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Depressive symptoms predict medical care utilization in a population-based sample[1]

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ABSTRACT

Background. Several examinations have detected a relation between depressive symptoms and medical utilization. However, selection biases have been involved in most previous examinations. We sought to test the association between depressive symptoms and prospective, increased medical care utilization, in a population-based Canadian sample, while controlling for utilization due to medical illness and controlling for selection bias.

Methods. Data from the Nova Scotia Health Survey 1995, an age- and sex-stratified random sampling of 3227 Nova Scotian adults, included the Center for Epidemiological Studies-Depression scale and items assessing chronic medical conditions and current limitations in daily activities resulting from medical illness. We linked survey data with medical care utilization measures for the year following the survey, including out-patient visits, reimbursement for out-patient services, hospitalizations, and hospitalization days.

Results. After controlling for age, sex, count of medical diagnoses and current medical severity, those with a greater level of depressive symptoms were at greater risk of having increased medical care utilization in the following year. These results remained after removing mental health care utilization costs.

Conclusions. In a population-based sample, depressive symptoms predicted greater medical care utilization, independent of a number of medical severity measures. Whether depressive symptoms are a risk marker or a causal risk factor for increased medical utilization remains to be explored.

INTRODUCTION

Over the last three decades, a body of literature has developed suggesting that depression is associated with greater levels of medical care utilization. This relation has been noted for out-patient costs (Simon *et al.* 1995; Unutzer *et al.* 1997), physician visits (Frerichs *et al.* 1982) and hospital length-of-stay (Levenson *et al.* 1990). In these studies, depressed medical patients have typically had 1·5 times greater utilization than non-depressed medical patients, although other investigations have failed to detect any association (Barsky *et al.* 1986; Beekman *et al.* 1997; Callahan *et al.* 1997).

Differing results may be attributable to selection bias introduced by the various strategies used for recruiting study populations: for example, a sample of health maintenance organization enrollees may be very different from a sample of Medicaid enrollees. One of the demonstrated factors influencing the choice of health insurance plan is a person's anticipated level of medical care use. That is, those expecting greater use select a plan with greater monthly premiums but more generous coverage, while those anticipating little or no medical care use select a plan with lower monthly premiums and less generous coverage (Leibowitz *et al.* 1992; Feldman *et al.* 1993; Sturm *et al.* 1995; Druss *et*

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al. 1998). Depending on the health insurance plan selected, this selection bias may influence the size and even the direction of the relation, weakening the ability to detect the true population relation. Additionally, inclusion of clinic-attenders only in studies introduces another selection bias: patients, whether with high levels of depressive symptoms or not, choose whether or not to make a clinic visit, influencing who will be included in analyses of clinic visitors.

A final significant limitation affecting some investigations has been the lack of control for the co-morbidity between depression and medical illness. An attempt to detect greater utilization in depressed persons needs to include a strategy for demonstrating whether this is excess utilization or whether it is appropriate utilization given the level of medical severity for that person. This co-morbidity was revealed in a population-based epidemiological survey of Los Angeles residents (Aneshensel *et al*. 1984), with depression following physical illness rather than physical illness following depression. A similar pattern was revealed in a more recent community-based sample of older adults in the Netherlands (Geerlings *et al*. 2000). Because of this co-morbidity, with depressive symptoms generally increasing after development of physical illness, statistical control for variance in medical care use due to medical severity is necessary.

We have designed an investigation that minimizes these selection biases, and so tests the purported depression-utilization relation more cleanly and perhaps with greater population generalizability. In Canada, each province administers a universal-access health insurance plan. In Nova Scotia, all adults are enrolled (with exceptions only for military personnel who have their own health insurance plans) and all healthcare providers submit for reimbursement through this system. Thus, all health claims are recorded regardless of individual decisions to seek specific types of care, or to enrol in a specific insurance plan, or financial inability to enrol in a medical insurance plan. Our sample was drawn randomly from the Nova Scotian medical insurance register, and we drew upon this same system of data to derive our medical utilization measures. Consequently, our study sample was drawn directly from the adult population, and the measures of utilization included virtually all medical care delivered to the survey participants (see Manga *et al*. 1987 for details about the Canadian medical utilization system).

METHOD

Survey and participants

To develop the Nova Scotia Health Survey 1995 (NSHS95) (Heart Health Nova Scotia & Nova Scotia Department of Health, 1996), a probability sample, designed by Statistics Canada, identified 5578 non-institutionalized Nova Scotian residents, 18 years old or older, from the provincial medical insurance register. From this sampling, 4630 were located. Reasons for lack of contact included: the person was deceased; the person refused to respond to five or more mail and phone contact attempts; or the person's address was not correct. Additionally, 140 were excluded from participation because of pregnancy or because a severe mental or physical disability interfered with their ability to respond. Of those located and eligible, 3227 (72%) agreed to participate. This recruitment percentage is comparable to other large health surveys, and weights applied from propensity analyses to test for response bias revealed no meaningful biases (Lawson, 1999). Weights applied to correct for non-location also failed to substantially alter population estimates for cardiovascular disease risk factors (Lawson, 1999).

