

A comparison of diabetic complications and health care utilization in diabetic patients with and without comorbid depression

A Canadian cross-sectional study of patients with diabetes found that those patients with comorbid depression experienced more diabetes-related complications.

ABSTRACT

Background: Depression has been found to interfere with patient self-management of diabetes and adherence to a medication regimen. Data on health care utilization indicate that depression is at least as prevalent as diabetes, and that both of these conditions represent substantial costs to the health care system. In this analysis, we used Canadian data from outpatient visits, hospital discharges, extended health care claims, and long-term disability claims to compare the rate of diabetic complications for subjects with diabetes alone and those with diabetes and depression. We then determined whether there is a higher rate of utilization of health care services by diabetic patients with depression.

Methods: In this cross-sectional study, 1427 diabetic patients were identified in a group of acute care hospital workers employed in British Columbia in 1998. Diabetic compli-

cations and depression were identified based on ICD-9 diagnostic codes. Rates of diabetes-related complications and use of health care services were then considered for diabetic patients with and without comorbid depression.

Results: Overall, the rate of utilization of health care services was found to be greater in diabetic patients with comorbid depression than those with diabetes alone. The rates of ischemic heart disease, peripheral vascular disease, and altered consciousness experienced by the group of diabetic individuals with depression were found to be significantly higher than those with diabetes alone.

Conclusions: The interaction between diabetes and depression results in an increased risk of diabetic complications, as well as increased utilization of health care services.

Background

Recent studies have estimated that patients with diabetes are twice as likely as members of the general population to be diagnosed with depression, and that depression in turn interferes with patient self-management of diabetes and adherence to a medication regimen.¹⁻³ Longitudinal data have also suggested that the interaction between diabetes and depression predicts greater mortality, greater incidence of both macrovascular and microvascular complications, as well as accelerated onset of these complications.^{4,6} Lustman and colleagues noted a significant association between depression and hyperglycemia, a well-established pre-

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dictor of diabetic complications in both type 1 and type 2 diabetes.⁷⁻¹⁰ Furthermore, a randomized controlled trial suggested that antidepressant therapy in patients with type 1 and type 2 diabetes improved glycemic control.¹⁰

US data on health care utilization and expenditures indicate that depression is at least as prevalent as diabetes, and that both of these conditions represent substantial costs to the health care system.³ Several studies have attempted to quantify the increase in health care costs in diabetic patients with comorbid depression. Egede and colleagues reported 4.5 times greater annual health care expenditures in diabetic patients with major depression, while Ciechanowski and colleagues reported that diabetic patients with depressive symptoms have between 51% and 86% higher health care costs.^{2,3} Many of these previous studies, however, relied on small samples or self-reported data, and only evaluated total health care costs. As a result, it is difficult to determine whether the increased costs are mainly due to treatment of mental health or due to the comorbid diagnosis of diabetes. Using US data, Finkelstein and colleagues conducted a retrospective analysis of Medicare claims and found increased health care utilization unrelated to mental illness in elderly claimants with both diabetes and major depression, thus indicating that diabetic patients with comorbid depression incurred higher medical costs than claimants with diabetes alone.¹¹

Similar studies comparing Canadian health care expenditures in such patients are currently lacking. Furthermore, there are no studies indicating whether there is a difference between the rates of utilization of specific health care services by diabetic patients with and without depression.

In this analysis, we used Canadian data from a combination of records for

outpatient visits, hospital discharges, extended health care claims, and long-term disability claims to compare the rate of diabetic complications for patients with diabetes and depression and those with diabetes alone. We then compared the use of specific health care services by the two groups in order to determine whether there is a higher rate of utilization of health care services by patients with diabetes and depression.

