Title

Physician perception of reimbursement for outpatient procedures among managed care patients with diabetes mellitus.

Journal

The American Journal of Managed Care, 15(1)

ISSN

1088-0224

Authors

Kim, Catherine
Tierney, Edward F
Herman, William H
et al.

Publication Date

2009

Peer reviewed

Published in final edited form as:
Am J Manag Care. 2009 January ; 15(1): 32–38.

Physician reimbursement perception for outpatient procedures and procedures among managed care patients with diabetes

Catherine Kim, M.D. M.P.H.[1,2], **Edward F. Tierney, M.P.H.**[3], **William H. Herman, M.D. M.P.H.**[1,4], **Carol M. Mangione, M.D. M.S.P.H.**[5], **K.M. Venkat Narayan, M.D. M.P.H. M.B.A.**[6], **Robert B. Gerzoff, M.S.**[3], **Dori Bilik, M.B.A.**[1], and **Susan L. Ettner, PhD**[5]

[1]Department of Medicine, University of Michigan, Ann Arbor, MI

[2]Department of Obstetrics & Gynecology, University of Michigan, Ann Arbor, MI

[3]Division of Diabetes Translation, Centers for Disease Control and Prevention, Atlanta, GA

[4]Department of Epidemiology, School of Public Health, University of Michigan, Ann Arbor, MI

[5]Division of General Internal Medicine and Health Services Research, Department of Medicine, David Geffen School of Medicine, University of California, Los Angeles

[6]Rollins School of Public Health, Emory University, Atlanta, GA

Abstract

OBJECTIVE—To examine the association between physicians' reimbursement perceptions and outpatient test performance. Previous studies have documented an association between reimbursement perceptions and electrocardiogram performance, but not for other common outpatient procedures.

STUDY DESIGN—Cross-sectional analysis.

METHODS—Participants were physicians (n = 766) and their managed care patients with diabetes mellitus (n = 2758) enrolled in 6 plans in 2003. Procedures measured included electrocardiograms, radiographs or x-rays, urine microalbumin measures, hemoglobin A1cs, and Pap smears for women. Hierarchical logistic regression models were adjusted for health plan and physician level clustering and for physician and patient covariates. To minimize confounding by unmeasured health plan variables, we adjusted for plan as a fixed effect. Thus, we estimated variation between physicians using only the variance within health plans.

RESULTS—Patients of physicians who reported reimbursement for electrocardiograms were more likely to receive electrocardiograms than patients of physicians who did not perceive reimbursement (unadjusted mean difference 4.9% (95% confidence interval, 1.1% to 8.9%)) and adjusted mean difference 3.9% (95% confidence interval, 0.21% to 7.8%)). For the other tests examined, no significant differences in procedure performance were found between patients of physicians who perceived reimbursement and patients of physicians who did not perceive reimbursement.

CONCLUSIONS—Our findings suggest that reimbursement perception was associated with electrocardiograms, but not with other commonly performed outpatient procedures. Future research should investigate how associations change with perceived amount of reimbursement and interactions with other influences upon test-ordering behavior such as perceived appropriateness.

Address for correspondence: Catherine Kim, MD MPH, 300 NIB, Room 7C13, Ann Arbor, MI 48109, Telephone: (734) 647-9688, Fax: (734) 936-8944, cathkim@umich.edu.

Keywords

managed care; reimbursement; outpatient

Ideally, physician test-ordering is determined by clinical factors, such as patient symptoms or disease screening recommendations. In reality, healthcare is delivered in a complex environment that exposes the physician to a wide range of non-clinical factors[1–4] which may influence test-ordering behavior. These competing influences may be especially strong for primary care physicians, who diagnose and treat a wide array of diseases.

