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Pharmacist-Provided Medication Therapy Management (MTM) Program Impacts Outcomes for Employees with Diabetes

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Abstract

The objective of this prospective, pre-post longitudinal study was to assess the impact of pharmacist-provided medication therapy management (MTM) services on employees' health and well-being by evaluating their clinical and humanistic outcomes. City of Toledo employees and/or their spouses and dependents with diabetes with or without comorbid conditions were enrolled in the pharmacist-conducted MTM program. Participants scheduled consultations with the pharmacist at predetermined intervals. Overall health outcomes, such as clinical markers, health-related quality of life (HRQoL), disease knowledge, and social and process measures, were documented at these visits and assessed for improvement. Changes in patient outcomes over time were analyzed using Wilcoxon signed rank and Friedman test at an a priori level of 0.05. Spearman correlation was used to measure the relationship between clinical and humanistic outcomes. A total of 101 patients enrolled in the program. At the end of 1 year, patients' A1c levels decreased on average by 0.27 from their baseline values. Systolic and diastolic blood pressure also decreased on average by 6.0 and 4.2 mmHg, respectively. Patient knowledge of disease conditions and certain aspects or components of HRQoL also improved. Improvements in social and process measures also were also observed. Improved clinical outcomes and quality of life can affect employee productivity and help reduce costs for employers by reducing disease-related missed days of work. Employers seeking to save costs and impact productivity can utilize the services provided by pharmacists. (*Population Health Management* 2014;17:21–27)

Introduction

Chronic conditions are some of the most burdensome diseases because of their long-lasting effects on patients' clinical, humanistic, and economic outcomes. Recently, in the United States, the passage of the Patient Protection and Affordable Care Act emphasized a reform in health care delivery with team-based care acting as a driving force for quality improvement, cost containment, and outcomes assessment.[1] An explicit team-based model of care is the patient-centered medical home (PCMH), a delivery system wherein patients receive care based on their individualized needs from a variety of providers.[2] Pharmacists play a key role in the medical home. Studies have demonstrated that pharmacists participating in team-based care models in acute care or outpatient clinic settings have made positive contributions to patient care quality and safe medication use.[3] The PCMH movement provides opportunities for pharmacists to affect the delivery of primary care and manage chronic conditions through the utilization of medication therapy management (MTM) programs and services.

One particular chronic condition that must be managed carefully is diabetes. Diabetes is among the most expensive health conditions in the United States. The American Diabetes Association (ADA) reports that average expenditures are 2.3 times higher for people diagnosed with diabetes compared to people without the disease. Diabetes cost the United States an estimated $174 billion in 2007, $58.3 billion of which was attributable to expenses related to lost productivity and disability losses.[4] There is a high prevalence of diabetes in the working-age population and, because the health care of this population is often shouldered by employers, employment and work productivity of individuals with diabetes are important issues for patients, families,

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employers, and policy makers.[5] A recent study showed that medical care, absenteeism, and short-term disability equated to a total of $3524 per employee for health-related problems.[6] In contrast, job attendance savings amounted to $1475 per employee diagnosed with diabetes based on effective use of prescription medications.[7]

Diabetes is not only very costly, but it also impacts the well-being, productivity, and health-related quality of life (HRQoL) of employees. HRQoL is a multidimensional concept that includes physical function, social function, role function, mental health, and general health perceptions. It refers to how one's life may be affected by health and disease and may strongly predict an individual's capacity for self-care.[8] Lower HRQoL not only affects the employee and coworkers, but the company as a whole. Absenteeism or presenteeism (lower efficiency at work) can negatively affect productivity and/or efficiency in the work environment.