Methods

This cross-sectional study examined data from health care workers at acute care hospitals in British Columbia employed in 1998. Access to all data was granted through application to the data steward responsible for each data set, and the unique identifiers were removed to protect patient confidentiality. The study protocol was approved by the Clinical Research Ethics Board at the University of British Columbia. The study included data from several sources that were merged to create a person-specific longitudinal database of health care utilization. The data included outpatient physician visits and hospitalization discharges (provided by the British Columbia Linked Health Database) and long-term disability (LTD) and extended health benefits data (provided by a universal health benefits provider to the BC health care workforce). From this group a study cohort of 1427 diabetic patients was identified based on methods described previously.¹² Specifically, we used *ICD-9* diagnostic codes 250 (diabetes mellitus), 357.2 (neuropathy in diabetes), 362.01 (diabetic retinopathy NOS), 362.02 (proliferative diabetic retinopathy), and 366.41 (diabetic cataract) as a primary or secondary diagnosis to identify diabetic patients within the database. Subjects with depression were identified using *ICD-9* diagnostic codes 263.2 or 263.3

(either single or multiple episodes of major depressive disorders). In addition, subjects submitting claims for antidepressant medication or receiving LTD benefits because of depression were assumed to be suffering from depression.

The utilization of health care services was examined by evaluating the following variables: visits to a primary care physician, total physician visits (primary care and specialist), hospitalizations, long-term disability claims, total extended health care claims, medication claims to extended health, diabetes-specific claims to extended health (i.e., all services coded under diabetes mellitus therapy by the health benefits provider), and claims for visits to allied health care workers.

A number of common diabetes-related complications were identified in the database for analysis. These included ischemic heart disease, peripheral vascular disease, diabetic retinopathy, diabetic neuropathy, diabetic nephropathy, and gangrene. These complications were identified based on *ICD-9* codes in the database provided by the MSP and hospitalization data.

Rates of diabetes-related complications and utilization of health care services were then considered for diabetic patients with and without comorbid depression. For continuous variables, *t* test analysis was used, while chi-square and fisher-exact testing were used for analysis of proportions.

Results

Table 1 presents the demographic characteristics of the two patient groups (depressed and not depressed). In total, the study cohort consisted of 1427 patients. Of these patients, 180 were identified as depressed. The two groups were comparable with one exception: there were significantly more females in the group with diabetes and depres-

Table 1. Demographic characteristics of study cohort: Health care workers in British Columbia in 1998.

	n	Age, mean (SD)	% female	Years experience, mean (SD)
Diabetes	1247	49.2 (9.3)	82.3*	13.9 (7.4)
Diabetes and depression	180	50.3 (7.9)	88.9	13.3 (7.1)

* = P<.01

Table 2. Rates of diabetic complications and total number of office visits per complication for subjects with diabetes alone and those with diabetes and depression in 1998.

Complication	Rate of complication (%)		Number of visits per year	
	Diabetes	Diabetes and depression	Diabetes	Diabetes and depression
Altered consciousness*	26.06	33.89*	1.85	1.92
Ischemic heart disease [†]	6.50	13.33 [†]	5.04	4.19
Myocardial infarction	0.72	1.67	3.33	5.0
Peripheral vascular disease [†]	1.20	2.77 [†]	2.4	2.13
Stroke	1.52	0.55	2.0	3.0
Retinopathy	16.76	13.33	1.63	2.04
Neuropathy	4.89	6.10	2.73	1.64
Nephropathy	2.56	2.22	3.25	16.72*
Skin infection	6.01	8.30	2.93	2.14
Gangrene in lower extremity	0.72	1.11	2.0	2.33
Unspecified	1.90	1.10	2.0	3.83
Death	2.57	3.33	—	—

* = P<.01, [†] = P<.001, [‡] = P<.05

Table 3. Rates of utilization of specific health care services and rate of long-term disability for subjects with diabetes alone and those with comorbid depression in 1998.

Service	Diabetes		Diabetes and depression	
	n	Rate (per yr)	n	Rate (per yr)
Total physician services* (primary care and specialist visits)	1209	23.99	177	31.23 [†]
Total extended health care claims	962	17.84	180	29.56 [†]
Drug claims	926	15.84	180	25.88 [†]
Primary care physician visits	1188	9.64	176	13.0 [†]
Diabetes-specific claims	721	9.71	130	9.84
Allied health care	580	7.08	102	8.63
Hospitalizations	278	1.50	45	2.18 [†]
Long-term disability claims	25	0.02	13	0.07 [†]

* may include multiple counts when more than one physician billing for the same clinical visit
[†] = P<.001

sion (88.9%) than in the group with diabetes alone (82.3%).

