (4) add medication, (5) switch to alternate brand, (6) change to alternate generic medication, (7) generic substitution, and (8) change to generic which is same medication but not bioequivalent to brand-name prescription, such as switching from Toprol XL to metoprolol. The total number of recommendations for each person was also counted.

Recommendation types were classified as cost saving or therapeutic. Recommendations were classified as cost

saving if there was a conversion from a brand-name product to a generic or therapeutic equivalent. A therapeutic intervention was defined as any recommendation aimed to improve a patient's drug therapy. Several stoppages were not classified because no reasoning was provided; therefore, the stoppage could have been for either cost savings or therapeutic improvement.

### **Analysis**

Comparability of the study groups was determined on the basis of 8 criteria: (1) age, (2) gender, (3) number of self-reported disease states, (4) self-rated health ranging from excellent to poor, (5) number of self-reported drugs currently utilized, (6) self-reported drug spending, (7) presence of prescription drug insurance, and (8) number of medication therapy problems. The *t*-test was used for comparisons of mean data and the chi-square test was used for nominal data. These comparisons indicated whether individuals who received brown bag reviews from pharmacy students and pharmacists were similar.

Recommendation types were compared based upon who made the recommendation. First, individual recommendation types were compared with Pearson chi-square tests to determine whether pharmacists or pharmacy students were more likely to make specific types of recommendation. Second, cost saving and therapeutic recommendations were compared with the Pearson chi-square test to determine whether either group made more general types of recommendations.

Prior to the collection and analysis of data, several hypotheses were formed. Patients were expected to be similar regardless of whether a pharmacist or pharmacy student performed the brown bag medication review. The number of prescriptions that could be substituted with a generic product was anticipated to be near 60% since that is consistent with prior studies.<sup>20</sup> Of the 60% of prescriptions that could be substituted with a generic product, previous research had shown that ~84% were generically substituted,<sup>20</sup> a figure also anticipated in our research. Pharmacy students were expected to make more therapeutic than cost-saving recommendations because it was thought that students would use their new clinical knowledge to adjust patients' drug therapy more than focusing on cost. Students were also anticipated to make more therapeutic recommendations because they are more likely to have extra time to research medication safety issues than the pharmacists, who had other duties to perform. Pharmacists were expected to make more cost-related recommendations because they have more practical experience and have found that cost containment is important to insurers and patients.

Table 1. Demographic Comparison of Patients in Pharmacist and Pharmacy Student Study Groups

	Pharmacist n (%)	Pharmacy Student n (%)
Age, y (mean ± SD)	77.2 ± 8.1	77.5 ± 7.3
Gender (% female)	68 (69.4)	38 (77.6)
Diseases per patient (mean ± SD)	3.4 ± 2.1	3.5 ± 1.5
Number of self reported disease states (mean ± SD)	3.25 ± 0.21	3.49 ± 0.22
High blood pressure	61(62.2)	35 (71.4)
Arthritis	55 (56.1)	30 (61.2)
High Cholesterol	38 (38.8)	23 (46.9)
Thyroid disease	20 (20.4)	9 (18.4)
Osteoporosis	18 (18.4)	14 (28.6)
Self-reported health		
Poor	3 (3.1)	2 (4.1)
Fair	27 (27.6)	15 (30.6)
Good	47 (48.0)	20 (40.8)
Very good	18 (18.4)	10 (20.4)
Excellent	3 (3.1)	2 (4.1)
Self reported drugs taken (mean ± SD)	4.9 ± 2.7	5.49 ± 2.6
Prescription drugs reviewed in Brown bag (mean ± SD)	5.27 ± 2.5	6.0 ± 2.6
Self reported drug spending (mean ± SD)	\$177.68 ± \$134.02	\$188.59 ± \$104.90
Presence of prescription insurance (%yes)	8 (8.2)	3 (6.1)
Number of drug therapy problems		
0	66 (67.3)	30 (61.2)
1	15 (15.3)	10 (20.4)
2	11 (11.2)	5 (10.2)
3-8	6 (6.1)	4 (8.1)

**RESULTS**

Of the 150 brown bag reviews examined, the average age of individuals was 77 years, and over 70% were female. There were no differences by study groups in the demographic, disease variables, or medication use variables (Table 1). The number of prescription medications the patients brought to the pharmacy for review in the brown bag was higher than their number of self-reported medications during the past month.

