

Health Care Costs Associated With Posttraumatic Stress Disorder Symptoms in Women

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Background: Posttraumatic stress disorder (PTSD) is a prevalent disorder that has been associated with elevated rates of medically unexplained physical symptoms, significant functional impairment, and high health care use. However, little is known about actual health care costs associated with PTSD.

Methods: We administered the PTSD Checklist (PCL) to 1225 female members of a metropolitan health maintenance organization and validated the instrument using a structured PTSD interview in a subset of 268 women. Participants were classified into 3 groups by PCL score: low (<30), moderate (30-44), and high (≥ 45). By using the cost accounting system of the health maintenance organization, we examined differences between the groups with respect to total and component health care costs, controlling for chronic medical illness and other forms of psychological distress.

Results: The total unadjusted mean \pm SD annual health care costs were $\$3060 \pm \6381 (median, $\$1283$) for the high PCL score group, $\$1779 \pm \3008 (median, $\$829$) for the moderate PCL score group, and $\$1646 \pm \5156 (me-

dian, $\$609$) for the low PCL score group. After adjusting for depression, chronic medical disease, and demographic factors, women with high PCL scores had a significantly greater odds of having nonzero health care costs compared with women with low PCL scores (odds ratio, 13.14; 95% confidence interval, 1.70-101.19). Compared with women in the low PCL score group, those in the moderate PCL score group had, on average, a 38% increase in adjusted total annual median costs, and those in the high PCL score group had a 104% increase.

Conclusions: Women with PTSD symptoms in this study had significantly higher total and component health care costs, even after controlling for depression, chronic medical illness, and demographic differences. These findings are similar to those found in studies of costs related to major depression and suggest that instituting health services interventions to improve recognition and treatment of PTSD in primary and specialty care clinics may be a cost-effective approach for lowering the prevalence of this disorder.

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RECENT STUDIES¹⁻⁵ have found that patients with affective and anxiety disorders experience significantly more medically unexplained symptoms and use more health care compared with patients without these disorders. For example, patients with major depression have twice the number of overall health care costs compared with nondepressed patients after controlling for medical comorbidities.^{2,3} Elderly patients with significant depressive symptoms have had 30% to 50% higher overall ambulatory medical care costs compared with nondepressed older individuals after controlling for medical comorbidities.⁴ Similarly, high users of medical care have had increased rates of major depression (23.5%), generalized anxiety disorder (21.8%), panic disorder (11.8%), and dysthymic disorder (16.8%).⁵ Despite the relationship between affective/anxiety dis-

orders and health care costs, little is known about the magnitude of health care costs and use that specifically relate to posttraumatic stress disorder (PTSD).

Posttraumatic stress disorder is a common disorder in the US population, with estimates suggesting lifetime prevalence rates from 1% to 14%.⁶ Among primary care outpatients, rates of PTSD have been estimated at 7% to 10%.⁷ More important, several studies⁸⁻¹³ have found PTSD and trauma to be associated with increased numbers of medical symptoms and functional impairment. Furthermore, patients with PTSD have had high comorbidity with other psychiatric disorders, such as alcohol and other substance abuse, affective disorders, and other anxiety disorders.^{14,15} Therefore, it would be expected that PTSD would be related to increased health care use and subsequent costs. Nevertheless, we are not aware of any previous population-based studies documenting the health care costs

of individuals with PTSD in general health care settings. Such information is critical for understanding the overall impact of PTSD on the individual and the health care system, and may highlight avenues for earlier detection and intervention efforts.

This article examines the health care costs of a large group of women who were members of a major metropolitan health maintenance organization (HMO). Given the association between PTSD, affective disorders, and pervasive physical symptoms, we hypothesized that patients with PTSD would have significantly increased health care costs and use. Furthermore, we believed that these differences in costs would be specifically associated with PTSD, and would remain after controlling for the presence of depressive symptoms and medical comorbidities.

