Are Low-Income Elderly Patients at Risk for Poor Diabetes Care?

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OBJECTIVE — Diabetes is common among low-income elderly, dual-eligible (DE) Medicare/Medicaid patients resulting in significant morbidity, mortality, and cost. However, the quality of diabetes care delivered to these patients has not been evaluated. The aims of this study were to describe the quality of diabetes care provided to DE patients and compare it with non-DE patients.

RESEARCH DESIGN AND METHODS — This was a cross-sectional analysis of administrative claims from 1 January 1997 through 31 December 1998. A total of 9,453 patients aged 65–75 years with diabetes participated in the study. These were Colorado Medicare fee-for-service (FFS) outpatients. The main outcome measures consisted of a proportion of patients receiving an annual hemoglobin A1c test, biennial eye examination, biennial lipid test, and all three of these care processes.

RESULTS — The mean patient age was 71 ± 2.8 years. Over 22% of patients were identified as dual eligible, and they were significantly more likely to be younger, female, and of minority race/ethnicity; reside in a rural location; and have comorbid conditions compared with the non-DE population. DE patients had more visits to primary care physicians, emergency departments, and hospitalizations but were less likely to visit endocrinologists. DE patients were significantly less likely to receive an annual A1c test (73 vs. 81%; $P < 0.0001$), biennial ophthalmologic examination (63 vs. 75%; $P < 0.0001$), and biennial lipid testing (43 vs. 57%; $P < 0.0001$). The adjusted odds ratio of urban DE patients receiving all three care measures was 0.60 (95% CI 0.52–0.69) compared with urban non-DE patients. Minority race/ethnicity and emergency department use were significantly associated with not receiving diabetes care, whereas endocrinology visits were associated with an increased odds of receiving diabetes care.

CONCLUSIONS — DE Medicare/Medicaid status was independently associated with not receiving diabetes care, especially among those in urban areas.

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Diabetes affects nearly 6% of the U.S. population and >20% of people older than 65 years (1). Several randomized controlled trials have shown that intensive glycemic control decreases microvascular complications among patients with diabetes (2,3). In addition, lipid management, blood pressure control, and eye and foot care prevent or retard progression of diabetes complications (4–10). As a result, care quality has been monitored using published evidence-based standards of care (11). However, many patients, including those with Medicare coverage and especially those of minority race/ethnicity and low income, fail to receive care according to recommended standards (1,12–15).

Medicare patients who are dual eligible (DE) for Medicaid based on low income and medical need are recognized as a population at risk for not receiving preventive care. Over 6.6 million Medicare patients (17% of the Medicare population) in 1998 were DE (16). It is estimated that one-half of the Medicare patients eligible for Medicaid are actually not enrolled (17).

Diabetes is more common among DE patients compared with non-DE patients (22 vs. 15%) (16). DE patients are more likely to report barriers such as care access, cost, poor health status, and disability (18). Furthermore, overall health care expenditures for DE patients are twice that of non-DE Medicare patients (19,20). Yet, to our knowledge, no studies have been published detailing the quality of diabetes care provided to the DE population.

The aims of this study were: *1*) to evaluate the diabetes care quality provided to DE patients; *2*) to determine which sociodemographic characteristics, comorbidities, and health use patterns are associated with receiving appropriate diabetes care; and *3*) to determine if the factors associated with receiving diabetes care differ by DE status. The results of this study are intended to allow for the development of quality improvement interventions aimed at reducing diabetes care disparities.

RESEARCH DESIGN AND METHODS

Study design and population

This study used Medicare claims data from Colorado during a 2-year period from January 1997 through December 1998. Both Medicare part A (institutional claims including those of hospitals and skilled nursing facilities) and part B (physician, laboratory, and other outpatient

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Abbreviations: ALOS, average length of stay; CADG, collapsed ambulatory diagnosis group; DE, dual eligible; FFS, fee-for-service.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

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services) claims were obtained for the entire study population.