Good glycemic control is essential in diabetes because it can prevent debilitating comorbidities, resulting in an improvement in HRQoL for the patient and decreased health care costs.[7] In a study conducted by the ADA, cardiovascular complications in patients with diabetes have been found to be accountable for increases in health care expenditures.[7] Many such complications can be prevented if patients undertake self-care steps per guideline recommendations.[8] Some of the ways self-care can be enhanced is through obtaining better knowledge about the disease and making lifestyle changes, such as decreasing tobacco and alcohol consumption, and weight management. These self-care steps also can help to improve the overall quality of life for patients.[9,10]

In an effort to empower patients with diabetes regarding disease management and to contain costs, employers have begun to institute wellness programs into their employees' health care plans.[10–12] MTM has gained popularity because of the cost savings it offers to employers by improving a patient's disease state.[13,14] MTM is a distinct service or group of services that optimizes therapeutic outcomes for individual patients.[15] Considered one of the most accessible members of the health care team, pharmacists can have a substantial impact on a patient's disease management.[16,17] During most MTM visits, the pharmacist performs a comprehensive medication review, creates a medication action plan, counsels the patient, and educates him or her about disease management.[14] This facilitates proper utilization of medications, maintenance of a healthy lifestyle, and better disease control.[18,19] Numerous studies have demonstrated the benefits of MTM programs on patients' care.[10,18,20] The Asheville Project showed improvements in employee health and overall decreased health care costs related to lost productivity.[17] The Minnesota Experience also demonstrated that the collaboration between pharmacists and members of the health care team leads to chronic care improvements.[20] Pharmacist-provided MTM services have been shown to have a positive effect on diabetes management. MTM can serve as a viable option for employers to improve the health and well-being of their employees with this disease. This study hopes to determine the effect of pharmacists' services on helping employees achieve better clinical and humanistic outcomes.

The objective of this study was to assess the impact of pharmacist-provided MTM services on employees' health and well-being by evaluating their clinical and humanistic outcomes.

Methods

Setting

The MTM program was sponsored by an employer group for employees, their spouses, and/or dependents who have diabetes with or without comorbidities. This MTM program was based on a patient-centered model that seeks to improve participants' clinical and humanistic outcomes through face-to-face educational counseling sessions provided by community pharmacists. All the MTM services were provided by the participating pharmacies of the Toledo Area Coalition of Independent Pharmacies, which consisted of 5 independent community pharmacies in Northwest Ohio. The study was approved by the Biomedical Institutional Review Board of The University of Toledo.

To recruit patients into the program, personal invitations were sent to all potential enrollees encouraging them to join the program. These invitations were sent through the mail and through brochures attached to the employee's pay stubs. To further encourage enrollment in the program, participants received a 90-day supply of their medications at a participating pharmacy for the same co-pay as would apply through their mail-order company and 100 test strips and lancets per month at no charge.

Patients could visit any of the participating pharmacies to take part in the MTM sessions. Patients agreed to visit the pharmacy on 5 occasions during the 1-year time period following their enrollment in the program. During the first visit, personal and demographic information was collected from the participants. A comprehensive list of their medications was obtained along with their informed consent. Clinical values and other data at this initial or baseline visit were collected by a trained pharmacy technician with no interaction between the patient and the pharmacist. The later visits were scheduled with pharmacists in semiprivate or private counseling areas within a coalition pharmacy. The patients met with the pharmacist 1 month after the baseline visit, followed by visits at 3-, 6-, 9-, and 12-month intervals.

Intervention

The ADA recommendations for self-management were followed by the pharmacists during the patient visits. These sessions comprised the core elements of MTM, such as performing a medication therapy review (MTR), providing the patient with a personal medication record, completing a medication-related action plan, providing a suitable pharmacist intervention and/or referral, and conducting patient follow-up. During the first visit with the pharmacist, the participant's basic clinical markers were documented and an MTR was completed, which included such elements as a brief explanation of the self-reported disease states, medications, and potential adverse drug events and/or drug interactions. Subsequent visits involved follow-up MTRs to discuss any new medications or to discontinue prior medications. During these visits, patients also were educated on their disease state and medications. Unresolved issues from the prior sessions also were discussed. The pharmacist carried out an assessment of the health care plan to monitor the

patient's adherence to the medication action plan and to establish new therapy goals when required. Abnormal lab values, potential medication-related interventions, and other updates on the patient's progress were reported back to the patient's physician. The physician could choose to accept or reject the pharmacists' recommendations and was responsible for the overall medical care of the patient and any changes in therapy.

Study design

This prospective, pre-post longitudinal study aimed to improve the clinical and humanistic outcomes of patients through pharmacist interventions. Enrollment in this program began on January 15, 2008 and continued until August 1, 2008. All patients who enrolled in the program were tracked for 1 year after their date of enrollment, with the last patient being followed until August 1, 2009.