METHODS

SETTING

The study took place from 1996 to 1997 among the enrolled membership of the Group Health Cooperative of Puget Sound, a large staff-model HMO that provides primary and specialty medical and mental health services to approximately 400,000 individuals in the Puget Sound area of Washington State. The main purpose of the study was to examine the long-term effects of early childhood maltreatment with respect to health care use, costs, and physical health outcomes.

STUDY DESIGN

This 2-stage investigation used a mailed questionnaire and subsequent in-depth structured interviews with selected respondents. The questionnaire allowed the administration of a PTSD assessment instrument to a large sample of participants, while the interview provided a nested validation sample using a clinician-administered structured interview as a gold standard. We selected a random sample of 1963 female HMO members aged 18 to 65 years. The sample was divided into 4 equal waves to reduce the effects of seasonal variation in return rates and to allow for gradual systematic follow-up interviews of selected participants.

QUESTIONNAIRE

All study participants received a mailed questionnaire that had been reviewed and approved by the Human Subjects Committees of the Group Health Cooperative of Puget Sound and the University of Washington School of Medicine. The questionnaire contained multiple physical and mental health-related questions, of which the details have been previously reported.^{16,17} The main purpose of this questionnaire was to screen for previous exposure to potentially traumatic events using 2 previously validated instruments.

Childhood Trauma Questionnaire (CTQ)

The CTQ inquires about 5 areas of childhood maltreatment: emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. Validation studies of the CTQ have been conducted in 7 different clinical and nonreferral samples consisting of more than 2200 respondents.¹⁸ These studies have supported the reliability and validity of trauma reports obtained with this instrument, including their stability over time, convergent and discriminant validity with structured trauma interviews, and corroboration using independent data.¹⁸ For this study, a short form of the questionnaire was used that showed good reliability and

validity in previous studies, including the invariance of its factor structure across clinical and nonclinical samples and external validation against independent evidence.¹⁸ When compared with clinician interviews, the instrument demonstrates better than 80% sensitivity and specificity across all 5 scales for the detection of childhood trauma exposures.¹⁸

PTSD Checklist (PCL)

The PCL is a 17-item self-report checklist based on the DSM-IV diagnostic criteria for PTSD.¹⁹ Each of the 17 symptoms is rated on a 5-point scale, ranging from not at all (1) to extremely (5), yielding scores ranging from 17 to 85. The PCL has been extensively used in research,^{20,21} and is well regarded.²² Using a cutoff score of 50, the instrument showed a sensitivity of 0.82 and a specificity of 0.83 for male war veterans¹⁹ and a sensitivity of 0.69 and a specificity of 0.99 for women with breast cancer.⁷ For civilians exposed to motor vehicle crashes and adult sexual assault, a cutoff score of 44 demonstrated a sensitivity of 0.94 and a specificity of 0.86.²³ In a previously reported receiver-operating characteristic analysis²⁴ from this study, we found that the PCL had good to very good predictive properties, with the best balance of sensitivity (0.82) and specificity (0.76) at a cutoff score of 30. At a score of 45, the PCL had a sensitivity of 0.36 and a specificity of 0.95 in this sample.

To control for depressive symptoms, we also used the 5-item mental health index (MHI-5) of the 36-Item Short-Form Health Survey. The MHI-5 has been used extensively in studies as a measure of depressive severity and has previously published general population and medical clinic norms.²⁵

INTERVIEW

To validate the PCL specifically within this population, we used the CTQ to select a group of women for a further in-depth interview. Cutoff scores for the CTQ were derived for identifying likely cases of childhood maltreatment with very good to excellent sensitivity and specificity. By using the CTQ scale scores, we identified 2 groups of women for a subsequent follow-up interview. The first group consisted of women who screened positive for childhood sexual abuse by having a score above the threshold for that scale as determined in previous validation samples. A second group of women was randomly selected from the group of women whose 5 subscale scores were below all cutoff score thresholds. For this study, we combined the 2 groups to construct a sample with a wider range of childhood maltreatment experiences.

