Need for Eye Care Among Older Adults With Diabetes Mellitus in Fee-for-Service and Managed Medicare

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Objective: To compare rates of need for eye care among Medicare beneficiaries with network-model Medicare Choice (MC) and fee-for-service (FFS) health insurance.

Methods: Cross-sectional study of a random sample of MC and FFS community-dwelling Medicare beneficiaries with diabetes who are older than 65 years of age in Los Angeles County. Study ophthalmologists masked to the participants' type of health insurance performed standardized dilated eye examinations and indicated the need for ophthalmic care during the next 6 months. To evaluate the association between type of insurance and need for treatment, we constructed logistic regression models adjusted for participant sociodemographic and clinical characteristics.

Results: The 311 MC and 107 FFS respondents reported comparable rates of eye care provider visits and preexisting eye diseases. However, on masked clinical examination, MC respondents were more likely to have diabetic retinopathy, visually significant cataract, glaucoma, or suspected glaucoma than FFS participants (68% vs 46%, P<.001). In multivariate analyses, persons enrolled in MC were significantly more likely than FFS participants to require further treatment during the next 6 months (42% vs 24%, P=.01).

Conclusions: Data from standardized study ophthalmic examinations suggest high rates of unrecognized and untreated eye diseases among Medicare beneficiaries enrolled in both FFS and MC and significantly higher rates of need for care among MC participants.


Older persons with diabetes mellitus have high rates of eye disease. Between 17% and 35% of persons with diabetes aged 65 years and older have diabetic retinopathy,1-3 and more than 8% have macular edema. Rates of age-related eye diseases, such as uncorrected refractive error, cataract,5-7 and glaucoma,8 are comparably high. Although evidence from randomized controlled trials and observational studies indicates that appropriate ophthalmic care can reduce the progression of eye disease and reduce or reverse visual disability,9,17 eye care for older persons with diabetes remains suboptimal.18-22

Managed care has the potential to enhance the coordination of primary and specialty care and increase access to appropriate eye care for older persons with diabetes.23 However, there are limited data on the quality of eye care provided in managed care settings compared with fee-for-service (FFS) settings, and the findings are mixed.24 In an early study comparing managed care and FFS quality of care, older persons with diabetes in a group-model managed care organization were more likely than FFS enrollees to have had a dilated eye examination.25 In contrast, a study of Medicare beneficiaries in Southern California suggests that rates of cataract surgery were 50% lower in managed care compared with FFS among persons dually eligible for Medicare and Medicaid27 and in the Medical Outcomes Study.28

Similar rates of use of ophthalmic services for diabetic retinopathy screening have been observed in managed care compared with FFS among persons dually eligible for Medicare and Medicaid27 and in the Medical Outcomes Study.28

The ability to draw conclusions from the findings of these prior studies is limited because they did not include detailed clinical assessment of the need for eye care, and very little of the earlier work evaluated care in newer for-profit network-
model managed care settings. In some states, including California, almost half of all Medicare beneficiaries in managed care were enrolled in for-profit Medicare + Choice (MC) plans in 1999, 29-31

In this study, dilated eye exams by ophthalmologists masked to the study participants’ types of health insurance were used to assess rates of need for eye care services among Medicare beneficiaries with diabetes in Los Angeles County. We also evaluated whether rates of need for eye care differed in FFS Medicare and a for-profit MC plan in which the health plan pays the provider group a capitated rate (ie, a fixed amount for each patient enrolled).