The study population consisted of Colorado Medicare fee-for-service (FFS) patients not enrolled in managed care Medicare plans, aged 65–75 years, with the diagnosis of diabetes from 1 January 1998 through 31 December 1998. Diabetes diagnosis was determined by having a single hospitalization with one of the ICD-9 codes of 250.XX, 357.2, 362.01, 362.02, or 366.41 or two outpatient visits at least 7 days apart with the same ICD-9 codes as above. Subjects meeting at least one of the following criteria were excluded to ensure maximum likelihood of capturing diabetes care claims: *1*) greater than 1 month break in part B coverage from 1 January 1997 until 31 December 1998; *2*) death before 31 December 1998; and *3*) residency outside of the state of Colorado from 1 January 1998 through 31 December 1998. Patients were considered DE if they had at least 1 month of Medicaid buy-in by the State of Colorado from 1 January 1997 until 31 December 1998. Of the 9,653 patients who met the study criteria, 200 (2%) were excluded due to missing sociodemographic information, leaving 9,453 patients available for analysis.

Sociodemographic and comorbidity characteristics

Study subjects' age and sex were determined using Medicare demographic data. It has previously been shown that patient race and ethnicity demographic data are often unreliable to determine Latino ethnicity; therefore, a Latino surname algorithm was used to identify patients of Latino ethnicity based on the Passel-Word Spanish Surname List used by the 1990 census (21). Otherwise, patient race and/or ethnicity (categorized as white [non-Latino], African-American, and other/unknown) were determined using the race/ethnicity information present in the Medicare demographic data.

To determine rural or urban residence, the patient's zip code was linked to the Rural Urban Commuting Area Codes that are based on 1990 U.S. Census commuting data and urban area and urban place definitions. A Rural Urban Commuting Area Code ≥7 was considered rural (22).

The burden of comorbid disease conditions was determined for each patient using the Johns Hopkins Adjusted Clinical Groups risk-adjustment method (23). The Adjusted Clinical Groups system uses ICD-9 diagnosis codes for all inpatient and outpatient encounters and has 12 collapsed ambulatory diagnosis groups (CADGs) based on the likelihood of persistence or recurrence of the diagnosis, severity of the condition, and types of health care services required for management for each individual patient. Three CADGs were excluded, including pregnancy (due to age of study population), eye/dental, and prevention/administration (as these may be an indirect measure of the outcome).

Health service use

Outpatient primary care (general practice, family practice, internal medicine, and geriatric) and endocrinology physician visits were determined using Medicare part B claims. Emergency department visits were determined using Medicare part A and B claims. Number of hospitalizations and average length of stay (ALOS) were determined using Medicare part A claims. Each patient had his/her ALOS calculated for all of his/her hospitalizations.

Diabetes care measures

Three indicators of diabetes care were measured: *1*) annual A1c; *2*) biennial ophthalmologic examination; and *3*) biennial lipid measurement. These diabetes process-of-care measures are consistent with those of the Diabetes Quality Improvement Project (24).

As the subject population was identified based on evidence of a diagnosis of diabetes during 1998 and two of the outcome variables (biennial eye and lipid evaluations) were determined to have occurred if claims were present during 1997 and 1998, it was possible that individuals newly identified during the study period did not have the entire 2-year measurement period to receive the recommended diabetes care. To control for the potential effect of this study subject selection criteria, we included a variable to account for the time when a subject first met inclusion criteria in each study model.

Statistical analysis

The proportion of patients receiving the individual diabetes care measures with the variable of interest, DE status, were compared using the χ^2, *t* test, and Wilcoxon two-sample test as appropriate. Logistic regression analysis was used to determine if DE status was independently associated with the likelihood of receiving diabetes care. A separate model was created with each of the three diabetes care indicators (annual A1c, biennial ophthalmologic examination, and biennial lipid measurement) as the outcome variable and DE status as the independent variable. Models were adjusted for potential confounding variables (age, sex, race/ethnicity, rural/urban residence, comorbidity, number of primary care visits, endocrinology visits, and emergency department visits). Interaction terms (including patient sociodemographic, comorbidity, and health care use) with DE status were examined.

Goodness of fit of the models was evaluated by the Akaike's Information Criterion, −2 log likelihood, and the Hosmer-Lemeshow statistic (25). All analyses were performed using the SAS software version 8.02.