Patients, patient advocates, policy-makers, and healthcare organizations attempt to manage these non-clinical influences to elicit their preferred version of test-ordering behavior. One of these influences is reimbursement. Reimbursement initiatives are predicated by the assumption that if physicians perceive financial rewards for ordering a particular test, this perception will affect their test-ordering behavior.[5] Few studies have examined the association between primary care physician reimbursement perceptions and performance of particular procedures. Epstein and colleagues compared test performance in fee-for-service patients to test performance in managed care enrollees.[6, 7] Their hypothesis was that reimbursement perceptions would be stronger in fee-for-service plans than in managed care plans, and thus fee-for-service patients would receive more tests. After adjustment for physician years in practice and patient age, sex, duration of disease, and blood pressure levels, they found that tests perceived as more profitable (i.e., electrocardiograms) were performed more frequently by physicians in fee-for-service settings than in managed care plans. Tests perceived as less profitable, such as urinalyses and radiographs, did not differ in frequency between managed care and fee-for-service. Thus, perceived reimbursement appeared to play a role in test-ordering practices.

More recent studies have examined actual reimbursement, as opposed to perceived reimbursement.[8, 9] These reports have focused on procedure performance in fee-for-service vs. salaried or capitated systems,[8] and more recently, specific pay-for-performance initiatives.[9] While such studies examine performance of procedures in different financial systems, they have usually not queried physicians on their *reimbursement perceptions*. Reimbursement perceptions may better predict actual test-ordering behavior because physicians may have limited awareness of actual reimbursement; in one survey, 16% of physicians did not know the percent of their compensation from salary.[15] In other studies, physicians were unaware of added reimbursement for vaccinations and cancer screening.[10, 11]

Since the studies by Epstein and colleagues, the health care environment has changed; the current health care market has higher managed care penetration[12] and physician groups may contract with both fee-for-service and managed care plans. In addition, pay-for-performance programs may currently affect more than 80% of managed care enrollees.[9] To our knowledge, the association between physician reimbursement perceptions and test performance has not been examined in this environment. Such an examination would inform our understanding of the importance of reimbursement perceptions in the clinical decision-making process. Therefore, we tested the hypothesis that the patients of physicians who perceived reimbursement for a particular procedure were more likely to have received that procedure than those whose physicians did not perceive reimbursement for the procedure. We used detailed clinical data from Translating Research into Action (TRIAD), a large cohort study of managed care enrollees with diabetes and their physicians enrolled in multiple health plans.

METHODS

Setting and Study Population

A detailed description of TRIAD has been previously published.[13] In summary, six Translational Research Centers (TRCs) collaborated with 10 health plans including staff model health maintenance organizations, network association HMOs, point of service plans, and preferred provider organizations. Eligible patients were ≥18 years of age, community-dwelling, not pregnant, had diabetes for ≥1 year, spoke English or Spanish, were continuously enrolled in their health plan for ≥18 months, used ≥1 service during that time, and could provide informed consent. Patients' ages and race/ethnicities varied widely across health plans.[14]

Data Collection

This report was based on a survey of TRIAD primary care physicians (54% physician survey response rate) and their patients. Patients participated in the 2003 wave of data collection and were continuously enrolled over a 12 month period prior to the physician survey. We excluded 3 health plans for which we had only institutional claims and 1 plan that had only a single continuously enrolled patient. Physicians were enrolled in group-network or staff plans. The study included 766 clinicians and their 2758 patients. When we compared patients who were continuously enrolled and their clinicians vs. patients who were not continuously enrolled and their clinicians, their demographics were similar (results not shown).

The 12 month observation period for each study participant was immediately prior to the month that the clinicians filled out a survey and began anytime between August 2002 to January 2003. Patient data were collected from mailed surveys or computer-assisted telephone interviews and medical record reviews. The inter-rater reliability (kappa) for the process of care variables at each of the six TRCs ranged from 0.86–0.94.