Inclusion criteria

All City of Toledo employees and/or their spouses or dependents covered under their medical insurance and prescription plan were eligible for enrollment, provided they were taking medication for Type 2 diabetes or had a new prescription administered for its treatment, had an adequate method of transportation to the coalition pharmacy sites, and were able to read and understand English for adequate participation in each MTM session. Employees who did not meet any of these inclusion criteria were excluded from the study.

Outcomes

The clinical outcomes assessed in this study were changes in A1c, systolic blood pressure (SBP), diastolic blood pressure (DBP), social measures (number of caffeinated beverages/day, number of alcoholic beverages consumed/day, number of packs of cigarettes smoked/day, and hours spent on physical activity per week), and process measures (disease-related sick days in the past 3 months, hypoglycemic episodes in the past 3 months, number of times blood glucose self-monitoring was done in a day). Humanistic outcomes measures included HRQoL and patient knowledge. A general HRQoL survey, the Short Form 36 (SF-36), was used after obtaining the license for its use. The survey was used because of its proven value in the literature as a tool for assessing HRQoL in patients with chronic disease states such as diabetes. The SF-36 survey was administered at the initial appointment (baseline visit), and at 6 months and 12 months. Three disease-specific knowledge surveys for diabetes mellitus and other common comorbidities (hypertension and hyperlipidemia) were designed containing 10 items each. Face and content validity were determined by a panel of practicing clinical pharmacists and faculty members from The University of Toledo College of Pharmacy and Pharmaceutical Sciences who had relevant experience in the field of research. Patient knowledge was assessed at preintervention (initial visit or the first visit to the pharmacist) and at 2 postintervention time points (ie, at the 6-month and 1-year visits).

Data collection and analysis

The pharmacist collected and documented the clinical and humanistic outcomes, social measures, and process measures at every visit. Point-of-care A1c testing was done by the counseling pharmacist. SBP and DBP values also were measured. All outcomes were documented on-site using intake forms and surveys. Copies were sent to the research personnel at the Pharmaceutical Care and Outcomes Research Laboratory at The University of Toledo for analysis. Data were entered and analyzed using SPSS version 17.0 (IBM, Armonk, NY). The data did not show a normal distribution, and hence nonparametric measures were used. Descriptive statistics were used to characterize the utilization of social and process measure findings at each time point. Spearman correlation was used to measure the relationship between clinical outcomes and humanistic outcomes. Disease knowledge surveys were completed by only those patients who had the respective disease states and were graded on a scale of 1–10 with higher scores showing greater knowledge. Changes in outcomes over time for clinical and humanistic outcomes were analyzed using Wilcoxon signed rank test for 2 time points and Friedman test for multiple time points at an a priori level of 0.05. A subgroup analysis was performed to focus on the patients in the high-risk group (patients with baseline A1c ≥ 7 and/or baseline SBP ≥ 130 and/or baseline DBP ≥ 80).

Results

Sixty-seven percent (101/150) of those invited participated in the study. A total of 101 patients joined the program since enrollment. Participants were not consistent throughout the program and, hence, complete 1-year data were available for only a small percentage of the total population, depending

Table 1. Change in Clinical Outcomes Over Time

Outcomes/ Measures	*Variables*	N	*Baseline visit (Mean ± SD)*	*6-Month visit (Mean ± SD)*	*12-Month visit (Mean ± SD)*	P *value*
Clinical	Overall A1c	35	7.77 ± 1.75	7.50 ± 1.74	7.50 ± 1.46	0.866
	Baseline A1c ≥ 7	20	8.87 ± 1.54	8.23 ± 1.93	8.18 ± 1.55	0.247
	Systolic blood pressure (SBP)	35	136.17 ± 20.93	130.40 ± 16.04	130.57 ± 17.48	0.189
	Baseline SBP ≥ 130	14	**155.36 ± 16.42**	**136.71 ± 16.54**	**139.14 ± 20.62**	**0.001**
	Diastolic blood pressure (DBP)	35	84.40 ± 11.93	81.23 ± 7.88	80.20 ± 8.52	0.252
	Baseline DBP ≥ 80	10	**98.80 ± 9.17**	**85.50 ± 4.62**	**86.50 ± 6.13**	**0.000**
	Body Mass Index	40	37.33 ± 7.74	37.00 ± 7.74	37.37 ± 8.10	0.837

Significance shown at alpha = 0.05.
The text in **bold** represents statistically significant results.
SD, standard deviation.