RESULTS

Patient characteristics

Sociodemographic, comorbidity, and health use characteristics are presented by DE status in Tables 1 and 2. The mean patient age was 71 ± 2.8 years. Of the 9,453 Medicare patients in the study, 2,096 (22%) were DE. DE patients were significantly more likely to be of younger age, female, minority race/ethnicity, and reside in a rural location compared with the non-DE population. Using the CADG risk adjustment, DE patients were more likely to have "psychosocial diagnoses" compared with non-DE (42 vs. 23%; $P < 0.0001$). DE patients were also more likely to have "acute minor and major," "likely to recur," "asthma," "chronic unstable medical," and "eye/dental" diagnoses compared with non-DE patients.

DE patients were significantly more likely to visit primary care physicians and access emergency department care compared with non-DE patients. DE patients were also more likely to be hospitalized and had longer mean ALOS days ($P < 0.0001$) than their non-DE counterparts. DE patients had significantly less visits to endocrinologists ($P < 0.0001$) during the study period.

Quality of diabetes care

Overall, 79% of the 9,453 Medicare patients had received an annual A1c test, 72% had received a biennial ophthalmologic examination, and 54% had received a biennial lipid test. Only 37% of patients,

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Table 1—*Sociodemographic and comorbidity characteristics of Medicare FFS patients with diabetes by DE Medicaid status, Colorado 1997–1998*

Characteristic	DE	Non-DE	*P*
n	2,096	7,357	
Age (years)			
65–69	834 (39.8)	2,502 (34.0)	<0.0001
70–75	1,262 (60.2)	4,855 (66.0)	
Sex			
Male	555 (26.5)	3,778 (51.4)	<0.0001
Female	1,541 (73.5)	3,579 (48.6)	
Race/ethnicity			
White (non-Latino)	1,002 (47.8)	6,235 (84.8)	<0.0001
African American	148 (7.1)	226 (3.1)	
Latino	821 (39.2)	757 (10.3)	
Other/unknown	125 (6.0)	139 (1.9)	
Geographic residence			
Urban	1,496 (71.4)	5,574 (75.8)	<0.0001
Rural	600 (28.6)	1,783 (24.2)	
Comorbidity			
Acute minor	1,951 (93.1)	6,579 (89.4)	<0.0001
Acute major	2,018 (96.3)	6,959 (94.6)	<0.0018
Likely to recur	1,867 (89.1)	6,288 (85.5)	<0.0001
Asthma	244 (11.6)	712 (9.7)	0.0085
Chronic medical: unstable	1,940 (92.6)	6,656 (90.5)	0.0033
Chronic medical: stable	2,093 (99.9)	7,345 (99.8)	0.8393
Chronic specialty: stable	480 (21.5)	1,752 (23.8)	0.3851
Chronic specialty: unstable	1,025 (48.9)	3,642 (49.5)	0.6272
Psychosocial	884 (42.2)	1,683 (22.9)	<0.0001

Data are *n* (%).

regardless of DE status, had evidence of receiving all three care indicators, whereas 6% did not receive any of the care indicators.

The proportion of Medicare patients receiving diabetes care by DE status is presented in Fig. 1. DE patients were significantly less likely to receive an annual A1c test, biennial ophthalmologic examinations, and biennial lipid testing and all three care indicators compared with non-DE patients (27 vs. 41% respectively; $P < 0.0001$).

Multivariate logistic regression analysis revealed that the odds ratios of DE patients receiving diabetes care was significantly lower compared with non-DE patients but differed by their geographic residence (Table 3). This significant interaction was present among each of the care measures except for biennial lipid testing.

DE patients residing in urban and rural locations received less frequent lipid testing and eye examinations than their non-DE counterparts. Urban DE patients were also significantly less likely to receive an annual A1c test and all three care measures. These differences were present after controlling for confounders.

In addition to DE status, African-American race/ethnicity was also associated with not receiving an annual A1c test, biennial lipid testing, and all three care measures together compared with white (non-Latino) patients. Latino patients were significantly less likely to receive biennial eye examinations, lipid examinations, and all three care measures.

Increased emergency department use was significantly associated with not receiving each of the three care indicators, whereas patients who visited an endocrinologist were 2.42 (95% CI 2.06–2.85) more likely to received all three indicators than those who did not visit endocrinologists. No other significant interactions between DE status and other variables were identified after controlling for number of outpatient visits, comorbidity, and time of first diabetes related claim.