Main Outcome Measures

Procedure performance was ascertained from health plan administrative data. For each patient, we recorded any claim in the 12 month review period for each of the following procedures: electrocardiograms, radiographs or x-rays, urine microalbumin, hemoglobin A1c (HbA1c), and Papanicolau (Pap) smears among women only. We dichotomized the measures because only a minority of participants had any procedure performed more than once. The one exception was measurement of HbA1c, which was multiply coded for 70% of patients. Among all participants, the median number of procedures performed for procedures was 0, with the exception of HbA1c. Among participants who had at least one claim for a particular procedure, the median number of electrocardiograms was 1 (interquartile range or IQR 1–2); radiographs, 2 (IQR 1–3); urine microalbumin 2 (IQR 1–3), HbA1c 3 (IQR 2–4); and Pap smears 1 (IQR 1-1). Current Procedural Terminology codes used to define each procedure are in the Appendix Table.

Independent variables

The primary independent variable was a set of dichotomous indicators for whether the physician perceived reimbursement for each procedure. The clinician survey enquired, "Which of these services do you get paid to perform and/or interpret on a fee-for-service basis?" Thus, the question assessed perception of reimbursement from several potential sources. The list of procedures included electrocardiograms, radiographs, urine microalbumin, HbA1c, and Pap smears. Other independent variables included physician gender, race/ethnicity, specialty, and years of practice; and patient age, gender, education, income, current smoking, body mass index (BMI), presence of other insurance, diabetes

treatment (diet-controlled, oral agents only, oral agents and insulin, or insulin alone), and the Charlson comorbidity index.[15]

Statistical Analysis

Cross-sectional associations between perception of reimbursement for each procedure and patient claims for each procedure were tested in unadjusted and adjusted models. Because we defined our outcome as the presence or absence of a procedure code, we had no missing data for our dependent variable. Distributions for variables were examined and missing values for covariates were imputed using IVEware Version 2.0.[16] IVEware uses sequential regression where each covariate was predicted as a function of all other covariates. Five multiply imputed datasets were created.

Hierarchical logistic regression models were used to account for the clustering of patients within physicians and health plans. Health plan effects were modeled as fixed and clinician effects as random. One implication of this approach is that all health plan characteristics that do not vary across patients within the same health plan (e.g. size, profit status, organizational type, referral management, etc.) are subsumed into these fixed effects, and hence, are implicitly controlled in the model. All analyses were performed using SAS 9.1.3 NLMIXED with full maximized likelihood estimation (SAS Institute, Cary, North Carolina).

Results are presented as mean differences in marginal predicted probabilities. These illustrate the average difference between the probability of having a claim for a particular procedure if fee-for-service reimbursement were perceived for that procedure, and the probability of having a claim if fee-for-service reimbursement were not perceived for that procedure, holding all other factors constant at their original values.

We performed several sensitivity analyses. We sought to determine whether percent compensation from salary confounded the association between perception of reimbursement and test ordering. The clinician survey enquired, “As a primary care physician, what percent of your total compensation is based on salary as opposed to productivity or fee-for-service? Fill-in-the blank.” We included percent compensation from salary as a main effect in a sensitivity analysis. This did not change the estimates (results not shown). For a subset of physicians (n=144), surveys were fielded between 9/2003 and 4/2004, but a more specific date was not available. We conducted a sensitivity analysis where these physicians were excluded. The estimates did not change appreciably (results not shown). For another subset of clinicians (n=206), there was gap of ≥1 month between the last available administrative data for their patients and the date the clinician filled out the survey. When we excluded these physicians from the analyses, the estimates were not noticeably affected (results not shown). Finally, we examined whether perceptions of reimbursement were stronger in non-staff model plans; when we performed analyses stratifying by staff vs.non-staff model, the strata did not appear to be different (results not shown).

RESULTS

Physician characteristics are illustrated in Table 1. When asked about reimbursement perceptions for specific procedures, physicians did not always respond to all of the items. For example, 733 physicians responded to the item enquiring after reimbursement perceptions for electrocardiograms, and approximately half of the 733 physicians reported reimbursement perception for electrocardiograms. However, only 659 physicians responded to the item on reimbursement perceptions for radiographs. Therefore, Table 1 lists the denominator for each procedure as well as the percent of physicians reporting reimbursement perception for that procedure.