From March to November 1995, public health nurses interviewed participants in a 90 min home-based interview. The participants were also asked for consent to allow their provincial health services use to be analysed in connection with survey results, and 90% consented. This allowed us to connect results from an age- and sex-stratified, random, population-based sample with prospective medical care utilization. Thus, our study has no selection bias into medical care plan, includes clinic attendees and non-attendees, and is not affected by missing uninsured persons – this type of sample recruitment would be virtually impossible in US-based investigations.

Measures

Utilization measures were gathered from the provincial health care registry database for a 12-month period following the date of the interview

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Table 1. *Descriptive statistics for study measures, depressed and non-depressed group*

	Depressed		Not depressed	
Study measure	Mean (S.D.)	Range	Mean (S.D.)	Range
Age	44 yr 7 mo (18 yr 6 mo)	18 to 85	48 yr 3 mo (19 yr 7 mo)	18 to 98
CES-D score	23·5 (7·5)	16 to 60	4·9 (4·1)	0 to 15
Functional disability score	0·8 (2·2)	0 to 10	0·2 (1·1)	0 to 10
Chronic medical condition count	2·9 (2·2)	0 to 11	2·0 (1·7)	0 to 11

for each participant. These measures were: number of physician visits; the total dollars (Canadian) of expenses reimbursed to physicians for out-patient treatment; number of hospitalizations, and number of hospitalization days. We then re-calculated all of these values subtracting any utilization costs associated with visits with physician codes for mental health care delivery.

The Center for Epidemiological Studies-Depression (CES-D) scale was administered as part of NSHS95. This instrument was designed for use in epidemiological studies as a measure of current level of depressive symptoms (Radloff, 1977), with a cut-score of 16 being commonly used to define a group to likely receive a depressive disorder diagnosis if assessed by a clinician. We excluded 72 participants with two or more missing items on this 20-item scale, and performed mean substitution for those missing one CES-D item.

To control for anticipated, appropriate medical utilization, we included as covariates both age and sex, as well as two measures developed from survey data concerning medical illness severity: a count of chronic medical conditions, and a measure of functional disability due to medical illness. The NSHS95 survey included ten items assessing functional limitations in three domains of activities of daily living: self-care/household activities, occupational/educational activities, and social/recreational activities. These have been recommended for population survey use by the Organisation for Economic Co-operation and Development (OECD) Social Indicator Development Program (McWhinnie, 1982), to assess disabilities due to illness. Positive responses were summed for a continuous measure of disability due to medical illness.

NSHS95 participants were also asked whether or not they have been diagnosed by a health professional with any of several medical conditions, including: allergies, arthritis, asthma, back problems, bronchitis, cancer, cataracts, diabetes, emphysema, environmental illness, epilepsy, glaucoma, heat attack history, high blood pressure, incontinence, migraine headaches, osteoporosis, peripheral vascular disease, rheumatism, and stomach or intestinal ulcers. Positive responses were summed to yield a count of chronic medical conditions. Descriptive statistics for the 1440 female and 1404 male participants investigated in these analyses are presented in Table 1.

Analysis

The medical care utilization measures for consenting participants were extracted from the provincial health care registry database and merged with the NSHS95 dataset. Analyses were conducted using the Statistical Package for Social Science software version 10 (SPSS, Chicago, IL). For each utilization measure a logistic regression was calculated to estimate the increased odds that depressed participants would be in the category of greater utilization, after controlling for age, sex, medical severity, and chronic medical condition count. We then re-ran each analysis employing the utilization measure adjusted for mental health care utilization.

RESULTS

Descriptive statistics (mean, standard deviation, median and inter-quartile range) for the medical care utilization measures, for both the depressed and the non-depressed group, are presented in Table 2. Overall, the median number of physician visits was five, while the mode was zero. The median price of each visit was CAN$101, while the mode was zero and the average cost was CAN$246. The modal number of hospitalizations was also zero, but 16·8% of the sample experienced at least one hospitalization, ranging up to 10 hospitalizations for the year.

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Table 2. *Descriptive statistics, medical care utilization variables for the year following the NSHS95 survey*

	Depressed			Not depressed		
Utilization measure	Mean (S.D.)	Median	Interquartile range	Mean (S.D.)	Median	Interquartile range
Physician visits	11·9 (13·3)	8	3 to 16	7·6 (8·2)	5	2 to 10
Out-patient treatment costs	$434 ($830)	$193	$65 to $515	$254 ($454)	$112	$36 to $270
Hospitalizations, *N*	0·4 (0·9)	0	0 to 0	0 (0·7)	0	0 to 0
Hospitalization days	2·1 (8·1)	0	0 to 0	1·1 (5·4)	0	0 to 0
Hospitalization days (for those hospitalized)	8·6 (14·7)	3	1 to 9	6·9 (12·1)	2	1 to 6

Table 3. *Utilization measures: odds ratios and* 95% *confidence intervals, depressed* versus *non-depressed group*