No later than 2 months after their completion of the questionnaire, we invited the women in the combined sample for an interview using the Clinician-Administered PTSD Scale for DSM-IV (CAPS).²⁶ The CAPS has specific criteria for intensity and frequency of the 17 symptoms of PTSD, making it one of the most well-studied structured interviews for PTSD.²⁷ It has been widely used in studies of varying samples²⁷ and has excellent psychometric properties.²⁶ The measure has good convergent validity with standard measures of PTSD, such as the Mississippi Scale for Combat-Related PTSD ($r=0.91$), the Minnesota Multiphasic Personality Inventory-2 PTSD subscale ($r=0.77$), and the Structured Clinical Interview for DSM-IV ($r=0.89$).²⁷ The women were interviewed by a nurse-psychologist who had extensive experience in the use of structured clinical interviews and specific training in the administration of the CAPS. Interviews were reviewed each week with the study psychiatrist (E.A.W.).

ASSESSMENT OF HEALTH CARE COSTS

Our dependent variables, use and costs, were determined using the HMO's automated cost accounting system. This system tracks

inpatient services, outpatient services, prescription drugs, and ancillary services such as laboratory use. Each primary care clinic allocates its actual monthly costs (facilities, payroll, and supplies) over the total number of outpatient visits provided, thus fully accounting for all overhead costs to each patient care department. Therefore, the total cost figures reported reflect the total costs from the perspective of the HMO. Our analyses focused specifically on total costs (including inpatient, primary care, outpatient, mental health, and pharmacy costs) and emergency department (ED) visits for the 5-year period before the study. Costs were calculated in 6-month increments during the 5 years preceding the survey (1992-1996). If a woman was not enrolled during an entire 6-month period, her costs and use were set up as missing for that 6-month period.

Because some of the variability in use and costs between the groups might have been due to differences in the severity of chronic diseases, we computed a measure of chronic disease severity, the Chronic Disease Score (CDS), developed by the HMO.²⁸ This automated algorithm predicts the mean annual total costs per member based on prescriptions filled by each member during the past 6 months for common chronic medical conditions. It is, therefore, a measure of recognized and treated medical disease. It is highly correlated with physician ratings of physical disease severity, and predicts mortality and hospital use during the subsequent years.²⁸ The CDS has had high stability during a 1-year period and prospectively predicts as much of the variance in primary care visits, outpatient costs, and total costs as do the ambulatory diagnostic groups. It is also a better predictor of hospitalization and mortality than the ambulatory diagnostic groups.²⁹

STATISTICAL ANALYSIS

Data were analyzed using Statistical Product and Service Solutions 10.0 for Windows (SPSS Inc, Chicago, Ill). Based on previous receiver-operating characteristic curve analyses of the PCL from other populations,^{7,24,30} we chose cutoff scores of 30 and 45 and formed 3 groups: women with PCL scores below 30, those with scores between 30 and 44, and those with scores of 45 or greater. Demographic (age, educational level, and marital status), medical comorbidity (CDS), and distress (MHI-5) variables were compared between the 3 groups using either an analysis of variance or χ^2 tests with corrections for continuity. Means, SDs, and medians were calculated for the 6 health care cost types. Bonferroni-adjusted post hoc tests were used to determine group differences in the presence of a significant overall test. Given the large SDs of cost data and their naturally right-skewed distributions (many women had zero costs, most had modest costs, and a few may have had high costs), we used a 2-part model.³¹ This allowed us to determine if health care costs varied as a function of PCL score severity. In the first part of this procedure, logistic regression was used to derive adjusted odds ratios of the probability of having any health care costs in a given category. Women in the middle and high PCL score groups were compared with the women with PCL scores of less than 30. These models adjusted the odds ratios for age, marital status (married or living with a partner vs not), educational level (in years), CDS, and MHI-5.