Table 2 presents the rates of diabetic complications in the two groups, as well as the number of visits per year to a primary care physician or specialist for each complication in those who experienced the complication. The rates of ischemic heart disease, peripheral vascular disease, and altered consciousness experienced by the group of diabetic individuals with depression were found to be significantly higher than those with diabetes alone. However, the number of visits to primary care physicians or specialists per year for these complications remained comparable between the two groups with the exception of nephropathy complications. The rate of all other diabetic complications analyzed remained comparable between the two groups.

Table 3 compares the rates of utilization of specific health care services for the two groups. Overall, the rate of utilization of health care services was found to be greater in diabetic patients with comorbid depression than those with diabetes alone. Specifically, the rate of hospitalizations, primary care physician visits, total physician services (primary care and specialist visits), total extended health care claims, drug claims, and long-term disability claims were found to be significantly higher in the group with diabetes and depression. However, diabetic-specific claims were comparable between the two groups.

Because it might be expected that diabetic patients with comorbid depression would seek mental health services at a rate greater than their nondepressed counterparts, we also analyzed the data without reference to these services. Even with mental health services removed, most relationships in **Table 3** continued to hold true. Specifically, the rate of total physician services (primary care and specialist vis-

its) used by those individuals with comorbid depression was 28.2 visits per year versus 22.4 visits per year for those without depression ($P < .01$). Visits to primary care physicians for the depressed group equaled 11.3 visits per year versus 9.3 visits for the non-depressed group ($P < .01$). Similarly, drug claims (again, excluding medication for mental health) in the diabetic subjects with depression were much higher, equaling 21.6 claims per year versus 11.7 claims per year for the non-depressed group ($P < .01$). With the removal of hospitalizations for mental health reasons, the difference between the groups in the rate of hospitalizations for other reasons was still apparent, although to a lesser degree, with 1.7 visits per year for the depressed group versus 1.5 visits per year for the nondepressed group ($P = .13$).

Our findings suggest that the interaction between diabetes and depression does result in an increased risk of diabetic complications, as well as increased utilization of health care services. The results of our study are similar to those of other retrospective analyses, longitudinal studies, and meta-analyses using US data.^{2,4,11,12} In addition, our findings support those of Finkelstein, who found that diabetic patients with depression will seek services for health problems unrelated to mental health at a greater rate than those with diabetes alone.¹¹

Our study is unique in that we have accessed an extensive Canadian database that includes extended health care claims and long-term disability information. Earlier studies have also reported increased health care use and expenditures in patients with diagnoses of diabetes and comorbid depression, but did not focus on the pattern of use and were mostly US-based.^{2,3,13-20} Analysis of the pattern of use is crucial in deriving hypotheses for the driving force behind the increase in health

care costs found in depressed individuals with diabetes. For example, in our study we noted that there was increased utilization of health care services in all areas, with the exception of diabetes-specific claims and allied health care. The increase in health care costs in such a wide range of services reflects

There are limitations to this study. Additional baseline information on our study cohort would have been useful, and the lack of such information may have been a source of confounding factors. In addition, our database did not subdivide the different types of depression and diabetes. Finally,

The increase in health care costs in such a wide range of services reflects the dramatic effect of depression on diabetes.

the dramatic effect of depression on diabetes. Furthermore, when comparing the two groups, those who experienced increased complications in the depressed group did not seek increased medical care from primary care physicians or specialists, perhaps reflecting a change in patient motivation to seek treatment in the depressed group.

The general increase in the rate of diabetic complications found in this study, particularly those of ischemic heart disease, is consistent with results of several other studies.^{4,6,21} However, there exists some controversy in the literature regarding which diabetic complications are increased in individuals with comorbid depression. For example, Cohen and colleagues²² and Miyaoka and colleagues²³ have correlated depression with diabetic retinopathy and nephropathy, but others have failed to find such an association.²⁴

because of the cross-sectional nature of this study, we cannot show causality and cannot conclude that the increase in health care utilization and expenditure is due solely to the effect of depression in individuals with diabetes.

Conclusions

Health care utilization was greater in diabetic individuals with comorbid depression than those without such a diagnosis. The increased utilization of resources may be due to management of diabetic complications, changes in patient compliance to diabetic management, a combination of the two factors, or unknown factors. Our findings further suggest that screening diabetic patients for depression may decrease the rate of diabetic complications and potentially decrease health care expenditure; however, further cost-benefit analyses are required to define the economic benefit of such a protocol.

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Competing interests

None declared.

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