Glycemic Control and Absenteeism Among Individuals With Diabetes

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The associations between adverse labor market outcomes and diabetes/diabetes complications are well described (1–8). Clinical guidelines have recommended standards for glycemic, lipid, and blood pressure control (9) that have been shown to prevent or delay the onset and progression of diabetes complications (10–16). It is possible that control of these symptoms can reduce absenteeism in employed patients. Two studies have examined the relationship between glycemic control and labor market outcomes including absenteeism (17,18), and this study adds to that literature by examining the cross-sectional associations between absenteeism from work and glycemic, lipid, and blood pressure control among individuals with diabetes.

RESEARCH DESIGN AND METHODS

— Patients were identified as having diabetes (n = 27,407) from administrative data available within a medical group in southeast Michigan between 1 June 2003 and 31 May 2004. From these patients, we selected those who were tested for A1C during the prior 12 months and aged 30–64 years (n = 11,324). Next, we drew a random sample of 1,000 patients stratified by glycemic control level (A1C <7.0, 7.0–7.99, 8.0–8.99, 9.0–9.99, or ≥10.0%). Several exclusions were made, including subjects who had died (n = 5), absence of a physician from whom to obtain permission for patient contacts (n = 72), patients' inclusion in other research studies (n = 132), physician refusal (n = 46), incorrect diagnosis (n = 5), and language barrier (n = 13). The final sample comprised 727 patients for a telephone survey and had an overall participation rate among eligible subjects of 59% (n = 427). The response rate for eligible subjects who were contacted was 81% (n = 525).

The primary outcome was hours absent from work for any reason during the 4 weeks before the survey and was reported by 218 of 233 employed patients. The explanatory variables of interest were A1C and LDL cholesterol, obtained through the automated laboratory data, and systolic and diastolic blood pressure levels, extracted from the medical records using computerized data collection forms. For patients with more than one test result during the 12 months before the telephone survey, we used the arithmetic mean value of A1C, LDL cholestorol, and systolic and diastolic blood pressure. We controlled for age, sex, race, education, marital status, comorbidities, BMI, years since diagnosis, insulin use, occupation type (white collar, blue collar, and service sector), and usual weekly hours worked.

We estimated a probit model for the probability of having any hours absent from work and a tobit model for hours missed from work using data from employed individuals. The tobit model accounts for 0 values that occur when a significant portion of patients do not report absenteeism (53%). We performed separate analyses for men and women given their differences in workforce participation, job type, and job attachment (19). Respondents with higher A1C values and male subjects were less likely to participate in the survey. Thus, we weighted coefficients from multivariable models by their inverse probabilities of survey participation. We report unweighted results because weighting did not change the results in either magnitude or statistical significance.

RESULTS

— Patients with diabetes in our sample were 53 years old on average, 54% female, and nearly evenly split between white and African-American race/ethnicity (49 and 45%, respectively). The employment rate (55%) among the study participants was comparable with the estimates in previously published studies of patients with diabetes (1,4,7,8). In pairwise comparisons, on average, both men and women with higher A1C levels reported a greater number of hours absent compared with those with lower A1C levels (results not shown), although patients did not differ by glycemic control in terms of employment status or usual weekly hours worked. For example, relative to employed patients with A1C <7%, employed men and women with A1C ≥10% lost an additional 5.4 h ($P < 0.05$) and 4.4 h ($P < 0.01$), respectively, in the past 4 weeks.

Table 1 presents two models. The first is a probit model predicting the probability of being absent from work ≥1 h, and the second predicts the number of hours absent from work. For ease of interpretation, the probit estimates are translated into derivatives of the probability (e.g., marginal effects) of being absent with respect to the independent variables. The marginal effects (unconditional expected values), as measures of total impact of individual risk factors on hours absent including observations with 0 values, are also reported for the tobit model, which takes into account that many employees (53%) did not report absenteeism.

