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Primary Care Physician's Knowledge of the Ophthalmic Effects of Diabetes

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Abstract

Objectives—Previous studies suggest that many diabetic patients do not receive an annual dilated eye examination due to a lack of referrals from primary care providers (PCPs). This study aims to determine the depth of knowledge of PCPs regarding diabetic eye disease.

Design—Cross sectional assessment

Participants—Ninety-seven primary care physicians

Methods—An 8 question, multiple-choice assessment was administered over a three month period to two hundred eight PCPs in attendance at continuing medical education conferences.

Results—Ninety-seven PCPs completed the assessment. Participants had a mean total score of 5.9 out of 8 possible (73.8%). Questions regarding screening, clinical findings, and prevention were answered correctly by 81% or more of the respondents. However, questions regarding risk factors and complications were answered correctly by less than 35% of the respondents. No difference in scores was found based on the type of residency training received or the number of years in practice.

Conclusions—Although PCPs may require greater education in the complications and risk factors of diabetic eye disease, study participants demonstrated a good overall depth of knowledge regarding diabetic eye disease. Thus, previous reports of only 35%–55% of diabetic patients receiving an annual dilated fundus exam are likely not due to a lack of physician education.

Introduction

Diabetic retinopathy is a leading cause of blindness in the United States among adults 24–75 years of age.¹ Blindness from diabetes costs the U.S. approximately \$500 million annually in lost income and associated services.^{2,3} Primary care physicians (PCPs) are the front-line caregivers for patients with diabetes and are the most important conveyors of information to

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Conflict of Interest Statement

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patients regarding diabetic retinopathy. Therefore, understanding the ocular manifestations of diabetes and knowing the screening guidelines can impact the timeliness of referrals to ophthalmology by PCPs.^{4, 5} It is well known to ophthalmologists that in proliferative diabetic retinopathy, the timing of the laser treatment can have a considerable effect on the long term vision of the patient.^{6,7} Properly diagnosing diabetic retinopathy requires a dilated fundus exam once or more per year. However, studies have reported that only 31% to 65% of diabetic patients receive an annual dilated fundus exam.^{4, 8–14} Although this low rate is largely speculated to be due to patient misunderstanding and noncompliance, PCP referral to an eye care specialist may also be a factor. For instance, Jacques et. al reported that only 72% of primary care physicians surveyed in Pennsylvania routinely refer their patients for vision care.¹⁵ Another study found that among family practice physicians, only 24% referred their pregnant patients with pre-existing diabetes to an ophthalmologist.¹⁶ This finding occurs at a time when the number of medical schools requiring an ophthalmology rotation has significantly decreased from 68% in 2000 to 30% in 2004.^{17,18} With a minimal level of training and studies suggesting a suboptimal screening pattern, is the amount of education and awareness concerning diabetic eye disease at issue? A survey of Canadian family physicians showed that while 80% were aware of the screening guidelines for Type II diabetes, only 44% knew that diabetic women who become pregnant should be screened in the first trimester for retinopathy. Also, only one third of the physicians knew that diabetic macular edema can present without visual symptoms.¹⁹

Studies regarding awareness of diabetic eye disease among PCPs have been performed in other countries.^{11,20–21} However, little is known about the depth of knowledge of U.S. trained PCPs. Our study attempts to learn more by asking the following questions. (i) How much do PCPs know about the relationship between diabetes and eye care as it pertains to their practice? (ii) Are there gaps in the knowledge of diabetic retinopathy (a) screening, (b) clinical findings and methods of prevention, or (c) ocular complications and risk factors? (iii) Do any gaps depend on the type of training the PCP underwent, or on the PCP's level of experience? Our overarching goals are to detect any deficiencies and provide direction for addressing any concerns.

Methods

An 8 question, multiple choice assessment concerning diabetes and the eye was created and piloted among non-physicians and ophthalmologists at the University of Arkansas for Medical Sciences (UAMS) (see Appendix). Any question answered incorrectly by an ophthalmologist or correctly by non-medical personnel by more than chance alone was considered to be either poorly worded or worded in such a way as that the answer could easily be guessed without knowing the information. These questions were revised and retested or eliminated. The finalized assessment was administered over a three month period to 208 primary care physicians (PCPs), comprised of academic and community PCPs, as well as primary care resident physicians. Participants were in attendance at primary care targeted continuing medical education conferences, noon resident lectures, grand rounds or faculty meetings at UAMS. Care was taken to ensure that diabetic eye disease was not a lecture topic prior to the assessment administration. An adequate amount of time was allowed for participants to complete the exam after distribution. The examinations were then immediately collected. Participation was anonymous, voluntary, and open to all PCPs in attendance. The assessment also collected information regarding the type of residency training received, the number of years in practice, and the current type of practice. This study was approved by the institutional review board at UAMS.

