Influence of pharmacist intervention on prescribing of angiotensin-converting-enzyme inhibitors, angiotensin II-receptor blockers, and aspirin for diabetic patients

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The influence of pharmacist intervention on the prescribing of angiotensin-converting-enzyme (ACE) inhibitors, angiotensin II-receptor blockers (ARBs), and aspirin for patients with diabetes was evaluated.

Methods. A retrospective chart review was performed for diabetic patients seen in a family medicine clinic. Patients were included in the analyses if they were 18–88 years old, had a diagnosis of type 1 or type 2 diabetes, had been seen in the family medicine clinic between July 2006 and October 2008, and had received a consultation by pharmacy services. All selected charts were reviewed to assess appropriate use of ACE inhibitor, ARB, and aspirin therapy, as recommended by American Diabetes Association (ADA) guidelines, before and after pharmacist intervention. Typical pharmacist interventions consisted of direct consultation with the prescriber and therapeutic education sessions conducted by pharmacy personnel. All patients were seen and evaluated by pharmacy personnel before meeting with the prescriber.

Results. Before pharmacist intervention, 41 (59%) of 70 patients were receiving appropriate ACE inhibitor or ARB therapy and 24 (34%) of 71 patients were receiving appropriate aspirin therapy as recommended by ADA. After pharmacist intervention, 63 (90%) of 70 patients were receiving appropriate ACE inhibitor or ARB therapy and 48 (68%) of 71 patients were receiving appropriate aspirin therapy as recommended by ADA (p < 0.0001 for both differences).

Conclusion. A pharmacy intervention program in a primary care setting was associated with a significant increase in prescriber adherence to ADA guidelines for ACE inhibitor or ARB therapy and for aspirin therapy in diabetic patients.

Index terms: American Diabetes Association; Angiotensin antagonists; Angiotensin-converting-enzyme inhibitors; Aspirin; Diabetes mellitus; Education; Interventions; Pharmaceutical services; Pharmacists; Physicians; Platelet aggregation inhibitors; Prescribing; Protocols; Rational therapy

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The Centers for Disease Control and Prevention estimated that in 2007 there were 23.6 million people, or 7.8% of the population of the United States, living with diabetes mellitus. This estimate represents an increase from 7% in 2005. Since diabetes is a leading cause of serious health problems, including cardiovascular events, stroke, blindness, nontraumatic limb amputation, and end-stage renal disease; any increase in disease prevalence or severity can have long-term health and economic consequences. Therefore, diabetes management should include plans for both serum glucose control and minimization of potential long-term complications. Treatments targeted specifically toward minimization of cardiovascular and renal complications include angiotensin-converting-enzyme (ACE) inhibitors, angiotensin II-receptor blockers (ARBs), aspirin, and statins.
The 2008 American Diabetes Association (ADA) standards of care recommend that diabetic patients with hypertension (blood pressure of 130/80 mm Hg or higher) should be treated with an ACE inhibitor or ARB. Blood pressure control in patients with diabetes has been shown to reduce the risk for macrovascular complications (i.e., myocardial infarction and stroke) by 33–50% and microvascular complications (i.e., nephropathy, neuropathy, and retinopathy) by 33%.1,4,6

Diabetes is the leading cause of end-stage renal disease, with nephropathy occurring in 20–40% of diabetic patients.3 ADA recommends that patients with microalbuminuria (urine albumin of 30–300 μg per milligram of creatinine) be treated with an ACE inhibitor or ARB and that patients with macroalbuminuria (urine albumin of >300 μg per milligram of creatinine) be treated with an ARB, as these agents have been shown to delay nephropathy in patients with diabetes.3

Another cardiovascular disease prevention strategy recommended by ADA is aspirin therapy. ADA guidelines recommend that diabetic patients with a history of cardiovascular disease or cardiovascular risk factors (age of >40 years, family history of cardiovascular disease, hypertension, tobacco use, dyslipidemia, or albuminuria) be treated with aspirin, because aspirin has been shown to decrease the incidence of cardiovascular events in this population.7 This is important because diabetic patients have two to four times the risk of heart disease and stroke than do patients without diabetes.1 All of the above recommendations continue to be endorsed by ADA in its 2009 standards of care.8

While these guideline-endorsed treatment strategies provide valuable examples of evidence-based recommendations, they must be properly implemented to achieve a corresponding benefit. In May 2005, medical services at a family medicine clinic in metropolitan Denver were expanded to include a clinical pharmacist and a pharmacy student. It has been well established that clinical pharmacists can significantly improve patient care through direct and indirect interventions.8,12 The objective of this study was to determine the effect of pharmacy interventions on prescriber adherence to ADA guidelines for ACE inhibitor or ARB therapy and aspirin therapy in a primary care setting.

