ORIGINAL ARTICLE

Psychiatric Diagnoses and Risk of Suicide in Veterans

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Context: Although numerous studies have documented the clear link between psychiatric conditions and suicide, few have allowed for the comparison between the strength of association between different psychiatric diagnoses and suicide.

Objective: To examine the strength of association between different types of psychiatric diagnoses and the risk of suicide in patients receiving health care services from the Department of Veterans Affairs in fiscal year (FY) 1999.

Design: This project examined National Death Index data and Veterans Health Administration patient treatment records.

Setting: Department of Veterans Affairs, Veterans Health Administration.

Participants: All veterans who used Veterans Health Administration services during FY 1999 (N=3 291 891) who were alive at the start of FY 2000.

Main Outcome Measures: Psychiatric diagnoses were obtained from patient treatment records in FY 1998 and 1999 and used to predict subsequent death by suicide during the following 7 years in sex-stratified survival analyses controlling for age.

Results: In the 7 years after FY 1999, 7684 veterans died by suicide. In diagnosis-specific analyses, patients with bipolar disorder had the greatest estimated risk of suicide among men (hazard ratio, 2.98; 95% confidence interval, 2.73-3.25), and patients with substance use disorders had the greatest risk among women (6.62; 4.72-9.29).

Conclusions: Although all the examined psychiatric diagnoses were associated with elevated risk of suicide in veterans, results indicate that men with bipolar disorder and women with substance use disorders are at particularly elevated risk for suicide.

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SUICIDE IS ONE OF THE MOST common causes of preventable mortality in the United States.[1,2] However, although the total number of suicides in the United States each year typically exceeds 30 000, the crude rate of suicide in the United States is approximately 23 per 100 000 for men and 6 per 100 000 for women.[1] This low rate makes the study of risk factors for suicide challenging and diminishes the ability to compare the risk associated with different psychosocial risk factors for suicide. Identifying high-risk subgroups is essential for indicated public health interventions to reach often-cited benchmarks, such as decreasing the rate of suicide to an average across men and women of 6 per 100 000 by 2010.[3]

Much of what is known about risk of suicide has emerged from longitudinal studies of specific high-risk cohorts, case-control and psychological autopsy studies, and analog research on nonfatal suicide attempts.[4-7] By examining overlapping results from these different research methods, the presence of any psychiatric disorder has emerged as a consistent risk factor for suicide, with estimates from psychological autopsy studies of between 90% and 98% of all individuals who die by suicide meeting criteria for at least 1 psychiatric disorder.[8-11] Prior research has consistently found associations between psychiatric conditions (eg, depression, bipolar disorder, posttraumatic stress disorder [PTSD], schizophrenia, and alcohol and/or drug use disorders) and risk of fatal and nonfatal suicide attempts.[12-17] However, determining the relative contribution of each of these disorders to risk of suicide is difficult because of (1) dif-

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Table 1. Characteristics of Veterans Who Used VHA Services in FY 1999 and Who Were Alive at the Start of FY 2000

Characteristic	No. (%) of Veterans		
	Total	Male	Female
Total	3 291 891 (100)	2 962 810 (100)	329 081 (100)
Age group, y			
18-29	133 823 (4.1)	93 861 (3.2)	39 962 (12.1)
30-39	262 230 (8.0)	197 789 (6.7)	64 441 (19.6)
40-49	564 320 (17.1)	472 234 (15.9)	92 086 (28.0)
50-59	707 703 (21.5)	648 222 (21.9)	59 481 (18.1)
60-69	652 473 (19.8)	618 486 (20.9)	33 987 (10.3)
70-79	757 689 (23.0)	728 461 (24.6)	29 228 (8.9)
≥80	213 653 (6.5)	203 757 (6.9)	9896 (3.0)
Any psychiatric diagnosis	841 279 (25.6)	784 431 (26.5)	56 848 (17.3)
Any substance abuse or dependence	327 631 (10.0)	317 160 (10.7)	10 471 (3.2)
Alcohol abuse or dependence	278 418 (8.5)	270 618 (9.1)	7800 (2.4)
Drug abuse or dependence	187 570 (5.7)	180 806 (6.1)	6764 (2.1)
Bipolar disorder	96 099 (2.9)	86 607 (2.9)	9492 (2.9)
Depression	477 489 (14.5)	435 574 (14.7)	41 915 (12.7)
Other anxiety	240 905 (7.3)	221 700 (7.5)	19 205 (5.8)
Posttraumatic stress disorder	206 423 (6.3)	192 863 (6.5)	13 560 (4.1)
Schizophrenia	134 993 (4.1)	127 474 (4.3)	7519 (2.3)