CONCLUSIONS — In this study, we confirmed that DE Medicare patients were less likely to receive routine diabetes care. Our findings of disparate diabetes preventive care among low-income DE Medicare/Medicaid patients are similar to those described by Srinivasan et al. (15) for Medicaid patients <65 years old. Such lack of care is worrisome given that 22% of the Medicare patients in Colorado were DE for Medicaid.

These diabetes care disparities among DE patients persisted despite increased health care use. Prior studies have attributed such differences to increased health care demands and more comprehensive health insurance coverage among DE patients compared with non-DE patients (26). The association between increased emergency department use and not receiving diabetes care may be due to increased fragmentation of health care resources. Other studies have shown that DE patients were less likely to identify a physician's office as a usual source of care and more likely to identify emergency departments, which are not designed to provide chronic illness care (26). Frequent emergency department use among those with diabetes may serve as useful identifier of a population at risk of not receiving preventive care.

We found that DE patients were more likely to have comorbid conditions, although it is unclear if such increased

Table 2—*Health care use characteristics of Medicare FFS patients with diabetes by DE Medicaid status, Colorado 1997–1998*

Characteristic	DE	Non-DE	*P*
n	2,096	7,357	
Primary care physician visits	11.4 ± 10.6	10.2 ± 8.2	0.0032
Endocrinologist visits	0.2 ± 1.1	0.6 ± 2.4	<0.0001
Emergency department visits	1.7 ± 2.5	0.8 ± 1.6	<0.0001
Hospitalizations	1.3 ± 2.1	0.8 ± 1.5	<0.0001
ALOS (days)	5.4 ± 5.5	4.9 ± 3.9	<0.0001

Data are means ± SD.

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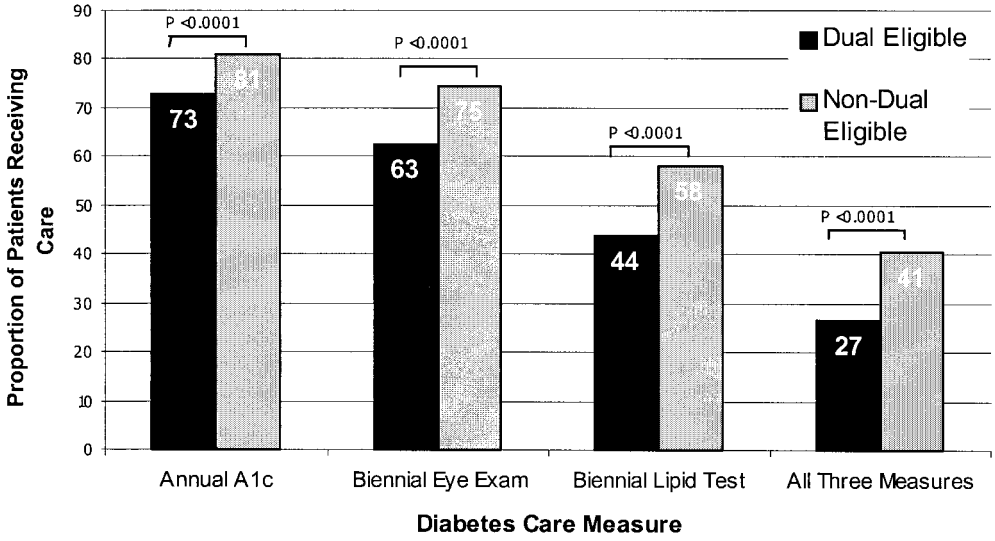

Figure 1—*Diabetes care of Medicare FFS patients by DE Medicaid status in Colorado, 1997–1998.*

comorbidity is in part responsible for their Medicaid status. Psychosocial diagnoses such as depression were especially common among DE patients compared with non-DE patients and were significantly associated with not receiving diabetes care. Previous studies have demonstrated an association between depression and poor glycemic control; therefore, special attention should be given to DE patients who are more likely to a have psychosocial diagnosis to ensure they receive the recommended diabetes care (27).

Despite increased comorbidity and health care use, DE patients were significantly less likely to visit endocrinologists. Decreased access to subspecialty care is also troubling given that endocrinology visits increased the likelihood of receiving appropriate care. It is unclear if such access is due to differences in referral patterns or other access issues such as transportation. The identification of barriers to specialty care among DE patients deserves further attention.