Table 2 illustrates patient characteristics. On average, each physician who completed a survey had 3 patients also included in the study. The percent of patients who had at least one performance of a specific procedure ranged between 12% for Pap smears and 70% for HbA1c. Therefore, 559 patients had at least 1 electrocardiogram, 873 patients had at least 1 radiograph, 1319 patients had at least one urine microalbumin measurement, 70% had at least HbA1c measurement, and 328 women had at least 1 Pap smear during the study period.

Table 3 shows mean differences in marginal predicted probabilities. These differences illustrate the average difference between the probability of having a claim for a particular procedure if fee-for-service reimbursement were perceived for that procedure, and the probability of having a claim if fee-for-service reimbursement were not perceived for that procedure. In unadjusted comparisons, perception of reimbursement was associated with slightly more frequent performance of electrocardiograms and HbA1c and slightly less frequent performance of radiographs, urine microalbumin, and Pap smears. These patterns did not change with adjustment for other patient and clinician factors. Only the difference for electrocardiograms was statistically significant; perceived reimbursement was associated with a regression-adjusted predicted probability of 23.4% for electrocardiograms, whereas lack of reimbursement was associated with a predicted probability of 18.7%. The significant difference of 4.7 percentage points represents a 25% increase when compared with 18.7%.

Use of percent compensation from salary as a main effect in a sensitivity analysis did not change the effect estimates, although the confidence intervals widened so the adjusted mean difference in electrocardiogram performance was no longer statistically significant (4.4%, 95% confidence interval or CI −0.6% to 9.5%). When we excluded the physicians without an exact survey date from the analyses, the point estimates also did not change significantly, although the confidence intervals widened so the mean difference in electrocardiogram performance was no longer statistically significant (4.8%, 95% CI −0.03% to 9.6%).

DISCUSSION

In a large, geographically diverse sample of managed care enrollees with diabetes and their physicians, we found inconsistent associations between physician reimbursement perceptions and procedure performance. Reimbursement perception for electrocardiograms was associated with more frequent test performance, but reimbursement perceptions for other tests were not associated with test performance. We found little change in these patterns after adjustment for physician characteristics and patient covariates. Our findings lend support to previous work from the 1980s suggesting that reimbursement perception is test-specific, and that any associations with test performance are limited to electrocardiograms.[6, 7] Our findings are also accord with previous work suggesting that report of compensation and performance of diabetes care measures such as urine microalbumin and hemoglobin A1c are not tightly linked.[1, 17, 18]

Earlier diabetes health services research examining associations between reimbursement and test performance consists of: 1) the previously cited comparisons of reimbursement perceptions for outpatient tests among fee-for-service and salaried physicians,[6, 7] 2) comparisons of diabetes quality of care in fee-for-service and salaried settings,[1, 17, 18] and 3) structured interventions based on financial incentives.[21–23] After adjustment for potential confounding characteristics of healthcare organizations, actual reimbursement does not appear to be strongly related to diabetes quality of care.[1, 17, 18] Comparisons of fee-for-service and salaried organizations in terms of diabetes measures have also shown that fee-for-service organizations may provide poorer quality of diabetes care, suggesting that fee-for-service reimbursement for these measures may not be sufficient to increase procedure

rates. To date, structured interventions based on financial incentives, or pay-for-performance initiatives, have had minimal to moderate effects.[21–23]

Our study examined physician reimbursement *perceptions*, which may more accurately reflect physician decision-making about test-ordering than actual reimbursement. In their examination of a pay-for-performance initiative, Hillman and colleagues found that little association existed between physician incentives for vaccination and vaccination rates, and little association existed between physician incentives for cancer screening and cancer screening rates. They found that most of the physicians in the program were not aware of the initiatives, and hence the initiatives did not affect their practices.[10, 11] The average incentives to physicians in a particular group may not be the same as incentives faced by any individual physician. In addition, physicians respond to the incentives they perceive to be in effect, even if their perception is incorrect. Thus, physician reimbursement perceptions may more accurately reflect reimbursement effects than actual reimbursement. By asking physicians directly whether they perceived reimbursement, we measured this influence on test-ordering closest to the source.