METHODS

PARTICIPANT POPULATION

We conducted a cross-sectional evaluation of the quality of diabetes care provided to older persons between June 1998 and February 2000. The managed care cohort was a random sample of Medicare beneficiaries with diabetes who were listed in the diabetes registry of a large for-profit MC plan in Los Angeles County and who were also identified in the 1995 Health Care Financing Administration enrollment database as enrolled in the participating health plan. This health plan enrolls a substantial percentage of the Medicare managed care beneficiaries in the region. The initial FFS sampling frame consisted of a random selection of persons in the Health Care Financing Administration enrollment database who had at least 1 claim with an International Classification of Diseases, Ninth Revision, Clinical Modification diabetes-related primary or secondary code of 250.XX, 357.2, 362.0X, or 366.41. The FFS participants were then randomly sampled from the same zip codes and age strata as the MC sample. To enhance participation in the clinical examination portion of the study, which was conducted at the University of California, Los Angeles (UCLA), we restricted study participation to zip codes within a 20-mile radius of the UCLA medical center. We oversampled African American persons, Latino persons, and Medicaid beneficiaries by 3-fold to allow adequate representation of these subgroups.

Potential participants were asked to confirm that they had diabetes and were 65 years of age or older, English-speaking, currently using diabetes medications, and continuously enrolled by the current health plan for 18 months or more. Exclusion criteria were diabetes diagnosed before the age of 30 (to decrease the likelihood of enrolling persons with type 1 diabetes), residing in a nursing home, severe illness or cognitive impairment that precluded participation in a 45-minute telephone interview, and having a spouse who participated in the study.

TELEPHONE INTERVIEW

Telephone interviews included questions about sociodemographic and clinical characteristics, self-reported eye conditions, comorbid medical illness, visual functioning using the 25-item Visual Function Questionnaire, and health status using the physical component summary (PCS-12) and mental component summary (MCS-12) of the Short Form 12. The Visual Function Questionnaire includes multi-item scales to rate difficulty with near vision and distance vision activities and limitations due to vision. Subscales are scored from 0 to 100, where 100 represents the best possible score on the measure and 0 represents the worst. Both the PCS-12 and the MCS-12 are normalized to a US population sample and are presented as T scores with a mean of 50 and SD of 10, with higher scores indicating better health. Participants were also asked about both general health care and eye care service use, including whether there had been a visit during the prior 12 months to an endocrinologist, diabetes educator, or an eye care provider (including ophthalmologists or optometrists).

CLINICAL EXAMINATION

Participants who agreed to come to UCLA underwent a standardized clinical evaluation by trained study staff. Transportation was provided to the examination site if needed, and attendees were paid a small honorarium for their participation. The study protocol was approved by the UCLA institutional review board.

The ophthalmic clinical examination included visual acuity measured under standard illumination with Early Treatment of Diabetic Retinopathy charts, measurement of intraocular pressure with the Goldmann applanator, slitlamp examination, and pupillary dilation, unless contraindicated because of gonioscopic examination. All subjects then underwent a dilated fundus examination by a trained study ophthalmologist. Lens opacities were graded using the Age-Related Eye Disease Study Clinical Grading system. Diabetic retinopathy was graded using the modified Early Treatment of Diabetic Retinopathy Scale. Age-related macular degeneration was defined as Age-Related Eye Disease Study category 2 or greater. Test-retest reliability (k) between examiners using the standards ranged from scores of 0.72 (very good) to 0.88 (excellent) for the 2 study ophthalmologists (D.S.F., A.L.C.). Based on the examination findings, the ophthalmologists provided a clinical impression of whether further treatment or follow-up was needed, the clinical indication for additional treatment, the recommended interval for follow-up, and the type of treatment needed. All ophthalmologists reviewed the condition-specific American Academy of Ophthalmology (San Francisco, Calif) preferred practice patterns for diabetic retinopathy and the other age-related conditions of interest, including glaucoma or glaucoma suspect and visually significant cataract. Need for eye care within 6 months of the eye examination was based on American Academy of Ophthalmology guidelines and clinical judgment. Examples of criteria used to identify need for eye care are presented in Table 1.

The examination also included measurement of height, weight, and blood pressure; a monofilament examination and visual inspection of the feet; hemoglobin A1c, and serum creatinine measurements; and measurement of urine proteinuria or microalbuminuria.