Table 2. Change in Social and Process Measures Over Time

Outcomes/ Measures	*Variables*	N	*Baseline visit (Mean ± SD)*	*6-Month visit (Mean ± SD)*	*12-Month visit (Mean ± SD)*	P *value*
Social	Caffeine (bev/day)	41	1.93 ± 1.78	1.81 ± 2.07	1.75 ± 1.62	0.422
	Alcohol (bev/day)	49	0.10 ± 0.05	0.00 ± 0.00	0.03 ± 0.18	0.368
	Smoking (packs/day)	40	0.07 ± 0.27	0.07 ± 0.27	0.10 ± 0.30	0.368
	Exercise (hrs/week)	34	1.16 ± 2.19	0.84 ± 1.20	1.83 ± 2.14	0.142
Process	Sick Days (past 3 mo)	32	1.12 ± 5.32	0.31 ± 0.93	0.09 ± 0.39	0.368
	Hypoglycemic Episodes (past 3 mo)	**38**	**2.10 ± 3.16**	**1.76 ± 2.45**	**1.01 ± 2.30**	**0.009**
	SMBG (times/day)	**40**	**1.68 ± 2.11**	**1.98 ± 1.43**	**0.76 ± 1.73**	**0.000**

Significance shown at alpha = 0.05.
The text in **bold** represents statistically significant results.
SD, standard deviation; SMBG, self-monitoring of blood glucose.

upon the outcome/measure. A Friedman test was done to compare the clinical end points of the patients at baseline, 6-month, and 12-month time points. The mean baseline clinical outcomes and changes in these outcomes throughout the study period are presented in Table 1. The analysis revealed that there was an overall trend of a decrease by approximately 0.27 in mean A1c values of patients at 12 months when compared to baseline. A subgroup analysis for people whose A1c was not in control (ie, baseline A1c ≥ 7.0) showed a greater decrease by an average of approximately 0.59 at the 12-month end point when compared to their baseline values ($P = 0.247$). An overall decrease in blood pressure values also was observed in patients over the 12 months, with an average reduction in SBP by approximately 6 mmHg ($P = 0.189$) and DBP by approximately 4.2 mmHg ($P = 0.252$). A subgroup analysis of hypertensive patients (blood pressure ≥ 130/80 mmHg) revealed that SBP and DBP had decreased significantly for this population by approximately 14 and 12 mmHg, respectively ($P < 0.001$).

Analysis of social measures showed that pharmacists' interventions resulted in mixed effects on lifestyle for the patients as shown in Table 2. Caffeine consumption was found to decrease, but smoking and alcohol consumption increased slightly. Hours spent exercising were found to increase within 6 months. The 40 patients for whom the complete 1-year record was available showed a significantly increased utilization of self-monitoring of blood glucose levels per patient in the first 6 months. Body mass index of patients remained consistent throughout their stay in the program, but a decrease of over 10 pounds of weight was noted for 6 out of 40 patients (15%) who completed 1 year in the program. A decrease in the number of sick days taken by patients also was seen, which was nonsignificant ($P = 0.368$).

The longitudinal change in patients' utilization of specialty care was tracked and is reported in Table 3. There was an overall significant increase from baseline in the percentage of patients enrolled in the program who visited the podiatrist ($P < 0.000$) and the dentist ($P < 0.016$) after the completion of 12 months in the program. The number of patients who visited an ophthalmologist was found to be nearly similar at baseline and at 12 months ($P = 0.144$). The number of hypoglycemic events for the 38 patients for whom a 1-year record of the specific data were available were found to decrease significantly from baseline after joining the program ($P < 0.01$; data not shown).

