The Effect of Medication Reviews in a Rural Community Pharmacy Assistance Program: The Cenla Medication Access Program

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The purpose of this article is to determine the effect of medication reviews on patient understanding of and compliance to medications for participants in the Cenla Medication Access Program (CMAP). A sample of 844 individuals with a total of 2013 reviews over a period of 6 months to 1 year produced 5 outcome variables: the percentage of the total number of drugs the patient understands the purpose of (PURPOSE), understands the proper use of (USE), and is compliant with (COMPLIANCE) and the percentage of patients that experienced any drug-drug or drug-disease interactions (INTERACTION) or any adverse reactions (REACTION). Mixed-effects models and generalized estimating equations were used to assess change in PURPOSE, USE, COMPLIANCE, INTERACTION, and REACTION over time. All effects were adjusted for differences in age, race, gender, the number of years of education, total number of medications per patient, and the patient's primary diagnosis. Significant increases were observed for PURPOSE, USE, and COMPLIANCE. A significant decrease was observed for INTERACTION. No significant difference in REACTION was observed over time. CMAP has seen increases in patient understanding and compliance, as well as a decrease in drug-drug and drug-disease interactions through the first year of medication reviews.

KEY WORDS: Medication reviews, compliance, access.

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INDIVIDUALS AGED 65 YEARS AND OLDER account for a little more than 12% of the US population, yet they consume nearly 25% to 35% of prescription medications.[1,2] Major problems facing the elderly population and all individuals on prescription medications are noncompliance with their medication regimens and adverse drug reactions.[3-5] As a group, the elderly population experiences more adverse drug reactions than any other age group.[1] On average, elderly persons in the United States are on 5 medications, and their risk for a drug-drug interaction can be as high as 50%.[2,6] As many as a quarter of all hospital admissions in elderly persons are drug related.[5]

A way of increasing patient compliance and preventing adverse drug events and drug-drug interactions is through medication counseling from a licensed pharmacist. Research has shown that medication reviews and consultations can improve a variety of patient outcomes, including reducing adverse drug events.[7,8]

Compliance with drug regimens is particularly important for elderly persons. A randomized trial of community pharmacists educating elderly patients taking 4

or more medications showed a significant increase in compliance compared to control subjects. These patients had fewer medication problems as well.[9] Similar results were observed in another rural study in Alabama, where a clinical trial on the effectiveness of medication reviews was performed. Patients considered at high risk of medication-related adverse events were randomized into 2 groups: one group received the standard of care, and the other group received specialized care from a pharmacist. The group that was assigned to the pharmacist showed improvement in a variety of outcomes, including medication compliance and knowledge of the medications they were taking.[10] A meta-analysis looking at the effectiveness of interventions to improve medication adherence found a 4% to 11% increase in adherence with regular medication reviews.[11]

A common method of evaluating the effectiveness of medication reviews has been to examine change in a group of individuals before and after the implementation of medication reviews. Studies using this pre-post approach have shown significant reduction in blood glucose levels, lipid levels, unscheduled physician visits, and hospital and emergency department admissions and have shown increased patient compliance.[12-14] Other studies using numerous study designs have shown that medication reviews, performed on a regular basis, help improve a variety of outcomes: reductions in blood glucose, hemoglobin A1C, total and low-density lipoprotein cholesterol, number of emergency department visits, hospital admissions, physician visits, and adverse drug reactions, as well as increases in patient satisfaction and self-reported health-related quality of life.[15-27] Increasing a patient's knowledge of his or her medications through medication reviews contributes to overall improved health outcomes.[10,21,23]

The purpose of the current study is to assess the impact of medication reviews on patient understanding, compliance, drug-drug and drug-disease interactions, and adverse events. The results presented are pre-post change over time in these outcomes for patients with at least 2 medication reviews during the first year of the program.

Program Description

The Cenla Medication Access Program (CMAP) began services for elderly persons and "working poor" in rural central Louisiana by providing chronic care prescription medications and medication education for people with incomes at or below 200% of the federal poverty guidelines. CMAP is funded by the Rapides Foundation, a nonprofit Hospital Conversion Foundation located in Alexandria, Louisiana. Qualified individuals can participate in CMAP through 1 of 2 programs. One program that began in May 2001 is accessed through a subsidized outpatient pharmacy at the region's public hospital. The other program that began in September 2001 is accessed through a community-based prescription card benefit system using existing retail pharmacies. A description of the public hospital component has been previously published.[28] This article reports on results from the community-based prescription card benefit system.

