

Improving Quality of Care in Diabetes Through a Comprehensive Pharmacist-Based Disease Management Program

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In the U.S., a large percentage of patients with diabetes receive less than optimal care (1). The use of pharmacists, nurse practitioners, and multidisciplinary teams in a variety of settings have led to improvements in disease control in patients with diabetes and other chronic diseases (2–14). This report describes the utility of a pharmacist-run disease management program in improving the care of predominately indigent, Spanish-speaking patients with diabetes and common comorbid conditions.

RESEARCH DESIGN AND METHODS

The study was conducted at El Rio Health Center, which is a federally qualified health center located in Tucson, Arizona. The patient population is comprised mostly of indigent, Spanish-speaking, and sometimes transient patients with primarily type 2 diabetes. The program was implemented in August 2001, using a residency-trained, bilingual PharmD as the provider for patients referred to the pharmacist-based diabetes service by staff physicians. The pharmacist served as the primary care provider for the patients' diabetes and comorbid conditions, hypertension, and hyperlipidemia. Using medical staff-approved collaborative practice agreements, the pharmacist provided appropriate diagnostic, educational, and therapeutic management services, including prescribing medication and ordering laboratory tests. The collaborative practice agreements were based on national standards of care

for diabetes, hypertension, and hyperlipidemia. The pharmacist used a customized Microsoft Access database to facilitate documentation of services and appropriate patient management.

All patients who had an initial visit, plus at least one additional visit over the following 90 days, were included in this analysis. Patients served as their own controls. Comparisons of continuous data from baseline to follow-up, such as lipid parameters, glucose, weight, BMI, blood pressure, and A1C were compared using a paired *t* test. Changes from baseline to follow-up in percentages or proportions, such as changes in percentage of patients at LDL cholesterol goal, use of aspirin, or patients at blood pressure goal, were compared using CIs and two-proportion testing. Significance for all statistical comparisons were set at $\alpha = 0.05$.

RESULTS — Of the 199 patients meeting inclusion criteria, 134 (67%) were female, 148 (74%) were Hispanic, and 191 (96%) had type 2 diabetes. On average, these patients were followed for 274 ± 141 days (means \pm SD). Baseline to follow-up means, SDs, and statistical comparisons for cholesterol measures, glucose, A1C, blood pressure, weight, and BMI are shown in Table 1. Follow-up changes in all the parameters measured were statistically different except for HDL cholesterol, weight, and BMI. Regarding attainment of treatment goals, the pharmacist-managed service showed an almost sevenfold increase (6 vs. 41%) in the

number of patients at target A1C levels. Increases in the percentage of patients achieving target goals for hypertension and LDL cholesterol levels were more modest at 24 and 17%. All but one patient received annual recommended lab tests (lipid panels, microalbuminuria, and A1C) plus diabetic foot and dilated eye examinations. Compared with baseline data, this represents increases ranging from 11.3 to 46.2%. The use of aspirin increased 53%, and the use of ACE inhibitors or angiotensin receptor blockers increased 25%. Patients managed by the pharmacist were more likely to have attained treatment goals and had recommended examinations, medications, and tests, with all *P* values <0.001 .

CONCLUSIONS — The 2% drop in mean A1C is similar to that achieved in a Veterans Administration pharmacist-based program (6). In the Veterans Administration study, only 26% of patients had their A1C lowered to $<8.0\%$ compared with 64% in our study (6). Compared with recently published national data for the first half of the 1990s (1), the results of the pharmacist-managed service provided similar percentages of patients at target A1C and blood pressure and were superior in percentage of patients at target LDL cholesterol levels (57 vs. 11%) and A1C levels $>10\%$ (8 vs. 14.9%). The percentages were also superior for patients receiving dilated eye examinations (99.5 vs. 63.3%) and foot examination (99.5 vs. 54.8%) (1).

Because of the unique population and practice setting, application of these findings to other pharmacist-managed programs may be problematic. Thirty-seven states allow pharmacists to prescribe medications. Arizona, along with several other states, require drug- or disease-specific collaborative practice agreements that have been approved by physicians participating in these programs. Pharmacist clinical privileges in this study were defined by such an agreement. The use of a bilingual pharmacist may have contrib-

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A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

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Table 1—Comparison of baseline to follow-up metabolic parameters

Parameter	Baseline	Follow-up	Difference	95% CI	P
Total cholesterol (mg/dl)	204.7 ± 51.5	181.2 ± 46.1	23.52 ± 44.3	17.3–29.7	<0.001
Triglycerides (mg/dl)	249.5 ± 232.4	191.3 ± 144.9	58.2 ± 192	31.3–85.1	<0.001
HDL cholesterol (mg/dl)	46.6 ± 12.2	46.1 ± 11.6	0.5 ± 11.1	–1 to 2.1	0.513
LDL cholesterol (mg/dl)	108.7 ± 40	97.6 ± 32.6	11.1 ± 39.4	5.5–16.8	<0.001
Blood glucose (mg/dl)	210.3 ± 91.5	169.5 ± 71.7	40.8 ± 90.5	28.1–53.6	<0.001
A1C (%)	9.6 ± 1.8	7.6 ± 1.7	2 ± 2	1.8–2.3	<0.001
Systolic blood pressure (mmHg)	126.1 ± 18.1	118.8 ± 21.1	7.3 ± 23.6	4–10.6	<0.001
Diastolic blood pressure (mmHg)	76 ± 9.8	71.5 ± 9	4.5 ± 11	3–6	<0.001
Weight (lb)	192.1 ± 47.9	194.1 ± 53.8	–2 ± 25.9	–5.6 to 1.7	0.285
BMI (kg/m ²)	32.8 ± 7.8	33.1 ± 8.7	–0.3 ± 4.2	–0.9 to 0.3	0.261

Data are means ± SD.

uted to the service's success through clearer communication and attention to cultural nuances that contribute to patient adherence. Also, many of the patients included in the data analysis were referred to the pharmacist because of the inability of previous care to obtain adequate disease control. This tended to provide a population that was inherently more difficult to achieve target levels of blood pressure, blood glucose, and lipids. Finally, El Rio Health Center is organizationally a staff model HMO where physicians, other professionals, and ancillary staff are employees of the delivery system. This facilitates the smooth integration of pharmacists into expanded roles and provides a patient care structure that supports the delivery of comprehensive care.

A pharmacist-managed service for the care of diabetes and frequently associated comorbid conditions was effective in significantly lowering A1C, blood pressure, and LDL cholesterol levels and had near-perfect compliance with national standards for diabetes care. This was accomplished in a federally qualified health center treating primarily indigent and transient Hispanic and Native-American populations. This study demonstrates the positive effect of clinically trained pharmacists in managing patients

with diabetes and common comorbid conditions.

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