Statistical Analyses

The questionnaire covered three topics: screening (Questions 1, 2, 3, 5), clinical findings and prevention methods (Questions 7, 8), and risk factors and complications (Questions 4, 6). In order to address our objectives, we compared mean totals among different training types with one-factor analysis of variance, between dichotomized years of experience with a two-sample *t*-test, and finally modeled totals with linear regression on years of experience. All tests were two-sided and conducted with significance level 0.05. We used SAS® Version 9.2 for all analyses. Specific testing for internal consistency was not performed since questions did not duplicate queries about the same fact and were not administered more than once.

Results

Sample Characteristics

Of the 208 examinations administered, 97 (47%) were returned prior to the diabetes lecture. Table 1 contains physician characteristics of the sample. Of the 97 participants, 93 reported training in a primary care residency, while 3 reported no residency training available in the year of their graduation and 1 reported training in Pathology, but practicing as a PCP. Eighty-five of the 97 participants listed themselves as currently practicing primary care medicine, while 12 reported either being in an administrative role, retired, in a subspecialty or chose not to answer this question. Of the training received, the majority (54 of 97 or 56%) was in Family Medicine, with Internal Medicine being the next most common (28 of 97 or 29%). When evaluating the effects of training, we considered three groups: family medicine, internal medicine, and all others (15 of 97 or 15%). Seventy-one respondents were either community or academic physicians while 26 were currently in residency training. Five of the 97 participants did not report years of experience; thus these 5 were excluded from analyses examining the effects of experience. Excluding the 26 residents (with 0 years experience), the average experience was 23.3 years (SD=13.8 years, $n=66$). Although practice location data was not addressed on the assessment, the type of conference attended (i.e. an academic faculty meeting versus a community physician targeted CME conference) suggested that 47 of the 97 participants practiced in the community, 36 participants (including 26 residents) were in an academic setting and 14 could not be determined.

Assessment Results

Participants had a mean total score of 5.9 (SD=1.0) out of 8 possible (73.8%). The means among the three training types ranged from 6.1 for family medicine (FM) trained physicians to 5.9 for those trained in internal medicine (IM) to 5.6 for physicians trained in a field other than FM or IM, but did not statistically differ ($F[2,94]=1.32$, $p=.2725$). Nor was there compelling evidence that total scores depended on experience, whether dichotomized into more or less than 10 years of experience (respective means of 6.0 vs. 5.9; $t[90]=0.35$, $p=.7239$) or when experience was treated as a continuous variable (slope for an increase of 1 year = -0.002 , $t[90]=0.30$, $p=.7678$). Table 2 contains the percent of correct answers for each question. Considered individually, questions from the topics of screening (Questions 1, 2, 3, 5) and clinical findings and prevention (Questions 7, 8) were answered correctly by 81% or more of the respondents. However, a large deficit in knowledge about risk factors and complications (Questions 4, 6) was clear, with less than 35% of the respondents answering either of these questions correctly.

Discussion

Our study set out to learn why many diabetics may not be getting proper ophthalmic care. Assuming the issue could be physician education, physician compliance, patient

communication, patient compliance or another barrier, we chose to begin the investigation by looking at physician education; i.e., the depth of knowledge of primary care physicians regarding diabetic eye disease. We wanted to identify any potential gaps of knowledge and to be able to make recommendations to address any problems identified. In order to be able to adequately describe deficiencies and provide specific recommendations, we broke our investigation down into specific areas in diabetic eye care: (a) screening, (b) clinical findings and methods of prevention, and (c) ocular complications and risk factors. Further, we wanted to be able to provide information regarding which PCP's might need additional education, if differences among PCPs were found.

The strengths of our study included a good response rate for a study of this design and a good cross section of physicians from the community and an academic setting. The sample also had a range of over 50 years of experience. This wide range allowed us to investigate how knowledge might vary with experience. With an overall score of 73.8%, the PCPs in our study had a good overall depth of knowledge of diabetic eye disease.

We learned that participants scored poorly overall on questions 4 and 6 regarding complications and risk factors. These findings suggest that greater education in these areas may be needed for most PCPs. Alternatively, it is possible that the available choices for these two questions could have influenced some of the incorrect responses. Questions 4 and 6 contained an item choice of "all of the above". This choice was not the correct answer for either question. It is possible that the temptation of choosing "all of the above" was too great for some participants. However, the questionnaire was well-piloted and did not identify these 2 items as being confusing or poorly worded in any way. Additionally, physicians are intelligent, well-experienced test takers. It is therefore reasonable to conclude that some participants just did not know the information.

As our results are taken from physicians in the rural southern United States, it is possible that PCP's in other areas of the country might score differently. However, based on our varied cross section of private practice and academic physicians of variable experience, our study is likely representative of many PCPs. Another potential drawback of our study is the small number of questions given to participants. More assessment items could have provided more detailed data. However, as the participants were voluntary and uncompensated, we believe a more labor intensive examination would have discouraged participation.