Our report has several limitations. We enquired after perceptions of reimbursement, but we did not enquire about the perceived amount of reimbursement. Thus, this may have biased our results to the null. We did not measure particular aspects of reimbursement, such as perceived reimbursement for reading radiographs vs. performing radiographs vs. downstream profits from ownership of radiograph facilities, as we were interested in the broad category of reimbursement. However, it is possible that specific subtypes of reimbursement are more closely associated with testing behavior. We did not enquire about each plan's reimbursement policies, and it is possible that physicians tailor their test-ordering practices according to the patient's health plan. As physician groups often contract with a number of plans, we reasoned that it would be difficult for physicians to quantify the proportions of patients enrolled in a health plan and the compensation for particular procedures associated with each plan. If such tailoring occurs, it would also have biased our results towards the null. We enquired after reimbursement perceptions after the observation period, and it is possible that reimbursement schemes changed in the time between our survey and the period during which tests were performed. Finally, we measured all of the procedures ordered for a particular patient, but we only assessed perceptions of reimbursement for the primary care physician. Therefore, it is possible that other physicians than those surveyed ordered procedures, thus biasing our results to the null.

We conclude that in managed care, perceptions of reimbursement for particular outpatient procedures have inconsistent associations with test-ordering among primary care physicians who care for patients with diabetes. Associations may exist for electrocardiograms but not for recommended diabetes care measures such as urine microalbumin or HbA1c, screening measures such as Pap smears, or other diagnostic tests such as radiographs. Further research is needed to determine whether larger incentives combined with greater physician detailing have a greater impact on test-ordering, how such associations vary as reimbursement levels change, and how perception of reimbursement interacts with other influences upon test-ordering behavior, such as appropriateness of tests.

Acknowledgments

Translating Research Into Action for Diabetes (TRIAD) was supported by the Centers for Disease Control and Prevention (CDC) U58/CCU523525-03. This study was jointly funded by Program Announcement number 04005 from the CDC (Division of Diabetes Translation) and the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the CDC and the NIDDK. C.K. was supported by K23DK071552 from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). This research utilized the Biostatistics and Measurement

Cores of the Michigan Diabetes Research and Training Program funded by NIH 5P60 DK20572 from the NIDDK. Dr. Mangione was partially supported by the UCLA Center for Health Improvement in Minority Elders/Resource Centers for Minority Aging Research, NIH/NIA, under Grant AG-02-004. Significant contributions to this study were made by members of the Translating Research Into Action for Diabetes (TRIAD) Study Group. The authors acknowledge the participation of our health plan partners.