Percentages may not total 100 because of rounding.
Abbreviations: FY, fiscal year; VHA, Veterans Health Administration.

ferences in the method of recruitment of the samples and assessment of the different diagnoses, (2) concerns that results related to nonfatal suicide attempts may not generalize to the study of suicide mortality, and (3) the low numbers of suicides in many of the studies.

Several recent studies[18-21] from Scandinavian countries have used national registries of psychiatric inpatients to examine the association between different clinical diagnoses and suicide risk over time. The use of system-wide clinical registries has several advantages, including examination of a large number of cases, the general representativeness of the samples, and the ability to compare risk across psychiatric diagnoses. However, most of this research has examined broad categories of disorders (eg, affective disorders), making it difficult to draw conclusions about the potential differential risks associated with specific disorders. These concerns are particularly salient to the comparison of bipolar disorders with unipolar depressive disorders and the comparison of alcohol use disorders with drug use disorders. Also, such studies have examined only individuals who were hospitalized for treatment of a psychiatric condition. This limits the ability to generalize these findings to most individuals with the diagnosis who are never seen in inpatient psychiatric settings. More research is needed to examine the association between psychiatric disorders and suicide in broader samples of health care system users.

The present study examines the population of patients who obtained any treatment from the Department of Veterans Affairs (VA) within a single year. The VA is the largest single health care system in the United States, and recent research indicates that veterans are at somewhat elevated risk for suicide relative to the general US population.[22,23] However, similar to the broader field of suicide research, the understanding of specific risk factors for suicide mortality is still preliminary. As part of the VA's ongoing evaluation of suicide risk among veterans being treated in VA facilities, this study examines the effect of different psychiatric disorders given by any VA health care provider for fiscal year (FY) 1998 (between October 1, 1997, and September 30, 1998) and FY 1999 (between October 1, 1998, and September 30, 1999) in the FY 1999 users of health care services on their risk of suicide through FY 2006.

METHODS

STUDY POPULATION

A cohort of Veterans Health Administration (VHA) patients was defined as all individuals who used VHA services in FY 1999 and were alive at the start of FY 2000, which resulted in a total sample size of 3 291 891 individuals. These individuals were followed up until death or the end of FY 2006, whichever came first. The FYs reflect the period from October 1 of a given year until September 30 of the following year, such that FY 1999 includes the last 3 months of calendar year 1998 and the first 9 months of calendar year 1999. The demographic and clinical characteristics of this sample are presented in **Table 1**. This project received approval from the Ann Arbor VA Human Subjects Committee.

DATA SOURCES

This study is based on data from 2 sources: the VA National Patient Care Database and the Centers for Disease Control and Prevention's National Death Index (NDI). The VA National Patient Care Database was used to identify all individuals who used any VHA inpatient, residential, or outpatient services in FY 1999. The VA National Patient Care Database includes demographic and diagnostic information for all treatment contacts of patients seen anywhere within the VHA treatment system. Diagnoses are based on the clinical assessments and impressions of VHA health care providers.

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Information about vital status and cause of death from the start of FY 2000 through the end of FY 2006 were obtained from the NDI using the following methods. First, all individuals who used VHA services in FY 2007 or 2008 were known to be alive through the end of the observation period (end of FY 2006), and no NDI searches were conducted for these individuals. The NDI searches were then conducted for all individuals who used VHA services in FY 1999 and did not have any record of VHA service use in FY 2007 or 2008. As described by McCarthy et al,[23] this method for conducting NDI searches was designed to be cost-efficient while still yielding a full population assessment of vital status and cause of death among all individuals who received VHA services in FY 1999. The NDI compiles death record data for all US residents from state vital statistics offices. Among all available population-level sources of mortality data, the NDI has the greatest sensitivity in determining vital status.[24] In instances in which the NDI search yielded multiple records as potential matches, procedures described previously by Sohn and colleagues[25] were used to identify true matches.