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

Table 1—*Multivariate models for probability of absenteeism and actual hours absent in the past 4 weeks*

	Probability of absenteeism (any hours absent)		Actual hours absent	
	Male (n = 110)	Female (n = 108)	Male (n = 110)	Female (n = 108)
A1C (%)				
7.0–7.99	−0.04 (−0.37 to 0.28)	−0.08 (−0.43 to 0.27)	1.40 (−3.81 to 6.62)	2.86 (−2.38 to 8.11)
8.0–8.99	0.32 (0.04 to 0.61)*	−0.04 (−0.38 to 0.31)	5.96 (−0.24 to 12.16)†	2.04 (−2.52 to 6.61)
9.0–9.99	0.24 (−0.10 to 0.58)	0.27 (−0.09 to 0.64)	3.80 (−3.49 to 11.09)	7.90 (0.96 to 14.84)*
≥10.0	0.35 (0.08 to 0.62)*	0.62 (0.45 to 0.79)‡	4.73 (−1.58 to 11.03)	10.26 (1.92 to 18.60)*
LDL cholesterol ≥100 (mg/dl)	0.26 (0.01 to 0.52)*	0.13 (−0.20 to 0.45)	3.80 (−0.65 to 8.24)†	0.38 (−3.03 to 3.79)
SBP ≥130 or DBP ≥80 (mmHg)	−0.04 (−0.30 to 0.22)	−0.18 (−0.44 to 0.07)	0.59 (−2.81 to 3.99)	−1.85 (−4.62 to 0.92)

Partial derivatives of probability of any absenteeism from a probit model (marginal effects) and partial derivatives of hours absent from a tobit model (marginal effects: unconditional expected values) with respect to independent variables are reported with SEs of marginal effects in parentheses. The derivatives are computed as the difference in probabilities and the difference in hours at the observed censoring rate as the dummy variable takes on the values 0 and 1, with the other variables at the sample means. All models include the following covariates: age, race/ethnicity, education, marital status, Charlson comorbidity score, years since diagnosis, insulin usage, BMI, occupational categories, and usual weekly hours worked. *$P < 0.05$; †$P < 0.10$; ‡$P < 0.01$. DBP, diastolic blood pressure; SBP, systolic blood pressure.

Among men, those with A1C between 8 and 9% and those with A1C ≥10% were more likely to miss work (marginal effect [ME] 32 percentage points, $P < 0.05$ and 35 percentage points, $P < 0.05$, respectively). Men with A1C between 8 and 9% furthermore lost ~6 h on average ($P < 0.05$) compared with men with A1C <7%. Men with LDL cholesterol ≥100 mg/dl were more likely both to miss work (26 percentage points, $P < 0.05$) and to report more hours absent (3.8 h, $P < 0.10$) relative to men with LDL cholesterol <100 mg/dl.

Among women, those with A1C ≥10% were 62 percentage points more likely to report any absenteeism ($P < 0.01$). Women with A1C between 9 and 10% and women with A1C ≥10% lost an additional 7.9 h ($P < 0.01$) and 10.3 h ($P < 0.01$), respectively, compared with those with A1C <7%.

In other multivariable models, usual weekly hours worked and the difference between weekly hours worked and hours absent per week did not vary by level of any risk factor control (results not shown).

CONCLUSIONS

As the prevalence of diabetes increases (20,21), the number of individuals with diabetes among the working population will rise. With projections that as many as one in three people born in 2000 will develop diabetes (22), the implications of diabetes on labor market outcomes are enormous for patients, families, employers, and policy makers.

Our study provides a cross-sectional assessment of the potential impact of diabetes control (glycemic, lipid, and blood pressure control) on absenteeism among those with diabetes. Poor glycemic control, in some cases, was associated with increased absenteeism. Among men, poor lipid control was also associated with absenteeism. Such findings imply that the adverse impact of diabetes on productivity might be partially reduced through improved control of modifiable risk factors.

Four important limitations are noted. First, the cross-sectional assessment of the relationship between diabetes control and absenteeism is not sufficient to estimate causal paths from control of risk factors to work productivity. Multiple measures over time are required for causal interpretations. Second, the study lacked information on medications taken for hyperglycemia, hypertension, and hyperlipidemia. Therefore, we were not able to account for treatment effects of these medications on outcomes. Third, a dose-response relationship between glycemic control categories and absenteeism (e.g., increasing absenteeism with increasing A1C categories) was not observed. Fourth, usual weekly hours worked or the difference between usual weekly hours worked and hours absent per week did not vary by level of any risk factor control; thus, our findings should be cautiously interpreted.

Given that access to health care is usually obtained through employer-provided health insurance plans in the U.S. and given that employers search for ways to control health care costs, documenting potential economic gains in the workplace (e.g., reduced absenteeism) from improved clinical control of diabetes may encourage employers, health plans, and policy makers to further their attempts to improve the quality of care delivered to patients with diabetes. The returns from preventing productivity losses might substantially offset costs of implementing such programs.

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