ANALYSES

For bivariate and multivariate analyses, we weighted the data to reflect the original eligible populations in the fielded samples, thereby adjusting for oversampling of African American persons, Latino persons, and Medicaid recipients. Weighted bivariate tests of association were used to compare need for care within the 6 months after the examination in FFS and MC.

Weighted logistic regression models were constructed to examine the main effect of type of insurance on the need for eye care within the 6 months after the examination while controlling for individual sociodemographic and clinical characteristics. All models were adjusted for age, sex, race/ethnicity, education, income, Medicaid and other supplemental insurance coverage, duration of diabetes, medical comorbidity, and health status using the PCS-12 and MCS-12. Additional models were constructed that also adjusted for prior eye disease, a reported
visit to an eye care specialist during the previous 12 months, or a visit to an endocrinologist during the prior 12 months. Because a larger proportion of the FFS sample was recruited for the interview portion of the study after the field period for the standardized examinations ended, a smaller percentage of FFS than MC participants were offered participation in the clinical examination. To evaluate the impact of the differences in rates of being offered participation in the examination, we performed 2 sensitivity analyses. We first compared the FFS sample with the MC sample participants who did not exceed the maximum time between the interview and examination in the FFS cohort. As a second sensitivity analysis, an indicator of the length of time between the interview and the examination was included in all models. Because the results of these analyses did not appreciably alter the study findings, the results presented here do not include an adjustment for time between interview and examination.

We generated weighted predicted probabilities from the logistic regression models by setting the values of the covariates in the model to their mean values for the entire study population. Predictions were then made by setting the indicator for MC to 0 (indicating enrollment in FFS) or 1 (enrollment in MC). This resulted in predictions for a hypothetical “mean” person under the 2 systems of care. We obtained the SEs of these predicted probabilities by propagating the estimated covariance matrix of the logistic regression coefficients through the logistic transform via the delta method. Because patterns of care may be correlated between patients within provider groups, we also conducted sensitivity analyses that adjusted for clustering within the 11 managed care provider groups. The results did not differ, and we present here the results without adjustment for provider group clustering. All analyses were performed using SAS version 8.042 and Stata version 7.0.43

**RESULTS**

Among eligible subjects, 497 (68%) MC participants and 233 (66%) FFS participants completed the interview. Clinical examinations were offered to persons who completed the survey prior to September 2000, so 479 MC participants (96% of those interviewed) and 166 FFS participants (71% of those interviewed) were eligible for the examination portion of the study. There were no clinical or sociodemographic differences between those offered and those not offered the clinical examination. Among persons who were interviewed and offered participation in the examination, 64% of the FFS enrollees and 65% of the MC enrollees participated. The persons who were both interviewed and examined were less likely to have supplemental insurance (14% vs 25%, \(P = .03\)) were more likely to report hyperlipidemia (69% vs 54%, \(P = .01\)), and had better physical health with higher mean PCS-12 scores (43.4 + 11.1 vs 40.5 + 11.2, \(P = .05\)) than those who participated only in the interview. The 2 groups did not differ by age, sex, race/ethnicity, education, income, Medicaid status, or clinical characteristics such as duration of diabetes, insulin use, or MCS-12 scores.

A comparison of the 311 MC and 107 FFS Medicare beneficiaries who completed the clinical examinations is presented in Table 2 by system of care. The MC participants included more Latino persons and were less educated, poorer, and less likely to have Medicaid or other supplemental insurance. In the 12 months preceding the interview, the MC participants were significantly less likely to have seen an endocrinologist, but rates of visits to an eye care provider were high and comparable in the 2 groups (85% in MC and 80% in FFS, \(P = .23\)). In both groups, over 99% had seen a primary care provider during the same time interval. There were few clinical differences between FFS and MC participants. The MC participants were less likely to report hyperlipidemia and had significantly lower PCS-12 scores, but the 2 groups did not differ in duration with diabetes or number of chronic medical conditions. The study examination revealed no differences in blood pressure control, proteinuria, or mean hemoglobin A1c or serum creatinine levels.