CMAP employs a pharmacy benefits manager (PBM) who enables participants to use any pharmacy within the state of Louisiana. Participants pay an $8 co-pay per prescription for up to 3 prescriptions per month, regardless of the pharmacy they use as long as the medication is on the program formulary. The PBM processes the medications claims, reimburses the pharmacy at its agreed on contract price, and submits a bill to CMAP bimonthly.

To be eligible for the card component of the CMAP, participants

- must have an income that falls at or below 100% of the federal poverty level;
- must not have any insurance that covers their medications, such as Medicaid or private insurance;
- must be patients of private practice physicians; and
- must reside in 1 of 6 central Louisiana parishes: Grant, Winn, Allen, LaSalle, Rapides, or Avoyelles.

CMAP partners with existing agencies in each of the 6 parishes to open designated enrollment sites. These agencies are senior centers, local hospitals, and local community centers. The program provides the agency's staff with education on the application process and provides ongoing support and training as needed. Sites are encouraged to recruit individuals into the program through a stipend of $20 for each complete application and each 6-month renewal. Participants are recruited into the program through billboards, radio and television commercials, direct mailings, and physician office visits. To enroll, an eligible person must visit one of the agencies and complete an application form, provide proof of income and residence, and bring his or her current medications. Patients are asked to return for a medication review with a licensed pharmacist if they use 3 or more prescriptions or have visited the emergency department or been admitted to the hospital in the previous 6 months. There are 2 licensed pharmacists employed full-time by CMAP.

Once an individual completes the CMAP application and provides all appropriate documents, the application is sent to the CMAP office for processing. Eligible individuals receive a prescription card in the mail that can be used immediately at any pharmacy in the state. The prescription card expires 6 months after it is issued, ensuring that the participant will return to his or her enrollment site for a reenrollment interview and to ensure that the participant is still eligible for the program. Medication reviews are performed at this time for all participants who meet the criteria.

This study was approved by the institutional review board, and informed consent was obtained prior to conducting the study.

METHODS

Medication Reviews

Medication reviews are performed by licensed pharmacists to help patients understand and use their medications in the safest, most effective manner. The CMAP pharmacists spend more than 33 minutes, on average, meeting 1-on-1 with the participant, reviewing each medication. The pharmacist asks the patient what each medication is used for to assess patient understanding of the purpose of each medication. The pharmacist also asks about the proper dosing of each medication, making sure that the patient knows when, how often, and with what each medicine is taken. Questions regarding compliance, adverse drug events, and drug-drug and drug-disease interactions are also asked to ensure that the patient is having the best possible health results they can achieve through their prescription medicines.

CMAP pharmacists encourage patients to use only 1 pharmacy if possible to keep a complete medication profile in 1 system and to form a relationship with the local pharmacist. They provide pill boxes, glucometers, and both written and oral education. In addition, the CMAP pharmacist corresponds with the patient's physician and pharmacist to inform them that their patient participates in the program, to encourage assistance from them, and to notify them of any interactions or other pertinent information collected during the medication review.

At each medication review, the CMAP pharmacists complete an Assessment of Medication Review form, created by the CMAP evaluators to ensure that the reviews are performed thoroughly. They determine and record 3 quantitative outcomes and 2 categorical outcomes. The 3 quantitative outcomes, based on the total number of drugs the patient is taking, are the percentage of the total number of drugs the patient understands the purpose of (PURPOSE), the percentage of the total number of drugs the patient understands the proper use of (USE), and the percentage of the total number of drugs the patient is compliant with (COMPLIANCE). The 2 categorical outcomes are the following: Were any drug-drug or drug-disease interactions experienced by the patient? (INTERACTION: 1 = yes, 0 = no) and Did the patient experience any adverse reactions? (REACTION: 1 = yes, 0 = no).