Our findings of disparate diabetes care among African-American Medicare patients are consistent with those reported by Chin et al. (14) in 1993, and more recently, by Schneider et al. (28) among Medicare-managed care plans. Such persistent disparities in diabetes care indicate the need for further interventions to narrow these care gaps.

The extent to which the patient's socioeconomic status contributes to our findings is not clear but is likely to be substantial. DE patients are by definition of low socioeconomic status. A recent study of the effects of such factors on physician care profiles by Franks and Fiscella (29) detailed potential explanations for the association between low socioeconomic status and health care quality including patient factors such as financial means and literacy, which influence adherence to health care recommendations, along with physician factors such as unconscious bias. Because socioeconomic

Table 3—*Association adjusted odds ratios of receiving diabetes care of Medicare FFS patients, Colorado 1997–1998*

Characteristic	Annual HbA_{1c} test	Biennial eye examination	Biennial lipid examination	All three care measures
DE*				
Rural	1.01 (0.81–1.28)	0.79 (0.64–0.97)	0.81 (0.67–0.98)	0.85 (0.69–1.01)
Urban	0.67 (0.58–0.78)	0.58 (0.50–0.66)	0.66 (0.58–0.75)	0.60 (0.52–0.69)
Age†				
70–75 years	1.01 (0.91–1.12)	1.11 (0.98–1.26)	0.87 (0.80–0.95)	0.94 (0.85–1.03)
Sex				
Women	1.05 (0.94–1.17)	1.16 (1.02–1.32)	0.93 (0.86–1.02)	0.99 (0.90–1.09)
Race/ethnicity‡				
African American	0.58 (0.45–0.73)	0.88 (0.65–1.19)	0.68 (0.55–0.85)	0.70 (0.54–0.90)
Latino	1.02 (0.88–1.17)	0.83 (0.70–0.99)	0.85 (0.75–0.96)	0.84 (0.73–0.96)
Other/unknown	0.61 (0.46–0.81)	0.58 (0.39–0.85)	0.76 (0.59–0.98)	0.69 (0.51–0.92)
Endocrine consultation				
≥1 visit(s)	3.77 (2.82–5.03)	2.64 (2.04–3.40)	1.91 (1.63–2.25)	2.42 (2.06–2.85)
Emergency department				
>1 visit	0.64 (0.56–0.72)	0.83 (0.71–0.97)	0.83 (0.74–0.92)	0.71 (0.63–0.80)

Data are odds ratio (95% CI). Referent group: *Non-DE; †age 65–69 years; ‡white (non-Latino); odds ratio also adjusted for number of outpatient primary care visits, comorbidity, and time of first diabetes claim.

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status is likely to explain in large part our findings, the above-described barriers related to low socioeconomic status should be the major focus of interventions aiming at closing the gap between the DE and their non-DE counterparts.

Administrative data have inherent limitations and are not collected for research purposes, therefore the quality of our data must be critically reviewed. Although these measures of diabetes care quality are consistent with those of the Diabetes Quality Improvement Project initiative, they admittedly reflect the minimal accepted care standards and were chosen based on available data sources. Diagnosis and evaluation codes may be subject to variation, incompleteness, a lack of specificity, and may not document other important clinical issues in outpatient settings (30). Such codes are primarily intended for reimbursement calculation and are subject to "up coding," a systematic increase intended to improve reimbursement (31). The differentiation of disease complications from preexisting comorbidities using diagnostic codes is problematic (32). This study is also limited in that it is based on process-of-care data rather than clinical outcomes. Process-of-care research allows one to study what is done for the patient, although the relationship between process and outcomes is not always clear (30). The cross-sectional design used in this study also makes the sequence of events unclear.

We only included patients who survived the entire study periods, thus selection bias is likely present as the DE group has a 50% higher age-specific mortality rate than non-DE Medicare beneficiaries. The excess mortality among the DE group most likely explains the higher use rates found for the dually entitled (33). This difference in age-specific mortality would likely further increase the care differences between the groups.

Our study did not investigate the potential influence of nursing home residence status on the likelihood of receiving diabetes care. Approximately 25% of DE patients in the U.S. reside in nursing homes (16). Institutionalization may influence provider attitudes toward the delivery of diabetes care. Few studies are currently available that detail the care of diabetes patients in U.S. nursing homes. One study demonstrated that diabetes care protocols in nursing homes were more likely to detail nutritional and nursing care standards than to guide medical care and monitoring for complications (34). The development of guidelines of the care of nursing home patients with diabetes deserves attention, especially given the growth of the elderly population and the increased prevalence of diabetes among these individuals.