**SELF-REPORTED EYE CARE AND EYE FINDINGS ON EXAMINATION**

There were no significant differences between the FFS and MC participants in self-reported eye disease or prior eye treatment. Based on findings from the study’s clinical examination, MC participants had significantly higher rates of cataract (36% vs 22%, \(P = .02\)), but the higher rates of diabetic retinopathy (31% vs 25%, \(P = .28\)) and glaucoma or suspected glaucoma (22% vs 17%, \(P = .35\)) in MC did not reach statistical significance. Overall, MC participants were more likely to have at least 1 of the 3 eye diseases diabetic retinopathy, cataract, or glaucoma or suspected glaucoma (68% vs 46%, \(P < .001\)) than FFS participants.

In the unadjusted model (Table 3), MC participants were more likely to need further treatment or follow-up within 6 months (42% vs 29%, \(P = .03\)). The most common clinical indications for need for care were newly identified diabetic retinopathy, unoperated visually significant cataract, glaucoma, and suspected glaucoma needing a formal visual field test in less than 6 months.

In the fully adjusted model (Table 3), which controlled for clinical and sociodemographic characteristics and visits to an endocrinologist, ophthalmologist, or

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**Table 1. Examples of Criteria for Classification of Need for Eye Care**

<table>
<thead>
<tr>
<th>Category</th>
<th>Follow-up Recommended Within 6 Months of the Study Clinical Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetic retinopathy42</td>
<td>1. Mild to moderate NPDR with macular edema</td>
</tr>
<tr>
<td></td>
<td>2. Mild to moderate NPDR with CSME</td>
</tr>
<tr>
<td></td>
<td>3. Severe or very severe NPDR with or without CSME</td>
</tr>
<tr>
<td></td>
<td>4. Proliferative diabetic retinopathy with or without CSME</td>
</tr>
<tr>
<td>Glaucoma43 or glaucoma suspect43</td>
<td>1. Vertical or horizontal cup/disc ratio ≥ 0.7</td>
</tr>
<tr>
<td></td>
<td>2. Asymmetry of cup/disc ratio &gt; 0.2 between the 2 eyes</td>
</tr>
<tr>
<td></td>
<td>3. Notching of neuroretinal rim</td>
</tr>
<tr>
<td></td>
<td>4. Focal loss of neuroretinal rim</td>
</tr>
<tr>
<td></td>
<td>5. Disc hemorrhage</td>
</tr>
<tr>
<td></td>
<td>6. Potentially occludable angle on gonioscopy</td>
</tr>
</tbody>
</table>

Abbreviations: CSME, clinically significant macular edema; NPDR, nonproliferative diabetic retinopathy.

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### Table 2. Characteristics of Managed Care and Fee-for-Service Respondents