In the second part of the procedure, only women with non-zero costs in a given category were used for analysis. Linear regression models were built using significant covariates (age, marital status, educational level, CDS, and MHI-5) and 2 dummy variables representing the 3 PCL score groups. To satisfy the conditions of normality, we transformed the costs using logs. Before modeling, we first tested for heteroscedasticity by comparing the variances of the log-transformed data. None of the comparisons indicated significant heteroscedasticity, which could have potentially invalidated our results. Cost ratios of estimated median health

care costs (with 95% confidence intervals [CIs]) between the high or middle PCL score category and the low PCL score category were obtained by exponentiation of the regression coefficients for each of the 2 dummy variables.²⁸

RESULTS

Of the 1963 surveys initially mailed, 1225 were completed and an additional 51 were ineligible or returned as undeliverable, for a final adjusted return rate of 62.4%. The 1225 participants were a mean \pm SD age of 41.8 \pm 11.5 years. Of the women, 51.4% were married and 57.3% had completed college. The median annual income was approximately \$40 000. The participants were 79.0% white, 5.7% African American, 8.1% Asian, 2.1% Hispanic, 1.2% Native American, and 3.9% other ethnicities. These demographic characteristics closely mirror those of the HMO population drawn from the sample and are also representative of the Puget Sound region of Washington State.

An analysis of automated medical records from the HMO showed that there were no significant differences between women who did and did not complete the survey with respect to age ($P = .37$), mean number of primary care ($P = .06$) or specialty clinic visits ($P = .48$), ED visits ($P = .29$), outpatient mental health days ($P = .14$), pharmacy visits ($P = .19$), filled prescriptions ($P = .09$), or physician-coded *International Classification of Diseases, Ninth Revision* diagnoses ($P = .26$). This suggests that the nonparticipant population was similar to the women who returned completed surveys.

Of the 1225 participants who completed questionnaires, 305 (24.9%) had a history of childhood sexual maltreatment based on the CTQ cutoff score. We were able to contact 204 (66.9%) of those with sexual abuse histories; of those who could be reached, 152 (74.5%) agreed to participate in a follow-up interview. In addition, we selected a second sample of 250 women who had scores below those of the CTQ cutoff scores for all forms of maltreatment and were able to contact 155 (62.0%) of them; 116 (74.8%) agreed to be interviewed, for a total interview sample of 268.

The mean \pm SD score on the PCL for the full questionnaire sample of 1225 women was 27.2 \pm 10.3 (median, 24.0; range, 17-77). The smaller interview sample had a mean \pm SD score of 27.9 \pm 10.5 (median, 25.0; range, 17-66). Within the interview sample, 28 (10.4%) of the women met the criteria for current PTSD using the CAPS. The women who had PTSD on the CAPS had a mean \pm SD PCL score of 41.1 \pm 12.3 compared with 26.3 \pm 9.0 for the remaining women who were not study patients.

Table 1 presents the demographic and clinical variables for the larger sample. The 3 groups did not differ in CDS, but were significantly different in age, MHI-5, percentage of college graduates, and percentage living with partners. Post hoc Bonferroni-corrected tests showed that the women in the low PCL score group were significantly older than those in the middle and high PCL score groups, which did not differ, and that those in all 3 PCL score groups varied significantly on the MHI-5. Women in the high PCL score group were less likely to graduate from college, whereas women in the low PCL score group were most

Table 1. Demographic Variables for 1196 Women*

Variable	PCL Score			Test Statistic
	<30 (n = 843)	30-44 (n = 270)	≥45 (n = 83)	
Age, y	42.6 (11.6)†	40.4 (11.0)	38.1 (11.0)	$F_{2,1193} = 8.45‡$
Chronic Disease Score	1214.8 (1091.5)	1265.4 (1288.3)	1255.1 (1212.0)	$F_{2,1193} = 0.20$
MHI-5§	24.1 (3.4)	19.6 (4.0)	16.9 (4.8)	$F_{2,1193} = 264.34‡$
College graduates	60.8	54.8	36.1¶	$\chi^2_2 = 19.95‡$
Married or living with a partner	54.7†	40.7	39.8	$\chi^2_2 = 20.11‡$

Abbreviations: MHI-5, 5-item mental health index; PCL, Posttraumatic Stress Disorder Checklist.