Population

From September 2001 until October 2003, 1080 individuals were eligible for and administered a medication review when enrolled in the program. Medication reviews were administered at initial enrollment (period 1), 6-month reenrollment (period 2), and 12-month reenrollment (period 3). This article summarizes outcomes for a sample of 844 individuals who had a total of 2013 reviews over a period of 6 months to 1 year. A demographic comparison of this study group to a group of 236 individuals with only a baseline interview is presented in the Results section. For the 844 individuals, 325 have medication reviews at periods 1, 2, and 3; 489 have medications reviews at periods 1 and 2 only; and 30 have medication reviews at periods 1 and 3 only. The 2 CMAP pharmacists did not always administer subsequent reviews to the same patient, with 1 administering 1032 reviews and the other administering 981 reviews.

Statistical Methods

The 2-sample *t* test was used to compare mean age, mean number of years of education, and mean number of prescriptions taken between the study sample of 844 and the group of 236 that had only a baseline interview. The χ^2 test was used to compare race, gender, and self-reported diagnoses between the same 2 groups. Mixed-effects longitudinal regression models were used to assess change in the quantitative measures (PURPOSE, USE, COMPLIANCE), and generalized estimating equations (GEE) were used to assess change in the categorical measures (INTERACTION, REACTION) over interview periods 1, 2, and 3.[29,30] These analyses adjusted for the dependent nature of the data over time by estimating the covariance structure of the repeated measures. All analyses adjusted for initial age, race, gender, education, total number of medications, primary diagnosis, and pharmacist. The results of *F* tests are reported for the mixed-effects model, and the results of χ^2 tests are reported for the GEE model.

Regression models were fit using PROC MIXED and PROC GENMOD in SAS version 8e.

RESULTS

Demographics

Table 1 presents descriptive information for the study sample of 844 and the group of 236 that had only a baseline interview. For the study sample, 632 (74.9%) are women and 285 (33.8%) are African American, with an average age of 66.2 years. The average number of years of education for the study sample was 9.86, and the average number of prescriptions taken per individual was 6.00. While the study group was significantly older (by 7.6 years) than the 236 individuals that had only 1 baseline measure, there was no significant difference in race, gender, education level, or average number of prescriptions taken between the 2 groups. Self-reported primary diagnoses were available for all participants. The 3 most common diagnoses were diabetes, heart disease, and hypertension. These constituted 82.5% of primary diagnoses in the study group, with the remaining 18.5% listed in Table 1 as "other" (including arthritis, asthma, anxiety, cancer, depression, epilepsy, glaucoma, high cholesterol, kidney disease, liver disease, osteoporosis, Parkinson disease, stroke, thyroid disease, ulcers, and fibromyalgia). Only 3.32% reported anxiety and 2.84% reported arthritis, with fewer than 1% of the patients reporting the remaining categories. Significant differences in distribution of primary diagnosis existed between the study group of 844 and 236 with only a baseline measure, with 28.8% of the latter group reporting primary diagnoses other than diabetes, heart disease, and hypertension. For this group, 5.93% reported anxiety and 5.08% reported depression (compared to 1.66% for the study group). Since these conditions were in the other diagnosis category, elimination of the 236 with only a baseline measure from the analysis did not affect the results with regard to our disease categories of interest.

Table 1
Demographics and Primary Diagnosis by Study Group for Cenla Medication Access Program Medication Reviews, September 2001-October 2003

	Participants With 2 or 3 Interviews (n = 844)	Participants With Only a First Interview (n = 236)	*P* Value
Age, $\bar{x} \pm$ SD	66.2 ± 14.8	58.6 ± 16.9	<.001
Education, $\bar{x} \pm$ SD	9.9 ± 3.0	10.1 ± 2.9	.218
Number of prescriptions, $\bar{x} \pm$ SD	6.0 ± 2.9	5.6 ± 2.9	.087
African American, %	33.8	30.1	.287
Female, %	74.9	70.8	.202
Primary diagnosis, n (%)			.006
Diabetes	155 (18.4)	34 (14.4)	
Heart disease	155 (18.4)	38 (16.1)	
Hypertension	378 (44.8)	96 (40.7)	
Other	156 (18.5)	68 (28.8)	

Table 2
Five Outcome Measures ($\bar{x} \pm$ SD) From Medication Reviews by Time Period, Cenla Medication Access Program, September 2001-October 2003