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Managed Care Respondents</th>
<th>Fee-for-Service Respondents</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ± SD age, y</td>
<td>75 ± 7</td>
<td>75 ± 5</td>
<td>.38</td>
</tr>
<tr>
<td>Women, %</td>
<td>48.2</td>
<td>46.7</td>
<td>.80</td>
</tr>
<tr>
<td>Race/ethnicity, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White, non-Latino</td>
<td>56.8</td>
<td>66.1</td>
<td>.13</td>
</tr>
<tr>
<td>Latino</td>
<td>21.3</td>
<td>12.4</td>
<td>.08</td>
</tr>
<tr>
<td>African American</td>
<td>11.7</td>
<td>7.8</td>
<td>.25</td>
</tr>
<tr>
<td>Other race or multiracial</td>
<td>10.3</td>
<td>13.8</td>
<td>.38</td>
</tr>
<tr>
<td>Education, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not graduate from high school</td>
<td>28.9</td>
<td>13.5</td>
<td>.01</td>
</tr>
<tr>
<td>High school but no college</td>
<td>31.9</td>
<td>22.0</td>
<td>.07</td>
</tr>
<tr>
<td>College graduate</td>
<td>39.2</td>
<td>64.5</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Medicaid participants, %</td>
<td>2.6</td>
<td>19.4</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Household income &lt;$20 000, %</td>
<td>51.6</td>
<td>29.3</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Supplemental insurance, %</td>
<td>3.7</td>
<td>16.6</td>
<td>&lt;.001</td>
</tr>
<tr>
<td><strong>Service Use in the Prior 12 mo</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ± SD health care visits, No.</td>
<td>5.6 ± 3.9</td>
<td>7.7 ± 9.5</td>
<td>.20</td>
</tr>
<tr>
<td>Hospitalized, %</td>
<td>28.3</td>
<td>35.8</td>
<td>.19</td>
</tr>
<tr>
<td>Emergency department visit, %</td>
<td>34.0</td>
<td>24.9</td>
<td>.11</td>
</tr>
<tr>
<td>Diabetes education, %</td>
<td>25.5</td>
<td>19.2</td>
<td>.20</td>
</tr>
<tr>
<td>Endocrinology visit, %</td>
<td>18.3</td>
<td>32.9</td>
<td>.004</td>
</tr>
<tr>
<td>Podiatry visit, %</td>
<td>36.9</td>
<td>42.8</td>
<td>.32</td>
</tr>
<tr>
<td>Ophthalmology or optometry visit, %</td>
<td>85.2</td>
<td>79.6</td>
<td>.23</td>
</tr>
<tr>
<td><strong>Self-reported Clinical Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ± SD duration of diabetes, y</td>
<td>11.5 ± 8.6</td>
<td>12.1 ± 11.4</td>
<td>.65</td>
</tr>
<tr>
<td>Mean ± SD chronic illnesses, No.</td>
<td>2.8 ± 1.7</td>
<td>2.5 ± 1.6</td>
<td>.10</td>
</tr>
<tr>
<td>Oral antidiabetic agent, %</td>
<td>74.9</td>
<td>78.3</td>
<td>.52</td>
</tr>
<tr>
<td>Insulin, %</td>
<td>32.6</td>
<td>34.2</td>
<td>.78</td>
</tr>
<tr>
<td>Hypertension, %</td>
<td>68.5</td>
<td>75.4</td>
<td>.21</td>
</tr>
<tr>
<td>Hyperlipidemia, %</td>
<td>53.2</td>
<td>73.0</td>
<td>.001</td>
</tr>
<tr>
<td>Smoker, %</td>
<td>7.0</td>
<td>4.8</td>
<td>.50</td>
</tr>
<tr>
<td>Mean ± SD health status score (Short Form 12)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical component summary</td>
<td>40.5 ± 11.3</td>
<td>44.0 ± 10.3</td>
<td>.01</td>
</tr>
<tr>
<td>Mental component summary</td>
<td>54.3 ± 8.9</td>
<td>53.8 ± 8.5</td>
<td>.59</td>
</tr>
<tr>
<td>Mean ± SD score on Visual Function Questionnaire (25 items)</td>
<td>86.3 ± 15.5</td>