The SF-36 was analyzed and normed scores were obtained based on the scoring system of the survey developers. Individual scores were calculated for all of the 8 domains; composite Physical Component Scores (PCS) and Mental Component Scores (MCS) were obtained and tracked over time (Table 4). PCS score for the population remained nearly the same while the MCS decreased slightly ($P = 0.234$). Specifically, patients had improved scores on the physical functioning ($P = 0.153$), role physical ($P = 0.452$), bodily pain ($P = 0.613$), and social functioning ($P = 0.163$) domains of the survey. Spearman correlation results showed that a higher MCS score was observed for patients who improved their clinical outcomes as measured by a decrease in A1c values. None of the improvements was statistically significant. A statistically significant improvement in mean diabetes knowledge scores was seen ($P < 0.001$), which is shown in Table 5. Although scores improved slightly for both disease states, these improvements were not significant for either hypertension ($P = 0.713$) or hyperlipidemia ($P = 0.072$) over 12 months.

Discussion

The City of Toledo MTM program showed a decrease in the overall A1c values, with 25% of the patients showing a 1% reduction in their values through the 12-month time

Table 3. Change in Utilization of Specialty Care Over Time

Outcomes/ Measures	*Variables* (N)	*Baseline visit* N *(%)*	*6-Month visit* N *(%)*	*12-Month visit* N *(%)*	P *value*
Process	Visited a podiatrist in past 6 mo (39)	**13 (33.3)**	**23 (59.0)**	**26 (66.7)**	**0.000**
	Visited an ophthalmologist in past 6 mo (34)	24 (70.6)	25 (73.5)	25 (73.5)	0.144
	Visited a dentist in past 6 mo (36)	**27 (75.0)**	**27 (75.0)**	**32 (88.9)**	**0.016**

Significance shown at alpha = 0.05
The text in **bold** represents statistically significant results.

Table 4. Change in Quality of Life

QoL Domains	N	*Baseline mean ± SD*	*6-Month visit Mean ± SD*	*12-Month visit Mean ± SD*	P *value*
Physical functioning	28	45.83 ± 10.48	47.11 ± 10.40	47.71 ± 10.90	0.153
Role—physical	32	47.98 ± 9.61	48.97 ± 8.94	48.66 ± 12.33	0.452
Bodily pain	31	47.82 ± 9.77	48.38 ± 9.36	49.29 ± 10.38	0.613
General health	31	46.84 ± 5.62	46.31 ± 4.89	44.95 ± 4.53	0.126
Vitality	30	50.95 ± 6.48	50.74 ± 4.07	50.95 ± 4.30	0.956
Social functioning	27	34.43 ± 2.31	35.03 ± 4.78	36.04 ± 3.03	0.163
Role—emotional	30	49.14 ± 10.41	48.88 ± 10.18	48.49 ± 13.44	0.736
Mental health	31	43.56 ± 8.76	43.38 ± 4.57	42.83 ± 5.08	0.547
Physical component summary	19	47.21 ± 8.03	49.37 ± 8.22	47.84 ± 10.09	0.349
Mental component summary	19	44.90 ± 4.94	42.27 ± 5.04	43.42 ± 5.83	0.234

QoL, quality of life; SD, standard deviation.

period. Patients who were above the ADA recommended guideline, having A1c >7.0, benefited the most from this program. These patients with higher clinical values are usually at a higher risk of developing long-term and short-term complications of diabetes.[21–23] Lowering and maintaining A1c at 7.0 helps reduce the likelihood for employees to develop diabetes-related complications; hence a possible reduction in the economic burden of the disease.[22] Blood pressure measurements showed that SBP and DBP decreased for patients when compared to baseline. Achievement of both glycemic and blood pressure control can be translated into a considerable reduction in the risk for several complications such as diabetes-related death, myocardial infarction, and microvascular complications.[23] This shows that the interventions provided by the pharmacists may have led not only to direct benefits, as observed by the decrease in clinical values, but also to indirect benefits such as reducing the risk of developing the aforementioned debilitating complications. Risk reduction may help prevent hospitalization and use of additional medicines to control these complications, thereby lowering costs to employees.