As this study was limited to Colorado, our findings may not be generalizable. Also, this study did not address care provided to DE patients enrolled in Medicare+Choice–managed care plans. Health Plan Employer Data and Information Set (HEDIS) 2000 nationwide data indicate that the mean proportion across Medicaid-managed care plans of diabetes patients receiving A1c testing annually is 66%, and the median across plans was 70% (35). These rates were quite similar to our findings in the FFS population. Of note, HEDIS data indicated that 41% received annual eye examinations and 52% were LDL screened among all Medicaid-managed care enrollees. Because we defined our rates biennially, a comparison with HEDIS rates for these two measures was not possible. Furthermore, this study classified those as DE as having at least 1 month buy-in to the Colorado Medicaid program; however, multiple levels of Medicaid coverage exist.

In conclusion, despite increased evidence detailing the effectiveness of diabetes preventive care, many Medicare patients remain at risk of not receiving such care. Previously identified at-risk populations such as racial/ethnic minorities continue to fail to receive such care. Furthermore, Medicare patients with Medicaid coverage are significantly less likely to receive diabetes care. Given the disproportionate amount of health care service use and expenditures attributable to the DE population compared with non-DE patients, specific targeted quality improvement interventions are warranted to address these care disparities.

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References

1. Centers for Disease Control and Prevention: *Diabetes Surveillance*. Atlanta, GA, U.S. Department of Health and Human Services, 1997
2. The Diabetes Control and Complications Trial Research Group: The effect of intensive insulin treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 329:977–986, 1983
3. UKPDS Group: Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). *Lancet* 352: 837–851, 1998
4. Pyorala K, Pedersen TR, Kjekshus J, Faegeman O, Olsson AG, Thorgeirsson G: The Scandanavian Simvastatin Survival Study (4S). *Diabetes Care* 20:614–620, 1997
5. Lewis EJ, Hunsicker LG, Bain RP, Rohde RD: The effect of angiotensin-converting enzyme inhibition on diabetic nephropathy: The Collaborative Study Group. *N Engl J Med* 329:1456–62, 1993
6. The Diabetic Retinopathy Study Research Group: Photocoagulation treatment of proliferative diabetic retinopathy: the second part of Diabetic Retinopathy Study findings. *Ophthalmology* 85:82–106, 1978
7. Caputo GM, Cavanagh PR, Ulbrecht JS, Gibbons GW, Karchmer AW: Assessment and management of foot disease in patients with diabetes. *N Engl J Med* 331: 854–860, 1994
8. CDC Diabetes Cost-Effectiveness Group: Cost-effectiveness of intensive glycemic control, intensified hypertension control, and serum cholesterol level reduction for type 2 diabetes. *JAMA* 287:2542–2551, 2002
9. Rodby RA, Firth LM, Lewis EJ: An economic analysis of captopril in the treatment of diabetic nephropathy. *Diabetes Care* 12:1051–1061, 1996
10. Grover SA, Coupal L, Zowall H, Alexander CM, Weiss TW, Gomes DR: How cost effective is the treatment of dyslipidemia in patients with diabetes but without cardiovascular disease? *Diabetes Care* 24:45–50, 2001
11. American Diabetes Association: Clinical practice recommendations. *Diabetes Care* 22 (Suppl. 1):S1–S114, 1999