		95% CI	
Utilization measure	OR	Lower bound	Upper bound
Physician visits above median	1·5	1·2	1·9
Out-patient treatment costs above median	1·6	1·3	2·0
Occurrence of hospitalization	1·5	1·1	2·0
Hospitalization days above 3, *N*	2·0	1·4	3·0
Hospitalization days above 3 (for those hospitalized)	1·8	1·1	3·0

In the 12-month period following assessment, depressed participants generally were at increased risk of greater medical care utilization across all four of these utilization measures (Table 3). In comparison to those with low or no reported depressive symptoms, depressed participants were at 1·5 times greater risk of having physician visits above the median of five, and were at 1·5 times greater risk of having had a hospitalization in the 12 months following the survey. For the 479 participants with a hospitalization, the depressed participants were at 1·8 times greater risk of having a length of stay longer than 3 days. We then re-ran all analyses with the adjusted utilization measures, to ensure that the elevated risk was not a result of mental health treatment costs. In all cases the odds ratios remained significant and elevated when the adjusted utilization measure was employed. Elevated risk for out-patient cost dropped the most; depressed patients were at 1·5 (confidence interval (CI) 1·2–1·9) times greater risk *versus* the odds ratio, 1·6, obtained when using the unadjusted medical utilization measure.

Thus, in a large, age- and sex-stratified population-based sample, with general medical utilization measures derived from administrative data, those participants with a greater level of depressive symptoms were at increased risk of having greater medical care utilization than those with a lower level of depressive symptoms. This result, consistent across outcome measures, appeared despite the inclusion of covariates expected to account for anticipated levels of utilization.

As an alternative strategy to control for appropriate, anticipated utilization, the same analyses were conducted, but were limited to the 546 participants who reported no chronic medical conditions. Except for the physician reimbursement measure (OR = 1·8, 95% CI: 0·97 to 3·3), the risk of increased levels of utilization was still greater for depressed participants when compared with non-depressed participants: for physician visits, OR = 1·9 (95% CI: 1·0 to 3·6); for hospital admissions, OR = 2·9 (95% CI: 1·2 to 6·8); for hospitalization days, OR = 7·3 (95% CI: 1·6 to 33·8).

DISCUSSION

Our results support the belief that elevated depressive symptom level is associated with greater levels of medical care, notably with out-patient visits, out-patient costs, hospitalizations, and hospital length of stay. Some potential

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causes for this association include misinterpretation of depressive symptoms as somatic symptoms (Barsky *et al*. 1986; Wagner & Hendrich 1993), increases in depressive symptoms following onset of medical illness (Aneshensel *et al*. 1984; Berkanovic & Hurwicz 1992), and/or onset of medical illness following increases in depressive symptoms (Goldberg *et al*. 1979). We are not able to distinguish these causal possibilities with our data set, but considering that depressive disorders can be diagnosed and treated (Shea *et al*. 1992; Gabbard *et al*. 1997; Balslev *et al*. 1998), even the modest possibility that depression is being misinterpreted as medical illness seems tragic.

A weakness of this investigation is the reliance upon self-report of depressive symptom level and the dependence upon a cutscore to define a depressed group: a structured interview would have yielded a stronger assessment of depressive status, although it would have demanded much more time by more highly trained interviewers.

Another weakness is the limit of generalizability from Canada to the US. We believe the two nations are similar enough, in culture and history as well as medical training and treatment, that the opportunity to investigate this relation is worthwhile, since it allowed us to minimize biases that are inherently involved in studies conducted with US samples.

As discussed, another weakness is difficulty in achieving statistical control for level of medical severity. Our strategy is similar to strategies incorporated into other investigations, and results from our analysis of participants with no reported chronic medical condition support our general conclusion.

Finally, we removed costs associated with mental health care utilization. Although this lowered our cost estimates by 5%, which is the provincial estimate of expenditure for mental health care, it is still possible (and perhaps even likely) that some mental health care delivery occurred that was not coded as such in the administrative data set. However, Canadian medical expenditures neither limit nor cap mental health care delivery, so while social stigma may have led to inaccurate utilization records, financial limitations did not.

Thus, our data suggest that depressive symptoms predict higher medical costs. This relation has inspired some to evaluate whether the treatment of depression can reduce this excess utilization, but there have not been dramatic results in the few well-designed cost-offset investigations, such as that by Von Korff *et al*. (1998) and as reviewed by Simon & Katzelnick (1997). It may be the case that researchers might only find cost offsets within particular subgroups of depressed patients. For example, Thompson *et al*. (1998) detected a cost-offset effect, among depressed patients maintaining SSRI treatment, in those with certain diagnoses including coronary heart disease and cancer, but not other conditions including diabetes. It is also plausible that future investigations may be able to detect whether the greater utilization seen in depressed patients might be due to the interaction of depressive symptoms with particular conditions such as chronic pain (cf. Brown, 1990). We hope that our investigation provides evidence that it is worthwhile to examine such hypotheses.

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