By enhancing clinical outcomes, the employee's quality of life may be improved. HRQoL is a very important aspect, and is becoming the focus of many employee wellness programs. Research has established the relationship between psychosocial work factors and production loss and employee health.[24] The present study found an improvement in various factors associated with the quality of life of the employees. Although there was a slight increase in PCS, there was a decrease in MCS among the general patient population. However, a higher MCS score was observed for patients who improved their clinical outcomes. A higher PCS score indicates an improved ability to carry out day-to-day activities both at and away from work, such as lifting heavy objects and climbing stairs, which might lead to improved productivity at work. These are observed by improvement in specific domains, such as the improvement in bodily pain, physical functioning, and social functioning. Scores on the social interaction domain were found to improve slightly, which might have led to a lower level of burnout and an increase in job satisfaction among employees. Improvement in the MCS score among patients who showed improvement in their clinical values, especially A1C values, demonstrated the emotional well-being the patients achieved because of their ability to better manage their disease.

When using the Spearman correlation, the change in the patient's A1c and improvement in quality of life scores showed that there was a significant relationship between HRQoL and A1c values. This relationship reiterates the authors' hypothesis that improvement in clinical outcomes improved employees HRQoL, which may have led to decreased absenteeism. A decrease in absenteeism may be inferred from the decrease in the average number of sick days. Decrease in the number of sick days can have an impact on productivity for employers as well as employees. The costs associated with absenteeism and loss of productivity were avoided, which accounts for a significant amount of health-related expenditures for employees.[25]

Pharmacists' interventions resulted not only in improved clinical and humanistic outcomes, but also resulted in some positive lifestyle changes among the patients. Patients in the program decreased their caffeine consumption, but smoking and alcohol consumption rose slightly. Lowering caffeine intake is vital because it is associated with improved blood pressure values and better glycemic control in patients with diabetes.[26] Obesity is one of the major risk factors for the

Table 5. Change in Patients' Disease-Related Knowledge Over Time

Tests	N	*Mean ± SD # of correct responses (Baseline)*	*Mean ± SD # of correct responses (6 month)*	*Mean ± SD # of correct responses (12 Month)*	P *value*
Diabetes knowledge	44	**7.95 ± 1.65**	**8.86 ± 1.26**	**9.00 ± 1.36**	**0.000**
Hypertension knowledge	29	8.48 ± 1.40	8.79 ± 1.08	8.76 ± 1.09	0.713
Hyperlipidemia knowledge	28	7.39 ± 1.79	7.82 ± 1.76	8.07 ± 1.38	0.072

Knowledge tests are scored on a scale of 1-10 (1 – low knowledge score, 10 – high knowledge score).
The text in **bold** represents statistical significant results.
SD, standard deviation.

development of various cardiovascular events and complications. Through pharmacists' intervention, it was found that the hours patients spent exercising increased within 6 months. Past studies have shown that patients who spend more time doing both moderate and vigorous physical activity show a significant improvement in A1c.[27] A decrease in over 10 pounds of weight was noted for 6 out of 40 patients (15%) who completed 1 year in the program. Losing 10 pounds of weight has been found to be associated with substantial reductions in blood pressure and lipid levels.[28] The progress achieved in some aspects of patients' lifestyles supplements the benefits of pharmacotherapy and, therefore, advancements in clinical outcomes have a better chance to be sustained over time. Thus, the ability of this program to improve a patient's lifestyle is noteworthy.

There was an overall evident increase from baseline in the number of patients who had podiatrist and dental visits after the completion of 12 months in the program. An increase in visits to the podiatrist is beneficial for the patient. As research shows, education and primary preventive measures provided by the podiatrist have resulted in reductions in prevalence of some minor foot problems.[29] The number of patients who visited an ophthalmologist was found to be nearly similar at baseline and 12 months. It is imperative for patients with diabetes to have regular visits with specialist care physicians in order to facilitate earlier detection of complications, such as retinopathies, dental caries, foot ulcers, and gangrene. Earlier detection aids faster resolution of these complications reducing costs to employers.

Patients' knowledge regarding their disease progressively improved from baseline to each follow-up visit for all 3 disease states. This may have resulted from the pharmacist's efforts to educate patients about their disease state. Better disease awareness among patients is linked with improved adherence and enhanced clinical outcomes. As mentioned earlier, an improvement in disease-related knowledge empowers patients to take better care of themselves by improving their self-efficacy.[30,31] A direct implication of the improved knowledge among patients was the significant decrease in the reported number of hypoglycemic events, which potentially prevented patients from having to visit the emergency room. The initial increase in the use of self-monitoring blood glucose machines also may be attributed to the increased knowledge among the patients. The observed decrease in the use of self-monitoring blood glucose machines could have been related to the improvement in clinical outcomes.

