Eye on Diabetes: A Multidisciplinary Patient Education Intervention
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Eye on Diabetes

A Multidisciplinary Patient Education Intervention

Purpose

The purpose of this study is to compare the efficacy of usual care to an intervention emphasizing patient education targeted at a multicultural adult patient population with diabetes seeking eye care in an academic health center.

Methods

Ninety patients were randomized to usual care or to the intervention. All patients received a comprehensive eye health and vision examination and completed a demographic survey, a patient satisfaction survey, and a diabetes eye health pretest and posttest administered by a masked examiner at 1 week and 3 months. A multidisciplinary (optometry, pharmacy, endocrinology) patient education curriculum was developed for patients randomized to the intervention. Because the dependent variable was measured at 3 points on a nominal scale, a binary generalized estimating equation was employed.

Results

The assessment of patient knowledge at baseline revealed misconceptions about diabetic eye disease. While most patients recognized that people with diabetes should have regularly scheduled eye examinations through dilated pupils (90.0%), most patients incorrectly reported that diabetic eye disease usually has early warning signs (75.6%). While controlling for age, gender, race, education, and HbA1c level, subjects who participated in the intervention were 2 times more likely to score higher on the posttest ($\chi^2 = 45.51, P > .00$). No differences between pretest and posttest scores were found for patients who did not participate in the intervention ($\chi^2 = 11.67, P > .11$).
Conclusions

Patients who participated in the educational intervention demonstrated an increase in knowledge across time. Patients may benefit from education emphasizing the importance of dilated eye examinations in the absence of ocular symptoms.

Diabetic retinopathy is estimated to be the most frequent cause of new cases of blindness in the United States among adults aged 20 to 74 years. Patients with diabetes may not understand the importance of periodic dilated fundus examinations or recognize the benefits of early detection of diabetic eye disease.

The American Diabetes Association advocates that patients with type 1 diabetes have an initial dilated and comprehensive examination by an optometrist or ophthalmologist within 3 to 5 years of the onset of diabetes and that patients with type 2 diabetes have an initial dilated examination shortly after diagnosis. Subsequent examinations for both types are recommended annually or more frequently if retinopathy is progressing. Less frequent examinations may be considered in low-risk patients on the advice of an eye care professional.

The goal of this study is to compare the efficacy of usual care to an intervention emphasizing patient education targeted at English-speaking adults with diabetes seeking eye care in an academic health center. The project was developed within the Health Professions Division at Nova Southeastern University. The division is committed to multidisciplinary education.

All patients provided informed consent according to the protocol approved by the University’s Institutional Review Board and the principles expressed in the Declaration of Helsinki. Patients were eligible for the study (1) if they were 18 years of age or older, (2) if they had a medical history of physician-diagnosed type 1 or type 2 diabetes, and (3) if they spoke and read English. Patients were excluded from the study if they were unable to read print of 20/60 or smaller in the best-corrected eye.

Methods

Patients

Between October 13, 2004, and October 15, 2005, 90 patients were randomized to 2 arms representing usual care and an intervention emphasizing patient education targeted at English-speaking adults with diabetes seeking eye care in an academic health center. The project was developed within the Health Professions Division at Nova Southeastern University. The division is committed to multidisciplinary education.

Participation was composed of a comprehensive eye health and vision examination, patient education, and completion of study instruments described below. A demographic survey documenting patient age, gender, physician-reported HbA1c, education, and birthplace was administered to all patients at baseline. Race and ethnicity were self-reported using categories in current use by the National Eye Institute, National Institutes of Health (Bethesda, MD).

Patients assigned to the intervention were provided with a written report at the conclusion of the examination. The triplicate form included a report of eye examination findings with a copy designated for the medical record, the primary care physician, and the patient. The back side of the patient’s copy included educational materials targeted at a layperson, while the physician’s copy included information directed at a primary care health care provider.