<td>88.3 ± 17.7</td>
<td>.46</td>
</tr>
<tr>
<td><strong>Self-reported Eye Diseases, %</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetic retinopathy or laser treatment for diabetes</td>
<td>22.9</td>
<td>20.2</td>
<td>.60</td>
</tr>
<tr>
<td>Ever had cataract</td>
<td>55.6</td>
<td>61.1</td>
<td>.37</td>
</tr>
<tr>
<td>Past surgery for cataract in at least 1 eye</td>
<td>23.6</td>
<td>32.8</td>
<td>.10</td>
</tr>
<tr>
<td><strong>Study Physical Examination Findings</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ± SD hemoglobin A1c, %</td>
<td>8.6 ± 1.9</td>
<td>8.4 ± 1.8</td>
<td>.31</td>
</tr>
<tr>
<td>Mean ± SD serum creatinine, mg/dL</td>
<td>1.2 ± 0.6</td>
<td>1.2 ± 0.8</td>
<td>.43</td>
</tr>
<tr>
<td>Proteinuria, %</td>
<td>48.6</td>
<td>46.0</td>
<td>.45</td>
</tr>
<tr>
<td>Mean ± SD pulse pressure, mm Hg</td>
<td>75.2 ± 17.3</td>
<td>77.3 ± 15.6</td>
<td>.26</td>
</tr>
<tr>
<td><strong>Eye Examination</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Best eye visual acuity, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worse than 20/200</td>
<td>2.1</td>
<td>4.3</td>
<td>.32</td>
</tr>
<tr>
<td>Better than 20/200 to 20/40</td>
<td>4.5</td>
<td>2.4</td>
<td>.27</td>
</tr>
<tr>
<td>Better than 20/40</td>
<td>93.4</td>
<td>93.3</td>
<td>.97</td>
</tr>
<tr>
<td>Dilated eye examination, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetic retinopathy</td>
<td>30.6</td>
<td>24.6</td>
<td>.28</td>
</tr>
<tr>
<td>Visually significant cataract</td>
<td>36.0</td>
<td>22.0</td>
<td>.02</td>
</tr>
<tr>
<td>Glaucoma or glaucoma suspect</td>
<td>22.2</td>
<td>17.3</td>
<td>.35</td>
</tr>
<tr>
<td>Any eye problem (diabetic retinopathy, cataract, or glaucoma)</td>
<td>68.4</td>
<td>45.8</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Further treatment needed in ≤6 mo, %</td>
<td>42.0</td>
<td>28.6</td>
<td>.03</td>
</tr>
<tr>
<td>Reason further treatment needed in ≤6 mo, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetic retinopathy</td>
<td>7.1</td>
<td>5.5</td>
<td>.60</td>
</tr>
<tr>
<td>Unoperated visually significant cataract</td>
<td>3.0</td>
<td>0</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Glaucoma or glaucoma suspected</td>
<td>23.3</td>
<td>15.1</td>
<td>.12</td>
</tr>
<tr>
<td>Macular edema</td>
<td>5.1</td>
<td>7.3</td>
<td>.43</td>
</tr>
<tr>
<td>Macular degeneration</td>
<td>3.7</td>
<td>1.3</td>
<td>.16</td>
</tr>
<tr>
<td>Other</td>
<td>3.0</td>
<td>2.3</td>
<td>.71</td>
</tr>
</tbody>
</table>
optometrist, 42% of MC participants compared with 24% of FFS participants needed further treatment or follow-up within 6 months ($P = .01$). None of the other covariates (ie, age, sex, race or ethnicity, income, education, Medicaid or other supplemental insurance, duration of diabetes, comorbid conditions, or health status) were significantly associated with the need for eye care within 6 months. In addition, there was no appreciable change in the results when we conducted sensitivity analyses that incorporated into the models the number of eye care provider visits and number of eye conditions.