OUTCOME MEASURES

Demographic Characteristics

The available data allowed for examination of age and sex. Age was divided into the following categories to match existing research on suicide risk in veterans[23]: 18 through 29, 30 through 39, 40 through 49, 50 through 59, 60 through 69, 70 through 79, and 80 years and older. Reliable information regarding other demographic characteristics (eg, race/ethnicity and employment status) is not available in the VA National Patient Care Database.

Diagnostic Characteristics

All psychiatric diagnoses were based on *International Classification of Diseases, Ninth Revision, Clinical Modification*[26] diagnostic codes given during a visit in FY 1998 or FY 1999. The psychiatric diagnoses examined were depression, schizophrenia, bipolar disorder I or II, substance use disorders (alcohol use disorders or drug use disorders), PTSD, and other anxiety disorders. These diagnoses were chosen because of previously established links to suicide in existing literature. These categories were not mutually exclusive, so any patient could receive multiple diagnoses. For each patient, an additional variable was created that indicated whether a participant had received any psychiatric diagnosis during this period.

Suicide

Using NDI data, we identified dates and causes of death. Suicide deaths were identified using the *International Statistical Classification of Diseases, 10th Revision* codes X60-X84 and Y87.0.[27]

STATISTICAL ANALYSES

All calculations used the closed cohort, defined as individuals who used VHA services in FY 1999 and were alive at the start of FY 2000. The unit of time used to calculate rates of suicide was person-years, and time of observation began the first day of FY 2000 and ended at the date of suicide or the last day of FY 2006, if alive. Data from any individual in the cohort who died of causes other than suicide during the period of observation were censored on that individual's date of death. The numerator in the rate was calculated by summing the number of suicides during the study period. The denominator, person-years, was calculated as the total number of observation days each participant contributed during the study period divided by 365.25. We then multiplied this quotient by 100 000 to calculate the rate per 100 000 person-years. A series of proportional hazards regression models yielded unadjusted hazard ratios (HRs) to estimate risk of suicide for each variable of interest and the 95% confidence interval (CI) for each estimate. Covariance sandwich estimators were used to adjust for the clustered nature of the data, with patient data nested within VHA facilities. The next series of proportional hazards regression models examined the HR of suicides for each diagnosis individually, adjusted for age group and stratified by sex. Although our cohort was the entire VHA user population of FY 1999 who were alive at the start of FY 2000, we note 95% CIs of HRs as a way to make conservative inferences about the potential overlap between conditions in terms of the risk of suicide associated with having each condition.

RESULTS

Of all patients who used VHA services in FY 1999, 7684 died of suicide in the following 7 years. As described in Table 1, individuals who used VHA services in FY 1999 were predominantly male (90.0%). Approximately 25.6% of the general population of VA users was diagnosed as having at least 1 psychiatric diagnosis, with the most common diagnostic categories being depression (14.5%) and substance use disorders (10.0%).

As indicated in **Table 2**, suicide mortality was less common in women than men and more likely in the older age groups relative to the group between the ages of 18 and 29 years. The presence of any psychiatric diagnosis was associated with an HR of 2.60 (95% CI, 2.47-2.74). Also, slightly less than half (46.8%) of those who died of suicide had at least 1 psychiatric condition at entry into the cohort. Among individual psychiatric conditions, bipolar disorder had the strongest association with suicide, with the lower limit of its 95% CI being greater than the upper limit of the 95% CI associated with any other psychiatric conditions; bipolar disorder was diagnosed in 9.0% of all patients who died of suicide. The conditions with the next strongest associations with suicide were depression, followed by substance use disorders (with similar results seen for alcohol use disorders and drug use disorders), schizophrenia, other anxiety disorders, and PTSD.

Table 3 presents the association between different psychiatric conditions and HRs of suicide separately for men and women, controlling for age. Being diagnosed as having at least 1 psychiatric diagnosis was associated with a significant risk of future suicide in men (HR, 2.50; 95% CI, 2.38-2.64); the association with at least 1 diagnosis of a psychiatric diagnosis with suicide was substantially greater in women (HR, 5.18; 95% CI, 4.08-6.58). For all diagnoses examined, the risk of suicide associated with having that diagnosis was greater for women than for men.