Patients assigned to usual care received patient education provided by the eye care provider according to the American Optometric Association’s Clinical Practice Guidelines. Following the initial examination, all medical records were reviewed with attention to communication with other health care providers. Patients assigned to usual care were mailed additional educational materials at the conclusion of the study.

Patients assigned to the intervention were invited to participate in a supplementary seminar that reinforced the educational message delivered at the time of the initial examination. A multidisciplinary (optometry, pharmacy, endocrinology) patient education curriculum incorporating materials from the National Eye Health Education Program (NEHEP) Diabetic Eye Disease Public

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Education Program, the ABC’s of Diabetes, an interactive activity, and a question-and-answer session was developed for patients randomized to the intervention. The ABC’s of Diabetes reviewed target HbA1c values, blood pressure measurements, and cholesterol levels as well as the impact of systemic disease management on ocular complications.

**Measures**

In addition to the demographic survey, a pretest assessing patient knowledge of self-care guidelines as well as ocular complications of diabetes was administered at baseline. The evaluation tool used 9 survey questions selected from the NEHEP’s “Eye-Q” test. Measurements were performed by a masked examiner who did not know whether the patient had been randomized to usual care or to the intervention.

An examiner administered the posttest by telephone at 1 week and 3 months. An examiner also administered a patient satisfaction survey modified from the Diabetes Treatment Satisfaction Questionnaire following the visit.12

**Data Analysis**

The primary outcome measures were patient knowledge of preventive health strategies for diabetes as they pertain to eye health and vision care and patient satisfaction with eye and vision care. The existing generalized estimating equation (GEE) approach required approximately 45 subjects per group to adequately model both the random and fixed effects.

The statistical analysis required 2 approaches. The first approach modeled the effects of the independent variable group (treatment or control), adjusted for the covariates, on the dependent variable (knowledge). Because the dependent variable was measured at 3 points—(1) pretest, (2) 1 week posttest, and (3) 3 months posttest—and because the dependent variable was measured on a nominal scale (right/wrong), a binary GEE was employed. The second approach modeled the effect of group assignment (treatment or control), adjusted for the covariates, on the multilevel data of patient satisfaction. Patient satisfaction was measured on a Likert-type scale that typically is viewed as an ordinal scale. The GEE approach was chosen because it yields significant gains in mean squared error when estimating the random effects variance and the longitudinal correlations while providing estimates of the fixed effects (group assignment).

**Results**

Patient demographics (Table 1) reflected a diverse population with respect to age (59.1 ± 10.4 years), gender (41.1% male, 58.9% female), race (34.4% black or African American, 3.3% American Indian/Alaskan native, 3.3% Asian, 11.1% Native Hawaiian or other Pacific Islander, 11.1% other), ethnicity, highest level of education completed (7.8% grade 6 or less, 16.7% grade 7-11, 21.1% grade 12, 32.2% 1 or more years of college, 11.1% completed college, 11.1% completed 1 or more years of graduate education), and country of origin (17 countries). Forty-one of the 90 patients enrolled in the study were born outside of the U.S.
continental United States (45.5%), with Jamaica (15.6%) and Puerto Rico (5.6%) most highly represented. HbA1c readings reflected a broad spectrum of metabolic control (7.92% ± 1.88%; range, 4.8-15.0).

The assessment of patient knowledge (Table 2) at baseline revealed misconceptions about diabetic eye disease. While most patients recognized that people with diabetes should have regularly scheduled eye examinations through dilated pupils (90.0%) and that people with diabetes are more likely than people without diabetes to develop certain eye diseases (90.0%), most patients incorrectly reported that diabetic eye disease usually has early warning signs (75.6%). Most (77.8%) of the patients with diabetes recognized that diabetic retinopathy, a highly specific complication of diabetes, is caused by changes in the blood vessels in the eye, while the minority of patients (43.3%) were aware that laser surgery can be used to halt the progression of diabetic retinopathy. Furthermore, many patients were unaware of the risk for other nonspecific ocular complications such as cataracts (40.0%) and glaucoma (40.0%).