Methods

Retrospective medical chart review for this study was approved by the Colorado Multiple Institutional Review Board, with a waiver of informed consent for up to 75 charts. Charts eligible for review were identified using internal pharmacy records from a family medicine clinic that uses a collaborative practice model and is devoted to the care of uninsured, low-income patients in the Denver area. Members of the collaborative practice care team include a nurse practitioner, part-time physician, registered nurse, medical assistant, certified diabetes educator, fitness trainer, mental health provider, dental hygienist, dental assistant, clinical pharmacist, and pharmacy student. Clients receiving care at this clinic range from infants to the elderly.

Medical chart numbers at this clinic correlate with the establishment of the patient–provider relationship. To provide a representative sample of patient data at different time points during the study period, charts were systematically identified by selecting the chart with the lowest number followed by charts with increasing numbers until 75 charts were reviewed. Patients’ data were included in the analysis if the patients were age 18–88 years, had been diagnosed with type 1 or type 2 diabetes, had been seen in the family medicine clinic between July 2006 and October 2008, and had received a consultation by pharmacy services. Patients were excluded from the analysis if they did not meet guideline criteria for ACE inhibitor, ARB, or aspirin treatment or if the use of these agents was contraindicated or cautioned.

Data collected included patient demographic information (i.e., age, sex) and information related to the appropriate use of ACE inhibitors, ARBs, and aspirin. Appropriate use of these agents was based on ADA guidelines and was assessed by determining (1) whether treatment was recommended by the guidelines for each patient according to specific qualifying criteria for each agent and (2) whether each patient had contraindications or precautions to treatment. Data were also collected to determine if each patient was prescribed an ACE inhibitor, ARB, or aspirin before and after pharmacy intervention. Specific qualifying criteria for ACE inhibitor or ARB therapy based on ADA guidelines included hypertension (blood pressure value of >130/80 mm Hg or current treatment with antihypertensive medication) or albuminuria (history of a urine albumin concentration of ≥30 μg per milligram of creatinine). Specific qualifying criteria for aspirin therapy included established cardiovascular disease, age of >40 years or other cardiovascular risk factors, including family history of cardiovascular disease, hypertension, tobacco use, dyslipidemia (low-density-lipoprotein cholesterol concentration of >100 mg/dL, high-density-lipoprotein cholesterol concentration of <40 mg/dL in men and <50 mg/dL in women, or triglyceride concentration of >150 mg/dL), or any degree of albuminuria. Contraindications and precautions for ACE inhibitor or ARB treatment consisted of known hypersensitivity, history of angioedema, pregnancy, or presence of significant drug interactions as determined by the investigator.

Use of aspirin was considered con-
Pharmacist intervention

traiindicated or cautioned in patients with known hypersensitivity to non-steroidal antiinflammatory drugs (NSAIDs), age of <18 years, active bleeding disorder, peptic ulcer disease, or significant drug interactions as determined by the investigator.

Typical pharmacy interventions consisted of direct consultation with the prescriber and education sessions (i.e., therapeutic discussions and journal article reviews) conducted by pharmacy personnel. All diabetic patients were seen and evaluated by pharmacy personnel before meeting with the prescriber. Therapeutic recommendations were typically made just before the patient’s meeting with the prescriber.

Data collected for ACE inhibitor, ARB, and aspirin use were analyzed independently. Data were analyzed using Fisher’s exact test with an a priori significance level of 0.05.

Results

A total of 75 charts were reviewed. Seventy patients were included in the evaluation of ACE inhibitor and ARB use. Five patients were excluded because they did not meet guideline criteria for treatment (i.e., they had neither hypertension nor albuminuria). Seventy-one patients were included in the analysis of aspirin use. Four patients were excluded, as two patients had no indication for treatment (i.e., no established cardiovascular disease or cardiovascular risk factors or were younger than age 40 years), one patient had a contraindication (aspirin allergy), and one patient had a precaution (chronic treatment with an NSAID).

In both analyses, the majority of patients were women, and patient age ranged from 30 to 86 years (mean ± S.D. age, 52 ± 13 years) (Table 1).

Before pharmacist intervention, 41 (59%) of 70 patients were receiving ACE inhibitor or ARB therapy and 24 (34%) of 71 patients were receiving aspirin therapy as recommended by ADA. After pharmacist intervention, 63 (90%) of 70 patients were receiving ACE inhibitor or ARB therapy and 48 (68%) of 71 patients were receiving aspirin therapy as recommended by ADA (p < 0.0001 for both differences). All patients who received appropriate treatment per ADA guidelines with an ACE inhibitor, an ARB, or aspirin before pharmacist intervention received appropriate treatment per ADA guidelines after pharmacist intervention.