*Twenty-nine women did not compete the PCL. Data are given as mean (SD) unless otherwise indicated.

†Significantly higher than the other 2 groups.

‡ $P < .001$.

§All group means differ significantly.

||Data are given as percentage of women.

¶Significantly lower than the other 2 groups.

Table 2. Unadjusted Annual Health Care Costs for 1196 Patients in 3 PCL Score Groups*

Service Category	PCL Score		
	<30 (n = 843)	30-44 (n = 270)	≥45 (n = 83)
Primary care	337 ± 396 (237)	432 ± 494 (319)	510 ± 485 (405)
Specialty care	267 ± 584 (0)	261 ± 512 (0)	355 ± 615 (108)
Emergency care	18 ± 134 (0)	31 ± 161 (0)	110 ± 445 (0)
Pharmacy	160 ± 406 (66)	240 ± 393 (112)	331 ± 578 (128)
Mental health	35 ± 190 (0)	150 ± 394 (0)	162 ± 502 (0)
Total outpatient	1352 ± 3236 (609)	1590 ± 2112 (829)	2603 ± 4939 (1283)
Inpatient	294 ± 2032 (0)	189 ± 1130 (0)	457 ± 1750 (0)
Total costs	1646 ± 5156 (609)	1779 ± 3008 (829)	3060 ± 6381 (1283)

Abbreviation: PCL, Posttraumatic Stress Disorder Checklist.

*Twenty-nine women did not complete the PCL. Data are given as mean ± SD (median) dollars, adjusted for inflation to 1997 dollars.

likely to have partners. **Table 2** shows, for descriptive purposes, the unadjusted costs by service category.

Table 3 presents the first stage of the adjusted cost analyses, showing the percentage of patients in each category with nonzero costs, including odds ratios and 95% CIs comparing the middle or high PCL score group with the low PCL score group. In general, women in the high PCL score group were more likely to have nonzero costs for all categories, with the exception of a trend in pharmacy costs. The odds of having a cost within a given category were significantly different between the low and middle PCL score groups for mental health and primary care costs. By using the low PCL score group as a reference, the women in the high PCL score group had increased odds in every category measured except ED costs and inpatient medical costs. Patients in the high PCL score group were 13 times more likely than patients in the low PCL score group to use ambulatory services during the 1-year period. In fact, all but 1 woman in the high PCL score group of 83 women had some costs. Women in the high PCL score group were almost 5 times as likely to have mental health costs as those in the low PCL score group. There were no significant differences in inpatient costs between the groups.

Table 4 presents the adjusted annual cost ratios and CIs for the median health care cost categories, using the low PCL score group as a reference. Women in the middle PCL score group had an average 38% increase in median total costs, and those in the high PCL score group had more than a 2-fold increase. This increase was pri-

marily due to higher cost ratios in primary care costs (21% and 35% for the middle and high PCL score groups, respectively) and pharmacy costs (42% and 56% for the middle and high PCL score groups, respectively). These estimates are adjusted for significant covariates. In all models except mental health and ED costs, CDS was a significant covariate ($P < .001$). In the primary care model, educational level was a significant covariate ($P = .01$), while in the pharmacy model, age ($P = .006$) and MHI-5 ($P = .02$) were also significant covariates.

Because of the possible comorbidity between depression and PTSD, we removed the effects of the MHI-5 from the model and recalculated the adjusted annual cost ratios for the median pharmacy costs. The results were similar: the ratio for the low to medium PCL score groups was 1.49 (95% CI, 1.27-1.76), and the ratio for the low to high PCL score groups was 1.67 (95% CI, 1.30-2.17). No covariates were significant in the inpatient model.