Each patient was using a mean of 5.5 ± 2.5 prescription drugs, of which 2.2 ± 1.5 (40.7%) were generic products. Patients were also using 2.5 ± 2.4 nonprescription medications, of which 1.6 ± 1.7 (64.0%) were generic products. Approximately half of the patients with prescription medications had at least one additional medication that could have been substituted with a generic product. Over 40% of patients taking nonprescription drugs

could have one or more additional generic substitutions. When substitution with a generic product was not possible, there were still many opportunities for interchange with a therapeutic equivalent. More than 90% of prescription medication users and ~13% of nonprescription medication users had the opportunity to interchange their medication with a therapeutic equivalent.

Of the total number of medications involved in the study, over 50% could be substituted or interchanged but were not at the time of the brown bag review (Table 2). Slightly less than 20% of nonprescription medications could have been substituted or interchanged (Table 2). Of the prescriptions for medications that could have been substituted, ~71% were actually filled with the generic medication. There were no differences between pharmacist and pharmacy student groups in the rate of substitution and interchange of medications.

Table 2. Substitution with generic product and interchange with therapeutic equivalent not utilized

	Total Number of Medications in Brown Bags	Generic at Brown Bag n (%)	Generically Available Not Used* n (%)	Therapeutic Interchange Not Used† n (%)
Prescription Drugs	823	335 (40.7)	136 (16.5)	319 (38.8)
OTC Drugs	381	244 (64.0)	74 (19.4)	1 (0.04)

\* Generically Available Not Used /Total Number of Medications in Brown Bag\*100.

† Therapeutic Interchange Available/ Total Number of Medications in Brown Bag\*100

Table 3. Comparison of Recommendations Between Pharmacists and Pharmacy Students

Recommendation Type	Pharmacists	Pharmacy Students	P value
	n (%)	n (%)	
Any recommendation	55 (56.1)	37 (75.5)	0.022
Cost saving	40 (40.8)	29 (59.2)	0.035
Substitution with generic product	13 (13.3)	13 (26.5)	0.047
Alternate brand medication	17 (17.3)	17 (34.7)	0.019
Alternate generic medication	16 (16.3)	3 (6.1)	0.082
Nonbioequivalent generic	1 (1.0)	2 (4.1)	0.216
Therapeutic	27 (27.6)	18 (36.7)	0.255
Change Dose	13 (13.3)	7 (14.3)	0.865
Stop Rx medication	3 (3.1)	7 (14.3)	0.011
Stop OTC medication	4 (4.1)	1 (2.0)	0.52
Add Medication	13 (13.3)	6 (12.2)	0.862

Analysis of the recommendation types showed that there were statistically significant differences in pharmacist and pharmacy student recommendations. Pharmacy students were more likely than pharmacists to make any recommendation (Table 3,  $p = 0.022$ ). Pharmacy students made significantly more “stop prescription drug,” “switch to alternate brand,” and substitution recommendations (Table 3). When individual recommendation types were grouped into cost-saving and therapeutic categories, pharmacy students made significantly more cost-saving recommendations than pharmacists. Students also made more therapeutic recommendations, although the difference was not statistically significant.

## DISCUSSION

The patient populations who received the brown bag medication reviews from pharmacists and pharmacy students proved to be very similar, a finding that was anticipated. It was important that the patient groups were similar in their disease states and number of medications because substantial differences in these criteria would have limited the comparability of the study groups in terms of the types of recommendations. Other findings of our study were different than hypothesized. We hypothesized that pharmacists would make more cost-saving recommendations than students; however, the opposite was found. Pharmacy students made substantially more recommendations in several categories. If the recommendation “Stop Rx” had been considered a cost-saving recommendation, then the difference in the percentages of pharmacy students and pharmacists making cost recommendations would have been even greater. In some instances, the pharmacy students’ rate of making recommendations was nearly 4 times that of pharmacists. Although we anticipated that students would make more therapeutic recommendations, and they appeared to

make more therapeutic recommendations, the difference was not statistically significant.

Pharmacy students may have made more recommendations than pharmacists because of differences in training, site-specific experiences, and practice orientation. For example, students may have better patient-interviewing skills resulting from more clinically oriented education. Because the 2 study groups had similar numbers of medications per patient, better interviewing skills may have allowed students to collect a more complete medication history, enabling them to make more recommendations. Pharmacists may have made fewer recommendations because of site-specific reasons, such as familiarity with the patient’s desires and reluctance to make recommendations because it might damage provider relationships at their pharmacy site. Finally, the orientation of the pharmacy practice site may have provided students with more time to perform brown bag reviews because they were on clinical rotations, while the pharmacists had other tasks to perform.