Discussion

The literature has demonstrated that adherence to clinical guidelines can result in reduced patient morbidity, mortality, and overall health care costs. The results of this study show that before pharmacist intervention, provider adherence to ADA guidelines in this family medicine clinic was poor. This was not surprising, as other studies that evaluated prescriber adherence rates also found poor guideline adherence. Klaus and Hamilton evaluated prescriber adherence rates to Joint National Committee (JNC) 6 hypertension guidelines in 1999 and found that only 52.3% of patients received treatment as recommended by the guidelines. Jami et al. evaluated adherence to JNC 7 guidelines and found that blood pressure goals were achieved in only 27.6% of diabetic patients, while 16% of diabetic patients were not treated with an ACE inhibitor or ARB.

The results of this study demonstrate that pharmacy intervention via prescriber education and therapeutic recommendations made at the time the patient was seen by the prescriber was associated with a significant increase in prescriber adherence to ADA guidelines. Adherence to ACE inhibitor or ARB therapy recommendations and adherence to aspirin therapy recommendations increased by 53% and 100%, respectively. These increases in guideline adherence, occurring with pharmacy collaboration, imply substantial benefits in terms of reducing the risk of diabetes-related complications.

Studies conducted by Haggerty et al. and Faragon et al. also demonstrated that pharmacist intervention could improve provider adherence to guidelines. These studies differed from ours in that the interventions in their studies were designed only to increase aspirin use in diabetic patients and may not have included provider education as a method to improve future guideline adherence through altering provider knowledge and prescribing behavior.

Haggerty et al. evaluated the rate of aspirin or antiplatelet-anticoagulant

Table 1. Demographic Characteristics of Diabetic Patients Included in the Analyses*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>ACE Inhibitor or ARB Analysis (n = 70)</th>
<th>Aspirin Analysis (n = 71)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women</td>
<td>43 (61)</td>
<td>44 (62)</td>
</tr>
<tr>
<td>Age, yr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21–30</td>
<td>1 (1)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>31–40</td>
<td>12 (17)</td>
<td>13 (18)</td>
</tr>
<tr>
<td>41–50</td>
<td>21 (30)</td>
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<tr>
<td>51–60</td>
<td>17 (24)</td>
<td>16 (23)</td>
</tr>
<tr>
<td>61–70</td>
<td>15 (21)</td>
<td>16 (23)</td>
</tr>
<tr>
<td>71–80</td>
<td>2 (3)</td>
<td>2 (3)</td>
</tr>
<tr>
<td>81–88</td>
<td>2 (3)</td>
<td>2 (3)</td>
</tr>
</tbody>
</table>

*ACE = angiotensin-converting enzyme, ARB = angiotensin II-receptor blocker.
Several limitations of the current study must be considered. This was a retrospective chart review that systematically sampled patients who received care at a family medicine clinic. Although this systematic review should have resulted in a random selection of patients in terms of when they were seen at the clinic, it was not a true random sample of patients. In addition, the study was very small, with only 75 patients included. While the patient number was large enough to determine statistical significance, it may not truly represent the general population. Furthermore, it appears that pharmacist intervention led to higher response rates in ACE inhibitor or ARB initiation. This may be due to documentation processes. Since aspirin is purchased without a prescription most of the time, patient charts may not be reflective of actual patient use. Also, patients may not believe that recommendations regarding aspirin use are as important as recommendations for treatment with prescription medications. The fact that no patients were identified as having stopped appropriate therapy during the period associated with a pharmacy presence in the clinic was surprising. While this may be strong evidence of the influence that pharmacy personnel have on patients, a more likely explanation is that this observation reflects a limitation in record keeping. While the medical charts were reasonably consistent in documenting the initiation of therapy, prescriber documentation of therapy cessation may not have been as accurate or complete.

Another limitation of this study is that it did not assess the adherence rates of patients. Adherence to recommendations regarding the use of hydroxymethylglutaryl–coenzyme A reductase inhibitors, or statins, in diabetic patients is another variable that could have been evaluated in this study.

The results of this study show a strong association between pharmacy intervention and increased prescriber adherence rates to practice guidelines. However, the indirect nature of intervention at this clinic permits alternative explanations for increased prescriber adherence rates. It is possible that these results were due to prescriber education by sources other than clinic pharmacy personnel or increased prescribing experience with this population or both. While these factors, along with other possibilities, may have contributed to the increase in prescriber adherence, the agreement of this study’s results with those of similar studies suggest that pharmacist intervention in the clinic was a major contributor to the study’s findings.

**Conclusion**

A pharmacy intervention program in a primary care setting was associated with a significant increase in prescriber adherence to ADA guidelines for ACE inhibitor or ARB therapy and for aspirin therapy in diabetic patients.

**References**