COMMENT

In this study, we found that more severe PTSD symptoms (as measured by the PCL) were associated with increased health care costs. Compared with the group with PCL scores below 30, those with high PCL scores had greater mean unadjusted total annual health care costs in all categories measured. They also had significantly higher odds of nonzero costs, including total outpatient, specialty care, primary care, pharmacy, and men-

Table 3. Patients in 3 PCL Score Groups With Nonzero Costs by Service Category and Adjusted ORs for PCL Score Groups With Any Costs for 1196 Women

Service Category	PCL Score*			χ^2 Value	OR (95% CI)†	
	<30 (n = 843)	30-44 (n = 270)	≥45 (n = 83)		PCL Score of 30-44	PCL Score of ≥45
Primary care	83.0	87.8	92.8‡	7.97§	1.73 (1.08-2.78)§	3.15 (1.24-7.98)
Specialty care	49.1	49.3	67.5¶	10.38	1.08 (0.78-1.49)	2.73 (1.56-4.78)#
Emergency care	5.2	7.4	13.3‡	9.06	1.16 (0.60-2.26)	2.24 (0.95-5.28)
Pharmacy	80.0	81.9	90.4‡	5.47**	1.21 (0.79-1.84)	2.92 (1.27-6.72)
Mental health	6.5††	21.5	27.7	69.02#	3.23 (2.03-5.13)#	4.65 (2.36-9.17)#
Total outpatient	90.4	90.7	98.8¶	6.59§	1.25 (0.72-2.16)	13.14 (1.70-101.19)
Inpatient	5.7	5.2	9.6	2.42	2.02 (0.50-2.07)	1.81 (0.70-4.73)
Total costs	90.4	90.7	98.8	6.59§	1.25 (0.72-2.16)	13.14 (1.70-101.19)

Abbreviations: CI, confidence interval; OR, odds ratio; PCL, Posttraumatic Stress Disorder Checklist.

*Twenty-nine women did not complete the PCL. Data are given as percentage of patients.

†Adjusted for age, marital status, educational level, Chronic Disease Score, and the 5-item mental health index. The reference is the group with a PCL score of less than 30.

‡Significantly more individuals with nonzero costs than in the group with a PCL score of less than 30.

§ $P < .05$.

|| $P < .01$.

¶Significantly more individuals with nonzero costs than in the other 2 groups.

$P < .001$.

** $P = .06$.

††Significantly fewer individuals with nonzero costs than in the other 2 groups.

tal health care costs, but not of ED or inpatient care costs. Adjusted annual cost ratios were also significantly higher for women with high PCL scores compared with women with low PCL scores. Total annual costs were more than twice as high in women with high PCL scores and 38% higher in women with moderate PCL scores.

Only a small portion of the increase in costs was because of mental health costs. The increase (Table 2) was in every cost component measured, especially within the high PCL score group. These increased costs remained after adjusting for significant covariates, such as chronic medical illness and depression. The results of the study are similar to previous investigations^{1,2,5} that compare the costs of primary care patients with and without depression, showing that mixed-age patients with depression have 1.5 to 2.5 times greater health care costs. The increased costs in depressed patients are also found across every cost component measured and are not primarily due to mental health costs.

The design of this study limits the generalizability of our results. Our sample contains only women, and the lower health care use of men might yield lower costs in a mixed-sex study. In addition, even though the sample accurately reflects the demographics of the Seattle metropolitan area, it has fewer minorities and a higher socioeconomic status than the country as a whole. Next, although the PCL demonstrates excellent psychometric properties for the quantitative measurement of PTSD-related distress, it cannot provide a formal PTSD diagnosis. We recognize that a formal PTSD diagnostic assessment on all participants would have been a preferable method, but it was beyond the limited resources of our study. In addition, this sample was not selected for a current trauma. Women with PTSD after a current trauma are likely to have even higher health care use. The fact that women with high PCL scores had trauma occurring at varying times over their lifetime may minimize the effect of PTSD symptoms on health care costs. Fi-