The results presented in this study were consistent with the previously published literature regarding MTM services provided by pharmacists in different settings across the United States, which demonstrated a significant improvement in economic, clinical, and humanistic outcomes of the study participants.[8,13,17,20,31] Patients lost to follow-up were similar to those who remained in the study. The model used in this MTM program can be used as a viable alternative to improve care and benefit to employees. It shows that health care reform can be beneficial and that, when given the opportunity, pharmacists can have an impact on patient care delivery and improving outcomes. Future research should focus on trying to evaluate the long-term sustainability and benefits of these programs. An evaluation of return on investment can help employers assess the cost-effectiveness of the service.

Limitations

The retention rate of patients in the program was an issue. One possible explanation for this was that a number of patients were not dependable in keeping their scheduled appointments. These patients were tracked and additional phone calls were placed to encourage them to keep up with their appointments. Another explanation could be that pharmacists may have seen the patient, but may not have recorded the outcomes on the intake forms because of the busyness and other responsibilities during a typical day. Either way, this resulted in only a small number of the total population having data available for the entire year. This varied depending upon the outcome being measured. For example, with regard to A1c values, this phenomenon could be seen based on the data. At baseline, 12 patients did not have data collected/reported (retention rate of 88.1%). This number grew to 35 (65.3%) and 62 (38.6%) at 6 and 12 months, respectively. A third possible explanation for why patients did not continue throughout the study was that a number of patients were well controlled in the early stages of the study; therefore, patients may have felt that they did not need to return for follow-up visits. Following the same example using A1c values, 36 patients were well controlled at baseline (35.6%) A second limitation is that the 1-year duration of the program limited the ability of the researchers to track the long-term benefits and sustainability of the program. There might be an element of selection bias in the study, as participation in the program was voluntary. Because it was an employer-sponsored program, the generalizability of the program might be limited to only similar employer groups with the ability to provide coverage. A final limitation is the lack of a separate control group. The study was conducted as practice-based research with patients serving as their own controls. The employer wanted all enrolled employees and associated spouses/dependents to gain the benefit of the MTM program.

Conclusion

This study explored the impact of an MTM program on clinical and humanistic outcomes in the employees, their spouses, and their dependents. The results of the study showed increased clinical markers, various components of HRQoL, and disease-related knowledge within the employee population. Employers seeking to improve the health of their workforce can utilize these services provided by pharmacists.