	Period 1 (n = 844)	Period 2 (n = 814)	Period 3 (n = 355)
PURPOSE	88.8 ± 18.7	95.9 ± 11.8	96.2 ± 11.0
USE	89.6 ± 19.9	96.3 ± 11.7	96.2 ± 11.0
COMPLIANCE	78.0 ± 26.6	94.0 ± 14.6	94.7 ± 14.2
INTERACTION	57.1 ± 49.5	38.5 ± 48.7	40.0 ± 49.1
REACTION	7.6 ± 26.5	8.1 ± 27.3	9.0 ± 28.7

Patient Understanding and Compliance

Table 2 presents means and standard deviations for the 5 outcome variables for each time period, all presented as percentages. The mean percentage of patients that understand the purpose of their medications was high at period 1 (88.8%), increasing to 95.9% at period 2 and remained stable at 96.2% at period 3. Mixed-effects multiple regression models detected significant change ($P < .001$) in these means across periods 1, 2, and 3, after adjusting for age, race, gender, the number of years of education, total number of medications per patient, and the patient's primary diagnosis. There were no significant interaction effects, as well as no significant differences due to age, gender, education, primary diagnosis, or pharmacist. Significant differences in race and total number of medications were detected, with men having 3.0% less understanding than women, on the average. The effect of an additional medication had no practical significance (a decline of 0.3% per 1 medication). Figure 1 demonstrates the adjusted means for these outcomes over time.

The mean proportion of patients that understands the proper use of their medications was also high at period 1 (89.6%), similarly increasing to 96.3% at period 2 and remaining stable at 96.2% for period 3. Mixed-effects multiple regression models detected significant change ($P < .001$) in these means across the 3 time periods. Again, no interactions were significant. Beside period, the only significant effect was CMAP pharmacist

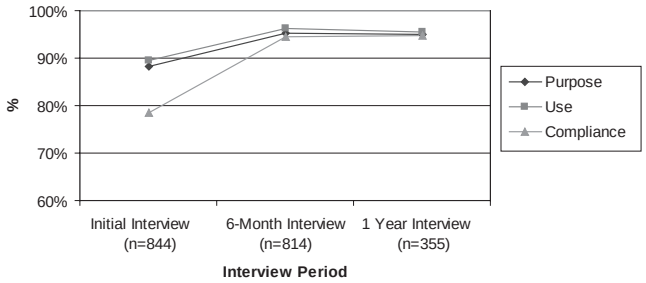

Figure 1. *Adjusted mean change in patient knowledge and compliance by interview period. Adjusted for age at initial interview, race, gender, education, total number of medications, primary diagnosis, and pharmacist. Purpose: Does the patient understand the purpose of his or her medications? Use: Does the patient understand the proper use of his or her medications? Compliance: Is the patient compliant with each of his or her medications?*

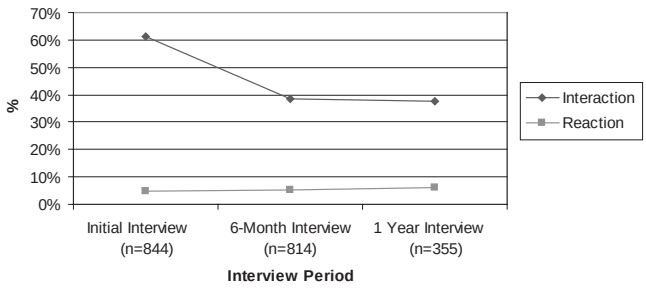

Figure 2. *Adjusted mean change in medication issues/problems by interview period. Adjusted for age at initial interview, race, gender, education, total number of medications, primary diagnosis, and pharmacist. Interaction: Did the patient experience any drug-drug or drug-disease interactions? Reaction: Did the patient experience any adverse events?*

(P = .0006), where pharmacist 1 recorded an average of 94.9% understanding and pharmacist 2 recorded an average of 92.6% understanding, a difference of little practical significance. Adjusted means for these outcomes over time are also presented in Figure 1.

Compliance at initial interview was lower (78.4%) but increased dramatically to 94.0% at period 2 and 94.7% at period 3. Mixed-effects multiple regression models detected significant race and period interaction, with African Americans having an adjusted mean compliance of 75.2% at period 1 compared to whites with 80.7% at period 1. Both race groups increased compliance to about 95.0% at period 2 and remained there at period 3. There was also a significant pharmacist effect, with pharmacist 1 recording 90.7% compliance compared to pharmacist 2 with 80.7% compliance. Since the racial difference in compliance at period 1 was small, overall adjusted mean compliance is presented in Figure 1.