The findings from this study show students made more recommendations than pharmacists. That physicians frequently accept recommendations from students at a rate similar to that at which they accept recommendations from pharmacists<sup>9-14</sup> indicates students can be valuable members of the healthcare team, even while in training. Some institutions have been reluctant to work with pharmacy students in the past, as they have felt that students only provide an additional burden to their staff. This study shows that students can make a significant impact, indicating to potential preceptors and institutions that students are beneficial to each practice site and may even decrease the workload for pharmacists.

This study revealed that many opportunities remain available for pharmacists and pharmacy students to make additional cost-saving recommendations to patients and

physicians. Of the brand-name prescription medications identified in the brown bag reviews, a substantial portion could be substituted or interchanged. Between 1991–1995 the rate of substitution of a medication with a generic product increased from 33.0% to 43.2%, but only rose to 44.6% by 1998.<sup>20</sup> Other studies have shown that ~60% of prescriptions written could be substituted.<sup>20</sup> Our data were similar, although only 71% were actually substituted when a generic was available in this study, compared with previous studies of 84%.<sup>20</sup> In our study, when a generic substitute was not available, interchange with a therapeutic equivalent was still possible, as 38.8% of the drugs had therapeutic alternatives. The frequency of interchange with therapeutic equivalents is not well documented. However, a therapeutic equivalent is commonly interchanged for a prescription medication in healthcare systems with formularies to improve patient outcomes, decrease costs, and control inventory.<sup>8</sup> Settings such as hospitals sometimes allow for automatic substitution by pharmacists, but in the community setting the physician's approval is required prior to interchange with a therapeutic equivalent.

All substitutions with generic products and interchange with therapeutic equivalents may not be in the best interest of all patients. For example, some patients with type II diabetes may have their blood glucose level well controlled with a particular oral medication, but there may be other less expensive oral medications available. If the less expensive medication is equally effective in controlling the patient's glucose level, it is obvious that patients should use the less expensive alternative. When the less expensive alternative is somewhat as effective, the decision of which medication should be used becomes more difficult for the patient and providers. Brown bag reviews by pharmacists and pharmacy students may help patients and prescribers understand the balance between effectiveness and costs. Cost-effective therapy may not necessarily mean the least expensive drug, since using more expensive drugs may save in overall healthcare costs.

Several limitations exist. Some of the forms were not completely filled out by the person performing the review, and identification of the individual who completed the documentation forms could not be confirmed. We suspected that some forms may have been completed by students, yet they were identified as having been completed by the pharmacists who were overseeing the students. If this occurred as suspected, differences in the rates of recommendations between the pharmacists and pharmacy students may be underestimated. Very few forms actually indicated whether a physician accepted the recommenda-

tions made. This prevented us from confirming the findings of other studies that showed student recommendations are accepted at a rate similar to that of practicing pharmacists. Several forms also contained incorrect classification of recommendation types, and this was corrected prior to analysis.

There were only a small number of pharmacy students involved in brown bag evaluations compared with the number of pharmacists. It is not clear whether the recommendations made by this group of students is representative of all pharmacy students. In addition, this project was done in pharmacies located exclusively in Iowa. This may be a limitation because the population and types of disease states commonly experienced throughout the rest of the United States may differ from those in Iowa. Iowa is a predominantly rural state with a large portion of elderly individuals. We did not reduce the alpha to account for multiple comparisons. Thus, some of the statistical differences found may be due to sampling error rather than to true differences.

The elapsed time between the brown bag review and our study was another limitation. The list used to classify drugs as available with generic products was updated through March 2003, but some of the brown bag reviews were performed at least 1 year prior to the list being updated. Therefore, some of the drugs may not have been generically available at the time of review. This time differential may have falsely elevated the percentage of medications considered available for substitution with generic products. However, the time differential would not have affected the number or types of recommendations made by pharmacists and pharmacy students.

Finally, there were no data regarding patient outcomes resulting from the recommendations that were accepted. We hope that illustrating the ability of pharmacy students to make recommendations comparable to those made by pharmacists will encourage future studies to quantify the outcomes of the recommendations.

## **CONCLUSIONS**

The Iowa Priority Brown Bag Medication Reviews provided patients an opportunity to receive feedback on their medications. Utilizing pharmacists and pharmacy students for medication reviews provides patients and physicians an opportunity to reconsider drug therapy in an effort to improve outcomes and reduce costs. By applying their clinical knowledge to patient-specific medication regimens and recommending ways the regimens could be improved, pharmacists and pharmacy students may improve patient drug therapies. Analysis of these data

have shown that pharmacy students still in training can make cost-saving and therapeutic recommendations. In addition, there appears to be additional cost savings that could be realized in terms of substitution of prescribed medications with generic products and interchange with therapeutic equivalents.

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