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References

1. Lipton HL. Pharmacists and health reform: Go for it! Pharmacotherapy 2010;30:967–972.
2. Cutler TW. The pharmacy profession and health care reform: Opportunities and challenges during the next decade. J Am Pharm Assoc 2011;51:477–481.
3. Kaboli PJ, Hoth AB, McClimon BJ, Schnipper JL. Clinical pharmacists and inpatient medical care: a systematic review. Arch Intern Med 2006;166:955–964.
4. American Diabetes Association. Economic costs of diabetes in the U.S. in 2007. Diabetes Care 2008;31:596–615.
5. Beaulieu N, Cutler D, Ho K, et al. The business case for diabetes disease management for managed care organizations. Forum Health Econ Policy 2006;9:Article 1.
6. Fidler C, Elmelund Christensen T, Gillard S. Hypoglycemia: An overview of fear of hypoglycemia, quality-of-life, and impact on costs. J Med Econ 2011;14:646–655.
7. Hogan P, Dall T, Nikolov P. Economic costs of diabetes in the US in 2002. Diabetes Care 2003;26:917–932.
8. Sigurðardóttir ÁK. Self-care in diabetes: Model of factors affecting self-care. J Clin Nurs 2005;14:301–314.
9. Polonsky WH. Understanding and assessing diabetes-specific quality of life. Diabetes Spectrum 2000;13:36.
10. Coffey JT, Brandle M, Zhou H, et al. Valuing health-related quality of life in diabetes. Diabetes Care 2002;25:2238–2243.
11. Baicker K, Cutler D, Song Z. Workplace wellness programs can generate savings. Health Aff (Millwood) 2010;29:304–311.
12. Naydeck BL, Pearson JA, Ozminkowski RJ, Day BT, Goetzel RZ. The impact of the Highmark employee wellness programs on 4-year healthcare costs. J Occup Environ Med 2008;50:146–156.
13. Fera T, Bluml BM, Ellis WM, Schaller CW, Garrett DG. The Diabetes Ten City Challenge: interim clinical and humanistic outcomes of a multisite community pharmacy diabetes care program. J Am Pharm Assoc (2003 2008;48:181–190.
14. American Pharmacists Association. *Medication Therapy Management Digest: Perspectives on 2009. A Year of Changing Opportunities.* Washington, DC: American Pharmacists Association; March 2010.
15. Gore PR, Madhavan S. Consumers' preference and willingness to pay for pharmacist counselling for non-prescription medicines. J Clin Pharm Ther 1994;19:17–25.
16. Drab S. Translating clinical guidelines into clinical practice: Role of the pharmacist in type 2 diabetes management. J Am Pharm Assoc (2003) 2009;49:e152–e162.
17. Cranor CW, Bunting BA, Christensen DB. The Asheville Project: Long-term clinical and economic outcomes of a community pharmacy diabetes care program. J Am Pharm Assoc (Wash) 2003;43:173–184.
18. Medication therapy management services: A critical review. J Am Pharm Assoc (2003) 2005;45:580–587.
19. Persell SD, Keating NL, Landrum MB, et al. Relationship of diabetes-specific knowledge to self-management activities, ambulatory preventive care, and metabolic outcomes. Prev Med 2004;39:746–752.
20. Isetts BJ, Schondelmeyer SW, Artz MB, et al. Clinical and economic outcomes of medication therapy management services: The Minnesota experience. J Am Pharm Assoc (2003) 2008;48:203–211; 3 p following 211.
21. Stratton IM, Adler AI, Neil HA, et al. Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): Prospective observational study. BMJ 2000;321:405–412.
22. Wyne K. Information technology for the treatment of diabetes: Improving outcomes and controlling costs. J Manag Care Pharm 2008;14:S12–S17.
23. Stratton IM, Cull CA, Adler AI, Matthews DR, Neil HA, Holman RR. Additive effects of glycaemia and blood pressure exposure on risk of complications in type 2 diabetes: A prospective observational study (UKPDS 75). Diabetologia 2006;49:1761–1769.
24. Karlsson ML, Bjorklund C, Jensen I. The effects of psychosocial work factors on production loss, and the mediating effect of employee health. J Occup Environ Med 2010;52:310–317.
25. Goetzel RZ, Long SR, Ozminkowski RJ, Hawkins K, Wang S, Lynch W. Health, absence, disability, and presenteeism cost estimates of certain physical and mental health conditions affecting U.S. employers. J Occup Environ Med 2004; 46:398–412.
26. Moisey LL, Kacker S, Bickerton AC, Robinson LE, Graham TE. Caffeinated coffee consumption impairs blood glucose homeostasis in response to high and low glycemic index meals in healthy men. Am J Clin Nutr 2008;87:1254–1261.
27. Hordern MD, Coombes JS, Cooney LM, Jeffriess L, Prins JB, Marwick TH. Effects of exercise intervention on myocardial function in type 2 diabetes. Heart. 2009;95:1343–1349.
28. Miller ER 3rd, Erlinger TP, Young DR, et al. Results of the diet, exercise, and weight loss intervention trial (DEW-IT). Hypertension 2002;40:612–618.
29. Ronnemaa T, Hamalainen H, Toikka T, Liukkonen I. Evaluation of the impact of podiatrist care in the primary prevention of foot problems in diabetic subjects. Diabetes Care 1997;20:1833–1837.
30. Scott DM, Boyd ST, Stephan M, Augustine SC, Reardon TP. Outcomes of pharmacist-managed diabetes care services in a community health center. Am J Health Syst Pharm 2006;63: 2116–2122.
31. Garrett DG, Bluml BM. Patient self-management program for diabetes: First-year clinical, humanistic, and economic outcomes. J Am Pharm Assoc (2003). 2005;45:130–137.

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