As described previously, a GEE was used to test for differences between groups (intervention and nonintervention) while controlling for age, gender, race, education, and HbA1c. With respect to patient knowledge (Table 3), differences were found between those patients who participated in the intervention and those who did not ($\chi^2 = 45.51, P > .00$). Subjects who participated in the intervention were 2 times more likely to score higher on the diabetes eye health posttests than those who did not participate. In addition, those who possess a higher education level were 1.5 times more likely to score higher on the examinations. Patients who participated in the educational intervention demonstrated an increase in knowledge during the study period (Figure 1).

Within-group changes were also examined using a GEE model. No statistical differences were found for those patients who did not participate in the intervention ($\chi^2 = 11.67, P > .11$); however, differences were found across measures within the intervention group (Table 4). Similar to the whole model effect, educated persons were
1.5 times more likely to earn a higher score. In addition, using the base score as the comparison measure, subjects randomized to the intervention were 2 times more likely to score higher on the 1-week and 3-month posttest. No differences were found for the intervention group between scores on the 1-week and 3-month posttest examinations.

No differences between the usual care and intervention groups were found across the variable of satisfaction, as measured by the patient satisfaction questionnaire. Issues related to continuity and coordination of care did not appear to differ between the intervention and usual care groups. However, written reports to other health care providers were not in evidence in the medical record for patients examined in the usual care group, with 1 exception.

While most patients (64.4%) randomized to the intervention attended the supplementary evening seminar that reinforced the educational message delivered at the initial examination, a significant proportion did not (35.6%). Primary reasons cited for nonparticipation included lack of transportation, occupational obligations, limited English language skills, and family responsibilities. The qualitative feedback from patients attending the supplementary educational program was overwhelmingly positive; however, the differences in patient knowledge, as measured by the pretests and posttests, between patients randomized to the intervention who attended the evening seminar and those randomized to the intervention who did not attend the seminar were not statistically significant. It should be noted that the pretest and posttests did not include queries about the “ABC’s of Diabetes” or the impact of systemic disease management on ocular complications—2 topics of discussion that were emphasized in the supplementary program.

Conclusions

The authors’ experiences reflect previous evidenced-based recommendations—that optimal diabetes management requires a systemic approach and involvement of a health care team.\textsuperscript{8} Diabetes self-management education and involvement of expert consultants, such as endocrinologists and diabetes educators, contributed to the program’s success. Reporting eye examination findings to primary care physicians was well received by patients and their physicians.

The results suggest that a concise educational program delivered in parallel with the eye examination may reach a broader patient population. A key message might include a statement that “vision loss from diabetes is often preventable with timely detection and treatment,” with reinforcement of the importance of periodic dilated fundus examinations in the absence of ocular symptoms. In addition, the impact of systemic disease management on ocular complications could be reinforced.

In addition, the need to develop educational materials that are culturally appropriate and linguistically competent...
for the target population was apparent. While diabetes occurs in people of all ages and races, it is more common in specific patient populations, including Latinos and African Americans, who were represented in the patient base. The ability to speak and read English was part of the inclusion criteria for this project because of the limitations in creating educational materials for a pilot study. However, future projects in the community would be enhanced by the provision of multilingual materials, including Spanish.

The results of the study shall be used to tailor the intervention to meet the needs of the diverse patient base. The ultimate goal of this project is to increase the proportion of persons with diabetes who have dilated fundus examinations at appropriate intervals and to reduce visual impairment due to diabetic retinopathy. The lessons learned are applicable to other patient populations with diabetes.

In summary, patients who participated in the educational intervention demonstrated an increase in knowledge during the study period. Patients may benefit from education emphasizing the importance of dilated examinations in the absence of ocular symptoms. Furthermore, patients with diabetes may benefit from an interdisciplinary approach to patient care and education using materials that are culturally appropriate.

References