Medication Issues

More than half of the participants (57.1%) experienced either drug-drug or drug-disease interaction at the initial interview. This decreased to 38.4% of patients at period 2 and remained at 40.0% at period 3. Adjustments for age, race, gender, the number of years of education, total number of medications per patient, and the patient's primary diagnosis using GEE resulted in no significant interactions. There was also a significant difference in CMAP pharmacist, with pharmacist 1 recording 33.9% and pharmacist 2 recording 58.1% over all 3 periods. Means of 61.4%, 38.5%, and 37.6% over periods 1, 2, and 3 ,respectively, presented in Figure 2, are adjusted for pharmacist differences. The change in these means was significant (P < .001).

Only 7.6%, 8.1%, and 9.0% of the participants experienced adverse drug effects at time periods 1, 2, and 3, respectively (Table 2), resulting in adjusted percentages of 4.9%, 5.2%, and 6.3% (Figure 2), respectively. The change over time was not significant (P = .3072).

DISCUSSION

In this study, medication reviews appear to have a positive effect on outcomes that are measured by the reviews. Patients appear to understand and use their medicines more effectively at the later periods when compared with the first period. Most of the effect was noted by the second interview, with a leveling for the third period. For some outcomes, significant differences in gender and pharmacists were detected.

Use of medication reviews has been shown to be practical and successful in a variety of patient care settings and populations. These include the large health maintenance organization Kaiser Permanente, a managed care facility in California[12]; a community-based pharmaceutical care service involving diabetic patient education[17]; and similar studies involving a variety of medical conditions.[22] The results observed in the CMAP demonstrate that an intensive medication review performed as seldom as once every 6 months to 1 year can help to improve patient outcomes. This strengthens the argument that pharmacists meeting with patients and evaluating their progress is a necessary component of any medication access program.

One limitation of this study is that with no built-in control group, it is difficult to be certain that the increase seen in understanding and compliance is due to

the intervention alone. However, the data do show that at later periods, patients are showing better outcomes than at earlier periods. It appears that individuals, on average, are benefiting from an overall increase in compliance and understanding and an overall decrease in the number of drug-drug or drug-disease interactions. These preliminary results appear to mirror the results of other studies and trials that have looked at the effect of pharmacist reviews on patient outcomes. In their study, Berringer et al found that compliance for diabetic patients receiving medication reviews was 90%, similar to what was found in our patients (a large proportion of whom are diabetic).[14] In addition, the impact of medication reviews in this study can be questioned because the pharmacists, rather than an independent third party, determine the levels of compliance, understanding, and medication problems at each interview. However, the authors feel that this is an easy, consistent, and repeatable method pharmacists can use to evaluate and monitor the patients with whom they meet.

An important question when looking at the effect of medication reviews is whether the reviews need to continue for the positive effects to continue. In one large meta-analysis looking at the effect of medication reviews on clinical outcomes, the researchers chose glycemic control in diabetic patients as the major outcome of focus.[16] The combined result of 31 studies showed a statistically significant drop in blood glucose after just 1 medication review. It also showed that this drop continued or stayed constant as long as regular medication reviews continued. As soon as the intervention of medication reviews was stopped, individuals began to return to their initial levels of blood glucose. This would seem to indicate that the benefit of medication reviews comes from the patient's continued and regular contact with a licensed pharmacist. CMAP pharmacists continue to meet with patients at each interview to help ensure the continuation of the improvements observed in this preliminary analysis.

The CMAP will continue to follow patients longitudinally, assessing their compliance, understanding, adverse events, and drug-drug and drug-disease interactions. Future analyses will focus on possible cost savings involved with the medication reviews, possible reductions in emergency department and hospital admissions, and change in self-reported health and self-reported health-related quality of life.

CONCLUSIONS

In general, medication reviews help to increase patient compliance with drug regimens and can help to empower individuals to take a more active role in their disease management.[31-33] Using a pre-post study design, the CMAP has seen increases in patient understanding and compliance as well as a decrease in drug-drug and drug-disease interactions through the first year of medication reviews. Monitoring of these patients through medication reviews will continue in order to assess the maintenance of high levels of compliance and understanding.

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