### Table 3. Predicted Percents of Untreated Eye Disease in Medicare-Choice and Fee-for-Service Medicare*

<table>
<thead>
<tr>
<th>Model†</th>
<th>Medicare-Choice Predicted Percent (95% Confidence Interval)</th>
<th>Fee-for-Service Predicted Percent (95% Confidence Interval)</th>
<th>$P$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unadjusted</td>
<td>42.0</td>
<td>28.6</td>
<td>.03</td>
</tr>
<tr>
<td>Model 1: Further treatment needed in $\leq$ 6 mo</td>
<td>41.9 (34.9-49.1)</td>
<td>24.8 (15.1-34.5)</td>
<td>.01</td>
</tr>
<tr>
<td>Model 2: Further treatment needed in $\leq$ 6 mo (also adjusted for endocrinologist visit)</td>
<td>41.9 (34.9-49.1)</td>
<td>24.8 (15.1-34.5)</td>
<td>.01</td>
</tr>
<tr>
<td>Model 3: Further treatment needed in $\leq$ 6 mo (also adjusted for ophthalmology visit)</td>
<td>42.5 (35.2-49.8)</td>
<td>24.0 (14.2-33.9)</td>
<td>.01</td>
</tr>
<tr>
<td>Model 4: Further treatment needed in $\leq$ 6 mo (also adjusted for self-reported eye disease)</td>
<td>41.8 (34.6-49.0)</td>
<td>25.0 (15.3-34.7)</td>
<td>.02</td>
</tr>
<tr>
<td>Model 5: Further treatment needed in $\leq$ 6 mo (also adjusted for endocrinologist and ophthalmology visit)</td>
<td>42.2 (35.0-49.5)</td>
<td>23.9 (13.9-33.8)</td>
<td>.01</td>
</tr>
<tr>
<td>Model 6: Further treatment needed in $\leq$ 6 mo (also adjusted for endocrinologist visit, ophthalmology visit, and self-reported eye disease at baseline)</td>
<td>42.4 (35.0-49.7)</td>
<td>24.2 (14.3-34.1)</td>
<td>.01</td>
</tr>
</tbody>
</table>

*Untreated eye disease is defined as further eye care treatment needed in $\leq$ 6 mo.
†Adjusted for patient age, sex, race/ethnicity, education, income, Medicaid status, duration of diabetes, comorbid illness, and health status.

In this study of older adults with diabetes, we found high rates of untreated eye disease in both a network-model MC plan and among FFS Medicare beneficiaries. Although participants with both types of insurance reported comparable rates of prior eye diseases and use of eye care services, on the study’s standardized masked dilated eye examination, we observed significantly greater need for future ophthalmic care within 6 months among MC participants than FFS participants.

An important finding in this study of older persons with diabetes is the high rate of other untreated age-related eye diseases in both MC and FFS settings that required treatment within 6 months. Although participants had comparable rates of self-reported eye diseases and similarly high rates of visits to an eye care provider, 42% of the MC participants and 24% of the FFS participants needed additional eye care within 6 months. In order of frequency from highest to lowest, the conditions requiring further treatment were glaucoma or suspicion of glaucoma, diabetic retinopathy, macular edema, macular degeneration, and cataract. These findings may have important implications for ophthalmic screening recommendations for older adults with diabetes. Although some organizations recommend annual ophthalmic screening for all adults with diabetes, decision analytic models suggest that among persons at low risk for retinopathy, annual screening for diabetic retinopathy is not cost-effective in comparison with less frequent screening intervals. However, models for the timing of eye care for persons with diabetes have not taken into consideration the potential health benefits of detecting other age-related vision problems. Thus, screening recommendations based on these models may not be appropriate for older persons with diabetes.

A second major finding from this study is the higher level of need for care within 6 months for MC participants than for FFS participants. The prevalence of diabetic retinopathy was the same in the MC and FFS groups, but the rate of glaucoma or suspected glaucoma was higher in MC participants. One explanation for this variation by eye condition may be that eye care providers in both systems of care are sensitized to finding and treating diabetic retinopathy, a Health Employer Data and Information Set measure, but in MC settings, they may not be diagnosing or treating other age-related eye diseases at the same rate as eye care providers in FFS settings. Thus, older persons in MC may not be gaining the same level of entry into the eye care system. The implications of this finding are unclear, however, because few study participants had sight-threatening eye diseases, and data suggest low rates of vision loss among patients with diabetes over a 3-year follow-up period.