In men, the risk of suicide was greatest for those with bipolar disorder, followed by depression, substance use disorders, schizophrenia, other anxiety disorders, and PTSD. Men with a depression diagnosis had a greater risk of suicide than men with all other diagnoses except bipolar disorder, and substance use disorders and schizo-

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Table 2. Unadjusted Associations Between Demographic and Diagnostic Groups and Suicide From FY 1999 to FY 2006 in All VHA Patients Treated in FY 1999 Who Were Alive at the Start of FY 2000

Characteristic	No. (%) of Patients Who Died of Suicide	Rate of Suicides per 100 000 Person-years	Hazard Ratio (95% Confidence Interval)
Total	7684 (100)	37.7	. . .
Sex			
Male	7426 (96.6)	40.9	1.00 [Reference]
Female	258 (3.4)	11.6	0.28 (0.25-0.32)
Age group, y			
18-29	232 (3.0)	24.9	1.00 [Reference]
30-39	698 (9.1)	38.5	1.55 (1.33-1.80)
40-49	1632 (21.2)	42.8	1.72 (1.47-2.02)
50-59	1738 (22.6)	37.4	1.50 (1.29-1.75)
60-69	1366 (17.8)	34.1	1.37 (1.19-1.58)
70-79	1580 (20.6)	37.8	1.52 (1.29-1.79)
≥80	438 (5.7)	44.1	1.77 (1.46-2.14)
Any psychiatric diagnosis	3594 (46.8)	69.8	2.60 (2.47-2.74)
Any substance abuse or dependence	1634 (21.3)	81.2	2.47 (2.30-2.64)
Alcohol abuse or dependence	1417 (18.4)	83.1	2.48 (2.32-2.65)
Drug abuse or dependence	958 (12.5)	81.4	2.33 (2.12-2.55)
Bipolar disorder	683 (9.0)	112.7	3.19 (2.94-3.46)
Depression	2397 (31.2)	81.8	2.70 (2.56-2.85)
Other anxiety	1128 (14.7)	76.7	2.21 (2.05-2.39)
Posttraumatic stress disorder	907 (11.8)	68.6	1.93 (1.79-2.08)
Schizophrenia	694 (9.0)	83.3	2.33 (2.15-2.52)

Abbreviations: ellipses, not applicable; FY, fiscal year; VHA, Veterans Health Administration.

phrenia were associated with a greater risk of suicide than PTSD. In women, the greatest risk of suicide was found in those with substance use disorders, followed by bipolar disorder, schizophrenia, depression, PTSD, and other anxiety disorder. Because of the lower number of women than men who use VHA services and the lower rate of suicide among women, the CIs were wider.

Table 3. Age-Adjusted Hazard Ratios of Suicide During FY 1999 to FY 2006 in All VHA Patients Treated in FY 1999 Who Were Alive at the Start of FY 2000

Characteristic	Hazard Ratio (95% Confidence Interval)	
	Male	Female
Any psychiatric diagnosis	2.50 (2.38-2.64)	5.18 (4.08-6.58)
Any substance abuse or dependence	2.27 (2.11-2.45)	6.62 (4.72-9.29)
Alcohol abuse or dependence	2.28 (2.12-2.45)	6.04 (4.14-8.82)
Drug abuse or dependence	2.09 (1.90-2.31)	5.33 (3.58-7.94)
Bipolar disorder	2.98 (2.73-3.25)	6.33 (4.69-8.54)
Depression	2.61 (2.47-2.75)	5.20 (4.01-6.75)
Other anxiety	2.10 (1.94-2.28)	3.48 (2.52-4.81)
Posttraumatic stress disorder	1.84 (1.70-1.98)	3.50 (2.51-4.86)
Schizophrenia	2.10 (1.93-2.28)	6.08 (4.35-8.48)

Abbreviations: FY, fiscal year; VHA, Veterans Health Administration.

COMMENT

A clinical diagnosis of a psychiatric disorder was strongly associated with increased risk of subsequent suicide in the population of all patients who used services from the VHA within a given year. The strength of association between psychiatric diagnoses and suicide was greater in women than men. The magnitude of the association between specific diagnoses and suicide varied substantially, depending on the diagnosis for men and women. Among men bipolar disorder had the strongest association with suicide, and among women substance use disorders were most closely related to suicide, relative to the other psychiatric diagnoses examined.