REFERENCES

1. Ettner S, Thompson T, Stevens M, et al. Are physician reimbursement strategies associated with processes of care and patient satisfaction for patients with diabetes in managed care? Health Serv Res. 2006; 41:1221–1241. [PubMed: 16899004]
2. Shortell S, Schmittdiel J, Wang M, et al. An empirical assessment of high-performing medical groups: results from a national study. Med Care Res Rev. 2005; 62:407–434. [PubMed: 16049132]
3. Casalino L, Gilies R, Shortell S, et al. External incentives, informational technology, and organized processes to improve health care quality for patients with chronic diseases. JAMA. 2003; 289:434–441. [PubMed: 12533122]
4. van der Weijden T, van Velsen M, Dinant G, van Hasselt C, Grol R. Unexplained complaints in general practice: prevalence, patients' expectations, and professionals' test-ordering behavior. Med Decis Making. 2003; 23:226–231. [PubMed: 12809320]
5. Robinson J. Theory and practice in the design of physician payment incentives. Milbank Q. 2001; 79:149–177. [PubMed: 11439463]
6. Epstein A, Begg C, McNeil B. The use of ambulatory testing in prepaid and fee-for-service group practices. Relation to perceived profitability. N Engl J Med. 1986; 314:1089–1094. [PubMed: 3960081]
7. Epstein A, Krock S, McNeil B. Office laboratory tests. Perceptions of profitability. Med Care. 1984; 22:160–166. [PubMed: 6700276]
8. Greenfield S, Rogers W, Mangotich M, Carney M, Tarlov A. Outcomes of patients with hypertension and non-insulin dependent diabetes mellitus treated by different systems and specialties. Results from the medical outcome study. JAMA. 1995; 274:1436–1444. [PubMed: 7474189]
9. Rosenthal M, Landon B, Normand S, RG F, Epstein A. Pay for performance in commercial HMOs. N Engl J Med. 2006:1895–1902. [PubMed: 17079763]
10. Hillman A, Ripley K, Goldfarb N, Nuamah I, Weiner J, Lusk E. Physician financial incentives and feedback: failure to increase cancer screening in Medicaid managed care. Am J Public Health. 1998; 88:1699–1701. [PubMed: 9807540]
11. Hillman A, Ripley K, Goldfarb N, Weiner J, Nuamah I, Lusk E. The use of physician financial incentives and feedback to improve pediatric preventive care in Medicaid managed care. Pediatrics. 1999; 104:931–935. [PubMed: 10506237]
12. Exhibit 2.3: Health Plan Enrollment for Covered Workers, by Plan Type, 1988–2005, Kaiser/HRET Survey of Employer-sponsored Health Benefits, 1999–2005. 2007 http://www.kff.org/insurance/735/sections/ehbs05-5-1.cfm.
13. TRIAD Study Group. The Translating Research Into Action for Diabetes (TRIAD) study: a multicenter study of diabetes in managed care. Diabetes Care. 2002; 25:386–389. [PubMed: 11815515]
14. Brown A, Gregg E, Stevens M, et al. Race, ethnicity, socioeconomic position, and quality of care for adults with diabetes enrolled in managed care: the Translating Research Into Action for Diabetes (TRIAD) study. Diabetes Care. 2005; 28:2864–2870. [PubMed: 16306546]
15. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chron Dis. 1987; 40:373–383. [PubMed: 3558716]
16. Raghunathan T, Solenberger P, Van Hoewyk J. IVEware: imputation and variance estimation software user guide. Survey Methodology Program, Survey Research Center, Institute for Social Research.

17. Keating N, Landrum M, Landon B, et al. The influence of physicians' practice management strategies and financial arrangements on quality of care among patients with diabetes. Med Care. 2004; 42:829–839. [PubMed: 15319608]

18. Kim C, Steers W, Herman W, Mangione C, Narayan K, Ettner S. Physician compensation from salary and quality of diabetes care. J Gen Intern Med. 2007; 22:448–452. [PubMed: 17372791]

19. Rosenthal M, Frank R. What is the empirical basis for paying for quality in health care? Med Care Res Rev. 2006; 63:135–157. [PubMed: 16595409]

20. Rosenthal M, Frank R, Li Z, Epstein A. Early experience with pay-for-performance: from concept to practice. JAMA. 2005; 294:1788–1793. [PubMed: 16219882]

21. Mehrotra A, Pearson S, Coltin K, et al. The response of physician groups to P4P incentives. Am J Manag Care. 2007; 13:249–255. [PubMed: 17488190]

22. Young G, Meterko M, Beckman H, et al. Effects of paying physicians based on their relative performance for quality. J Gen Intern Med. 2007; 22:872–876. [PubMed: 17443360]

23. Levin-Scherz J, DeVita N, Timbie J. Impact of pay-for-performance contracts and network registry on diabetes and asthma HEDIS measures in an integrated delivery network. Med Care Res Rev. 2006; 63:14S–28S. [PubMed: 16688922]