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12. Weiner JP, Parente ST, Garnick DQ, Fowles J, Lawthers AG, Palmer RH: Variation in office-based quality: a claims-based profile of care provided to Medicare patients with diabetes. *JAMA* 273:1503–1508, 1995
13. Jencks SF, Cuerdon T, Burwen DR, Fleming B, Houck PM, Kussmaul AE, Nilasena DS, Ordin DL, Arday DR: Quality of medical care delivered to Medicare beneficiaries: a profile at state and national levels. *JAMA* 284:1670–1676, 2000
14. Chin MH, Zhang JX, Merrell K: Diabetes in the African-American Medicare population: morbidity, quality of care and resource utilization. *Diabetes Care* 21:1090–1095, 1998
15. Srinivasan M, Przbylski M, Swigonski N: The Oregon Health Plan: predictors of office-based diabetic quality of care. *Diabetes Care* 24:262–267, 2001
16. Health Care Financing Administration 1998 Medicare Beneficiary Survey [article online], 1999. Available from http://www.cms.hhs.gov/mcbs/CMSsrc/1998/Summary8.pdf. Accessed 2 December 2002
17. Barents Group: A profile of QMB-eligible and SLMB-eligible Medicare beneficiaries [article online]. Available from http://www.resdac.umn.edu/doc2go/dualelig.pdf. Accessed 2 December 2002
18. Schoen C, Neuman P, Kitchman M, Davis K, Rowland D: Medicare beneficiaries: a population at risk: findings from the Kaiser/Commonwealth Fund 1997 Survey of Medicare Beneficiaries [article online], 1998. Available from www.cmwf.org/programs/medutur/medicare_survey97_308.asp.
19. Kaiser Family Foundation: Medicare and low income beneficiaries: fact sheet #1481e [article online], 1999. Available from http://www.kff.org/content/1999/1481/lowincome.pdf. Accessed 2 December 2002
20. O'Brien E, Rowland D, Keenan P: Medicare and Medicaid for the elderly and disabled poor [article online], 1999. Available from http://www.kff.org/content/archive/2132/poor.pdf. Accessed 2 December 2002
21. Perkins R: Evaluating the Passel-Word Spanish surname list: 1990 Decennial Census Post Enumeration Survey Results [article online], 1993. Available from http://www.census.gov/population/www/documentation/twps0004.html. Accessed 2 December 2002
22. Morrill R, Cromartie J, Hart G: Metropolitan, urban, and rural commuting areas: toward a better depiction of the United States settlement system. *Urban Geogr* 20:727–748, 1999
23. Weiner JP, Starfield BH, Steinwachs DM, Mumford LM: Development and application of a population-oriented measure of ambulatory care case-mix. *Med Care* 29:452–472, 1991
24. Fleming BB, Greenfield S, Engelgau MM, Pogach LM, Clauser SB, Parrott MA: The Diabetes Quality Improvement Project: moving science into health policy to gain an edge on the diabetes epidemic. *Diabetes Care* 24:1815–1820, 2001
25. Hosmer DW, Lemeshow S: *Applied Logistic Regression*. New York, Jones, Wiley and Sons, 1989
26. Health and Health Care of the Medicare Population: Data from the 1995 Medicare Current Beneficiary Survey [article online]. Available from http://www.cms.hhs.gov/MCBS/PubHHC95.asp. Accessed 12 January 2004
27. Lustman PJ, Anderson RJ, Freedland KE, de Groot M, Carney RM, Clouse RE: Depression and poor glycemic control: a meta-analysis review of the literature. *Diabetes Care* 23:934–942, 2000
28. Schneider EC, Zaslavsky AM, Epstein AM: Racial disparities in the quality of care for enrollees in Medicare managed care. *JAMA* 87:1288–1294, 2002
29. Franks P, Fiscella K: Effect of patient socioeconomic status on physician profiles for prevention, disease management, and diagnostic testing costs. *Med Care* 40:717–724, 2002
30. Brock J, Sauaia A, Ahnen D, Marine W, Schluter W, Stevens BR, Scinto JD, Karp H, Bratzler D: Process of care and outcomes for elderly patients hospitalized with peptic ulcer disease: results from a quality improvement project. *JAMA* 286:1985–1993, 2001
31. Payno TH, Murphy GR, Salazar AA: How well does ICD-9 represent phrases used in the medical record problem list? *Proc Annu Symp Comput Appl Med Care* 654–657, 1993
32. Iezzoni L: Assessing quality using administrative data. *Ann Intern Med* 127:666–674, 1997
33. McMillan A, Pine PL, Gornick M, Prihoda R: A study of the crossover population: aged persons entitled to both Medicare and Medicaid. *Health Care Financ Rev* 4:19–46, 1983
34. Funnell MM, Herman WH: Diabetes care policies and practices in Michigan nursing homes, 1991. *Diabetes Care* 18:862–866, 1995
35. National Medicaid Results for Selected 2000 HEDIS and HEDIS/CAHPS measures. Available at http://www.ncqa.org/Programs/HEDIS/medicaiddiabetes00.htm. Accessed 8 January 2004

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