The observation of higher levels of need for follow-up ophthalmic care may be explained by selection or differences in health care systems. In our study, compared with FFS participants, those in MC were less educated, poorer, and more likely to be Latino. Members of these groups may have been unable to follow up or may not have realized that they needed to follow up on an active problem because of financial, educational, language, or cultural barriers, or they may have seen providers who were less likely to think additional eye care services were needed. In prior research, Latino persons have also been shown to have higher rates of glaucoma and vision loss than white persons. However, in our study, none of these characteristics were in-
dependently associated with need for care in the
adjusted analyses, and statistical adjustment for educa-
tion, income, and race/ethnicity did not appreciably
change the association between insurance type and need
for eye care.

Another possible explanation for the higher rates of
need for eye care in the MC group compared with the
FFS group may be greater barriers to needed ophthal-
mic care in MC participants that result in lower rates of
identification of eye problems relative to FFS partici-
pants. The administrative complexity of the process of
referral care may result in reduced access to eye care spe-
cialists. However, in this study, as in prior research, par-
ticipants in FFS and MC reported similar rates of visits
for ophthalmic care. The higher rates of need for fol-
low-up care for MC participants may also reflect lower
diagnosis of eye problems or less aggressive man-
gement of treatable eye conditions than for FFS partici-
pants. Possible explanations may include the use of capi-
tated carveouts—which may create a financial disincentive
to performing cataract surgery, frequent follow-up, or
time-consuming functional visual fields—or the use of
less expensive alternative providers for ophthalmic care.24

For several reasons, our findings comparing eye care
in FFS and MC settings must be interpreted with cau-
tion. Our study includes only 1 for-profit, network-
model MC health plan in 1 managed care market. Al-
though for-profit network-model managed care is one of
the most common types of Medicare managed care in the
United States, we do not know whether similar findings
would be observed in staff-model or not-for-profit set-
tings. It is also important to recognize that the health care
market in which the study was conducted is one of the
largest managed care markets in the United States, that
our sample size is comparable with or higher than other
those in observational studies of managed care and FFS
settings, and that our study population includes partici-
ants from 11 physician provider groups. There is the
possibility that we did not draw comparable samples from
MC and FFS because the MC sample came from the health
plan’s diabetes registry, but the FFS sample was derived
from a random sample of Medicare beneficiaries with a
diagnosis of diabetes. Because it is likely that patients in
a registry are more closely followed than those with FFS
Medicare, the observed difference in need for eye care
may have been even greater if we had identified MC par-
ticipants who were not in the registry. However, we took
several steps to ensure the comparability of the MC and
FFS samples: all participants in the study were repre-
sented in the Health Care Financing Administration en-
rollment database, and to ensure the comparability of dia-
betes severity, all participants had to be on either oral
antidiabetic medications or insulin. Although we relied
on self-report of prior eye disease and of visits to eye care
providers, we used questions validated in other sur-
veys50-52 and found rates of eye care visits comparable with
sources that use self-report of eye disease.50-52 Finally,
because we do not have information on scheduled care in
the 6 months following the examination, we do not know
if MC participants, who had greater need for care, may
also have had more visits to eye care specialists sched-
uled in the 6 months after our examination.

Our findings indicate that older adults with diabetes
are at risk for undetected and untreated age-related eye
diseases, suggesting that more than just treatment of reti-
nopathy must be considered when evaluating the appro-
priateness of the interval between eye care visits for older
persons with diabetes. Additionally, older adults with di-
betes who were enrolled in a network-model managed
care setting were more likely to need care for treatable
ophthalmic conditions than comparable persons who ob-
tain care under FFS Medicare. Moreover, the majority of
study participants had been seen by an eye care special-
list in the prior 12 months, and this did not differ by type
of insurance. This suggests that although access to eye
care visits is similar in the FFS and MC settings studied,
the content and quality of that care may differ. Further
research is needed in other managed care settings and
in other regions to evaluate the longer-term conse-
quences of our findings and to identify the health care
organizational and financial characteristics that may in-
fluence eye care for older persons with diabetes. Such work
may have policy implications for recommended screen-
ing intervals for older persons with diabetes, the types of
eye care providers who should examine them, and the
content of those eye care visits.

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