One challenge in identifying specific subgroups of individuals who might be appropriate for an indicated suicide-related intervention is that many of the risk factors for suicide are also extremely common. Within this sample, the diagnosis with the lowest overall prevalence in the clinical records, bipolar disorder, was also the diagnosis with the strongest association with suicide. This makes bipolar disorder particularly appropriate for targeted intervention efforts or attempts to improve medication adherence. These efforts are attractive, given the evidence supporting the potential effect of lithium on reduction in suicide risk in individuals with bipolar disorder,[28-30] although evidence supporting lithium comes mostly from naturalistic studies that are insufficient to conclude that lithium directly reduces suicidal behaviors in adults with bipolar disorder.[31]

The present finding of markedly increased risk of suicide in men with bipolar disorder differs from the results of the study by Laursen and colleagues,[18] who found broadly similar rates of suicide in those with unipolar depression, schizophrenia, and bipolar disorder. However, Laursen and colleagues' study used psychiatric conditions during a psychiatric inpatient stay as the marker of diagnosis, whereas the present study focused on psychiatric diagnoses provided during any visit to a VHA

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health care provider. Using only inpatient diagnoses would identify individuals with a more severe presentation of the disorder than using inpatient and outpatient indicators. It is possible that risk of suicide in those with more severe depression (such as those included in the study by Laursen and colleagues) more closely resembles the risk associated with more severe bipolar disorder. In the present study, when examining a broader spectrum of severity, the risk of suicide associated with bipolar disorder was notably higher than the risk of suicide in unipolar depression in men.

More broadly, in comparing the present results with those found after an inpatient psychiatric stay in the Danish population,[18] the estimated magnitude of risk for each condition is markedly lower. This is likely because of a combination of 2 factors: (1) the way that psychiatric conditions were identified and (2) the makeup of the comparison group. As noted previously, relative to the present study in which diagnoses were obtained from outpatient or inpatient records, those with psychiatric diagnoses in the Danish study had, on average, more severe psychiatric symptoms. In addition, the present analyses focused on comparisons of those with a given condition vs those without this condition. As a result, the comparison group includes those with other conditions, which have their own associated increased risk of suicide. This factor likely diminished the magnitude of the observed effects. In the Danish study, the use of control individuals who did not have a psychiatric diagnosis may have enhanced the magnitude of the effects of conditions on risk of suicide.

The present results related to depression, substance use disorders, and schizophrenia are generally consistent with other research on different samples,[12-17] indicating that these diagnoses are associated with elevated risk of suicide. Each diagnosis clearly contributes to risk, and health care providers treating those with any of these diagnoses should be aware of this risk. Knowledge of suicide risk is likely to be high for general health care providers and specialty mental health care providers treating depression and schizophrenia but may be lower for those in substance use disorder treatment settings. However, it is important to point out that even among these highest-risk groups, most of those with these diagnoses did not die of suicide.

Although men were more likely to die of suicide, the increase in the risk of suicide for patients attributed to having clinical psychiatric diagnoses was greater for women than men. This could be explained by higher suicide rates among women with psychiatric disorders compared to men with psychiatric disorders. Alternately, this could be because of a higher suicide rate among men not diagnosed as having psychiatric conditions by VHA physicians. The latter could be because of untreated illness, higher case fatality rates in suicidal acts committed by men, or suicides in men more likely to be caused by nonpsychiatric factors, such as unemployment or divorce.

In looking at diagnoses associated with relatively low rates of suicide, it is interesting to note that the association between PTSD and suicide was the lowest of all diagnoses examined. This finding is consistent with recent research on a cohort of veterans with depression,[32] which found that a comorbid diagnosis of PTSD was associated with *lower* risk of suicide. The present results indicate that in a sample that includes nondepressed and depressed veterans, PTSD is associated with increased risk but not to the degree of magnitude of most other psychiatric diagnoses.