Table 4. Adjusted Annual Cost Ratios of Median Health Care Costs for 1196 Patients by PCL Score Group*

Service Category	Cost Ratio (95% Confidence Interval)	
	Low PCL Score (<30) vs Medium PCL Score (30-44) (n = 843)	Low PCL Score (<30) vs High PCL Score (≥45) (n = 270)
Primary care	1.21 (1.07-1.37)†	1.35 (1.11-1.66)†
Specialty care	0.98 (0.79-1.23)	0.95 (0.69-1.31)
Emergency care	1.20 (0.70-2.04)	1.95 (1.00-3.79)‡
Pharmacy	1.42 (1.17-1.71)§	1.56 (1.16-2.08)†
Mental health	1.34 (0.93-1.92)	0.92 (0.57-1.49)
Total ambulatory care	1.40 (1.18-1.66)§	2.00 (1.53-2.62)§
Inpatient	0.83 (0.37-1.86)	1.01 (0.26-3.83)
Total costs	1.38 (1.16-1.66)§	2.04 (1.52-2.74)§

Abbreviation: PCL, Posttraumatic Stress Disorder Checklist.

*Twenty-nine women did not complete the PCL. Adjusted for the significant covariates of age, marital status, educational level, Chronic Disease Score, and 5-item mental health index. If the lower limit of the confidence interval is at least 1.00, this is equivalent to $P < .05$.

† $P < .01$.

‡ $P < .05$.

§ $P < .001$.

nally, causation cannot be determined from this study. It is conceivable, for example, that high users are more likely to report PTSD-related problems, as opposed to PTSD-related problems causing health care use.

Nevertheless, despite these limitations, this study has several strengths. We used an automated cost accounting system in a well-established HMO that captured a wide range of medical care costs in a large well-defined population sample. We attempted to minimize the diagnostic limitation of the PCL by calibrating the instrument with a nested validation study against a clinician-administered structured PTSD interview to obtain cutoff points using receiver-operating characteristic curves from prior research with this and other samples. In part because the PCL items reproduce the exact language of DSM-IV criteria for PTSD, the

instrument demonstrates good to very good sensitivity and specificity as a proxy measure. Regardless of the chosen cut-off score, however, there is a clear increase in costs as PCL scores increase. That this increase persists after the effects of depressive symptoms and medical comorbidities are removed from the analysis attests to the strength of the association.

It seems likely that the findings of this study underestimate the true cost differences that might be incurred by patients with PTSD in general medical settings. The relatively higher socioeconomic status of this HMO population may be associated with lower rates of PTSD than might be found in uninsured or indigent populations that have diminished access to mental health treatment resources. Also, the primary care culture of this HMO tends to minimize specialty and emergency care services, which is demonstrated by the lower differential in costs in these categories. Health care systems that do not have a prevention or primary care gatekeeping focus on this would likely show higher costs in these areas as individuals seek treatment in expensive EDs or are referred to medical specialists because of unexplained physical symptoms such as chest pain.

In conclusion, this study provides strong evidence that reports of PTSD symptoms are associated with increased health care costs. Because prior studies^{9,12,32} have shown a marked association between PTSD, trauma, and somatic symptoms, somatic complaints may be one factor related to the increased costs in these non-mental health categories. Future research into the nature of somatic symptoms in patients with PTSD and the factors related to increased health care use is clearly needed. In addition, an important next question is whether improved diagnosis and treatment of PTSD might be associated with decreased medical care costs. Evidence-based treatment of PTSD has decreased distress and improved functioning and quality of life.³³ The impact of such treatments on health care use could be similarly assessed. Finally, because most patients with PTSD initially present in primary care settings,³² collaborative care models that enhance patient education and integrate mental health professionals or nurses into the primary care treatment (such as those developed for the treatment of major depression and panic disorder^{34,35}) may be beneficial for this population. Large-scale effectiveness studies will be needed to test such approaches in populations with PTSD.

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