Given that complications of diabetic eye disease are largely preventable when detected early and the large amounts of resources that are spent annually in the United States to care for patients with diabetic complications, few would agree that the published reports of less than half of diabetic patients receiving adequate annual screening is acceptable. Our findings reveal that regardless of the type of primary care training or the number of years of experience, PCPs are well educated in regards to diabetic eye disease. If our findings are generalizable to all primary care physicians, then the lack of examinations are likely due to an issue other than physician knowledge. Thus, other avenues of investigation into the etiology of this problem, such as examining physician compliance, patient communication, patient compliance or other barriers to healthcare need to be explored.

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Appendix

An 8 question, multiple-choice survey administered to 208 primary care physicians in attendance at continuing medical education conferences, noon resident lectures, grand rounds or faculty meetings at the University of Arkansas for Medical Sciences.

Please circle the SINGLE best answer for each question

My residency training was in:

- A. Family Medicine
- B. Internal Medicine
- C. Pediatrics
- D. Internal Medicine/Pediatrics
- E. Other _____

My current practice can be best described as:

- A. Primary care
- B. Other _____

I have been in practice (after residency) for _____ years

1. A 50 year old patient is diagnosed with diabetes mellitus type 2. When should you consult an eye care specialist? (89% answered correctly)

- A. 6 months to 1 year after diagnosis if visually asymptomatic
- B. Within 2 years from the diagnosis if visually asymptomatic
- C. Consult only if the patient is visually symptomatic
- D. Consult only if the serum glucose has been > 450

E. Upon diagnosis regardless of symptoms

2. A 50 year old patient with well controlled diabetes mellitus type 2 returns from an appointment with Ophthalmology. The patient was found to have no diabetic retinopathy and no visual complaints. The patient cannot remember if a follow up was scheduled. How often should he be seen by Ophthalmology? (92% answered correctly)

- A. Every two years if visually asymptomatic
- B. Every year if visually asymptomatic**
- C. Every 6 months if visually asymptomatic
- D. Return only if visual symptoms develop

E. Return only if the diabetes becomes poorly controlled

3. The ideal method for evaluating diabetic retinopathy is (81% answered correctly)

A. An exam with a direct (hand-held) ophthalmoscope

B. Retinal angiography

C. A dilated eye exam at the slit lamp

D. Visual field testing

E. Ultrasonography of the eye

4. All of the following are ocular complications of diabetes EXCEPT: (26% answered correctly)

A. Retinal detachment

B. Macular edema

C. Vitreal Hemorrhage

D. Macular degeneration

E. All of the above are ocular complications of diabetes

5. Which of the following findings should increase your suspicion of diabetic retinopathy? (97% answered correctly)

A. Hypocalcemia

B. Microalbuminuria

C. Hyperkalemia

D. Increased liver function tests

E. Hematuria

6. All of the following are known to increase the risk of diabetic retinopathy EXCEPT: (34% answered correctly)

A. Hyperparathyroidism

B. Poorly controlled HTN

C. Pregnancy

D. Hyperlipidemia

E. All of the above can increase the risk of diabetic retinopathy

7. Diabetic retinopathy may present with any of the following EXCEPT: (90% answered correctly)

A. Retinal hemorrhages

- B. Cotton wool spots
- C. Normal vision (20/20 or better)
- D. Hard exudates

E. Diabetic retinopathy may present with any of the above

8. The most effective method of preventing progression of diabetic retinopathy is: (85% answered correctly)

- A. Increased frequency of dilated eye exams
- B. Pan-retinal (LASER) photocoagulation
- C. Tight serum glucose control**
- D. Intraocular injection of an anti-VEGF medication
- E. Phacoemulsification

Table 1

Demographics of 97 physician survey participants

Training	N	Description of current practice	N	Years in practice after residency	N
FM	54	Primary care	85	In residency	26
IM	26	Subspecialist	6	10	16
IM/Peds	5	Administrative	2	> 10 and 20	13
General internship	4	Retired	2	> 20 and 30	17
None	3	Not answered	2	> 30	20
Pediatrics	2			Not answered	5
EM	2				
Pathology	1				

FM – family medicine; IM – internal medicine; Peds – pediatrics; EM – emergency medicine.

Table 2

Overall survey results of 97 physician participants, by topic.

Question #	1	2	3	S	All S correct	CF	P	CF & P correct	C	R	C & R correct
Count (%) of Correct Responses	86 (89)	89 (92)	79 (81)	94 (97)	63 (65)	87 (90)	82 (85)	73 (75)	25 (26)	33 (34)	10 (10)

S= screening; CF=clinical findings;P=prevention; C=complications;R=risk factors