The current findings should be interpreted with caution for several reasons. First, this study is based on individuals who use VHA treatment services. Individuals who use VHA services tend to be of poorer general physical and mental health functioning than the general US population.[33,34] Caution should be used in generalizing these findings to nonveterans and women. In addition, future work could examine rank in army or other measure of socioeconomic status as potentially important covariates in the analyses. All diagnoses were provided by health care providers and likely differ from what would be found with structured diagnostic interviews. However, although this is a weakness in terms of the reliability and validity of these predictors, the use of clinical diagnoses captures the impressions of the patients' health care providers and may more readily generalize to diagnoses obtained under real-world conditions. This study defined a cohort and measured diagnoses based on data on VHA users from the late 1990s as predictors of subsequent suicide. Because of the recent conflicts in Iraq and Afghanistan, the situations influencing specific psychiatric disorders (eg, PTSD) and the types of patients using VA services have changed.[35] The extent to which the present results may shift over time is unknown. In addition, time since discharge from the military was not available in the present data, which could modify the effects of different psychiatric disorders on suicide.

The study was designed to examine the effect of different diagnoses to risk of suicide during a relatively long period. It is possible that the strength of association between these diagnoses may diminish over time and likely that the rates of change in this association may differ among the diagnoses examined. Thus, looking at the more proximal association between a specific diagnosis or receipt of a new diagnosis could change the nature of these results. In addition, emerging literature regarding suicidal thoughts and nonfatal suicide attempts indicates that certain psychiatric conditions are more strongly associated with suicidal thoughts, whereas others have a stronger effect on suicidal behaviors in those individuals with ongoing suicidal ideation.[36-38] Comprehensive, longitudinal data that include information on suicidal thoughts, nonfatal suicide attempts, and suicide mortality would allow for important tests of the ways that different conditions influence the progression from suicidal thoughts to engaging in nonfatal and fatal suicidal behaviors.

For the present study, to control for differential rates of follow-up in individuals who died of causes other than suicide, survival analyses were used despite the fact that no clear date of onset was available for the psychiatric conditions. The older age of the cohort increases the likelihood that these findings may be most relevant to understanding risk associated with ongoing psychiatric diagnoses as opposed to new cases. In addition, the present study did not control for ongoing treatment of the conditions examined because of the difficulty of quantifying quality treatment across multiple conditions. Future work should examine the effect of care on suicide

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risk within specific conditions after controlling for symptom severity.

Despite these limitations, this study provides unique and important data on the relationship between psychiatric diagnoses and suicide among veterans. Psychopathologic conditions are clearly linked to increased risk of suicide. Despite this consistent relationship, slightly less than half (46.8%) of those in the present cohort who died of suicide were diagnosed as having a psychiatric condition in the 2 years before entry into the cohort, a figure noticeably lower than the rate of greater than 90% typically found with psychological autopsies of those who died of suicide.[8-11] This is likely owing to discrepancies in research methods between the present study and psychological autopsy studies, which typically involve comprehensive assessments of psychiatric disorders through interviews with close associates of the deceased individuals. Some of the observed differences could be attributed to recall bias in psychological autopsy studies or, in the present study, to individuals who died of suicide experiencing an emerging disorder during the 7-year observation period. However, these factors are unlikely to fully account for the low rate of diagnosed psychiatric disorders in the sample.

In all likelihood, many individuals with psychiatric disorders who were at risk for suicide were not identified by the treatment system. This could be owing to stigma, which may have made individuals less likely to report their mental health symptoms to physicians, an effect that could be more pronounced among men with military experience.[39] These findings highlight the importance of improved identification, diagnosis, and treatment of psychiatric diagnoses (particularly bipolar disorder, depression, substance use disorders, and schizophrenia) of all health care system users.

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Announcement

I regret to announce that Ross Baldessarini, MD, DSc (Hon), will be retiring from the Editorial Board after 35 years of service. I first met Ross in 1968 when he supervised me on my medical student psychiatric rotation at the Phipps Clinic at Johns Hopkins. The next year he moved to Harvard Medical School, where he was promoted to professor of Psychiatry in 1978 and has spent his entire career. Ross is a scholar in the truest sense—an encyclopedic knowledge of the scientific literature, curious, judicious, and generous. The *Archives* will miss his thoughtful evaluations of our manuscripts.

—*Joseph T. Coyle, Editor*

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