24. Mangione C, Gerzoff R, Williamson D, et al. Influence of diabetes disease management on quality of care: the TRIAD study. Ann Intern Med. 2006; 145:107–116. [PubMed: 16847293]

25. Lindenauer P, Remus D, Roman S, et al. Public reporting and pay for performance in hospital quality improvement. N Engl J Med. 2007; 356:486–496. [PubMed: 17259444]

Take Away Points

In managed care, perceptions of reimbursement for particular outpatient procedures have inconsistent associations with test-ordering among primary care physicians who care for patients with diabetes. Associations may exist for electrocardiograms but not for recommended diabetes care measures such as urine microalbumin or HbA1c, screening measures such as Pap smears, or other diagnostic tests such as radiographs. In order to improve performance of certain measures, additional interventions may be necessary, including greater physician detailing, levels of reimbursement, and discussion of appropriateness.

Table 1

Clinician characteristics. Percents or means (standard deviations) shown.

	n=766
Age (years)	47± 9
Years of practice (years)	17 ± 10
Women (%)	31%
Race/ethnicity (%)	
Non-Hispanic White	55%
African-American	2%
Hispanic	4%
Asian/Pacific Islander	35%
Other	4%
Specialty (%)	
Family/General Practice	34%
General Internal Medicine	54%
Endocrinology	2%
Other	8%
Percent who perceived reimbursement for a specific procedure (%) *	
Electrocardiograms (n=733 physician respondents)	47%
Radiographs or x-rays (n=659 physician respondents)	14%
Urine microalbumin (n=672 physician respondents)	21%
Hemoglobin A1c (n=672 physician respondents)	22%
Pap smears (n=692 physician respondents)	32%

* Percents are calculated with the denominator as the number of physician respondents. For example, 47% of 733 physicians perceived reimbursement for electrocardiograms.

Table 2

Patient characteristics. Percents or means (standard deviations) shown.

	n=2758
Age (years)	61 ± 12
Women (%)	54%
Race/ethnicity (%)	
Non-Hispanic White	37%
African-American	10%
Hispanic	19%
Asian/PI	22%
Other	12%
Education (%)	
< High school education or some high school	24%
High school graduate	29%
Some college	28%
4 years of college or more	19%
Annual household income (%)	
< $15,000	29%
$15,000 – $40,000	31%
$40,000 – $75,000	25%
> $75,000	15%
Duration of diabetes (years)	12 ± 11
Treatment of diabetes (%)	
Diet only	8%
Oral medications	63%
Insulin only	16%
Insulin + oral medications	12%
Body mass index (kg/m^2)	31 ± 7
Current cigarette smoking (%)	16%
Presence of other insurance (%)	31%
Charlson comorbidity score	2.2 ± 1.5
Percent of patients who received at least one procedure (%)	
Electrocardiograms	20%
Radiographs or x-rays	32%
Urine microalbumin	48%
HbA1c	70%
Pap smears	12%

Table 3

Regression-adjusted differences in the predicted probability that the patient received the procedure.

	Unadjusted Difference	Adjusted Difference†
Outcome measures		
Electrocardiograms	*5.6% (1.0%, 10.4%)*	*4.7% (0.01%, 9.3%)*
Radiographs or x-rays	−2.4% (−8.0%, 3.5%)	−1.3% (−7.1%, 4.7%)
Urine microalbumin	−0.76% (−6.9%, 5.2%)	−0.43% (−6.5%, 5.5%)
HbA1c	1.5% (−4.2%, 6.5%)	1.4% (−3.3%, 6.0%)
Pap smears	−0.81% (−6.4%, 5.1%)	−0.47% (−6.4%, 5.8%)

*Values > 0 indicate that perception of reimbursement is associated with a higher predicted probability that the procedure was performed. Statistically significant differences are in italics.

†Adjusted for clustering within health plan, and patient and physician characteristics