Impact of Hospital Type II Violent Events: Use of Psychotropic Drugs and Mental Health Services

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Background *While violence can adversely affect mental health of victims, repercussions of violence against workers is not as well characterized.*

Materials and Methods *We explored relationships between workplace violent events perpetrated by patients or visitors (Type II) against hospital employees and the employee use of psychotropic medications or mental health services using a data system that linked violent events with health claims.*

Results *Significant associations were observed between reported Type II workplace violent events and employee prescription claims for anti-depressants and anxiolytics combined (RR = 1.45, 95% CI = 1.01–2.33) and anti-depressants alone (RR = 1.65, 95% CI = 1.10–2.48). No significant association between reported violent events and health claims for treatment of depression or anxiety was observed.*

Conclusions *Type II violence experienced by hospital workers may lead to increased use of psychotropic drugs, particularly anti-depressants but also anxiolytics. Our results suggest an important role of employee assistance programs in mitigating the psychological consequences of workplace violent events.* Am. J. Ind. Med. 57:627–639, 2014. © *2014 Wiley Periodicals, Inc.*

KEY WORDS: workplace violence (Type II); health care workers; mental health services; psychotropic medications; employee assistance programs

INTRODUCTION

It is well-established globally that exposure to violence can adversely affect the mental health of victims including examples from intimate partner violence [Volpe et al., 2012; Dillon et al., 2013], childhood traumatic experiences [Bensley et al., 2003; Hooven et al., 2012], and community violence [Kelly, 2010; Kohrt et al., 2012; Sharkey et al., 2012; Yi et al., 2013] to name a few. Repercussions of workplace violence are less well understood. A large, Danish population-based case-control study of hospitalized patients with affective or stress-related disorders documented increased odds of exposure to workplace violence among both men and women with depression and stress; threats at work were associated with increased risk of depression in males and females [Wieclaw et al., 2006].

Violence against health care workers, including physical assaults and verbal threats, has become a growing public health concern [NIOSH, 2002]. While many events go unreported, a large cross-sectional study of nurses working in various health care settings in Minnesota reported crude rates of physical assault by patients and visitors as high as 13.0 per 100 person-years of work [Gerberich et al., 2005]. As expected, non-physical assault (threats, sexual harassment, and verbal abuse) rates were higher, relative to physical assaults, with 38.4 events per 100 person-years of work.

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In the hospital setting, violence perpetrated by patients and visitors (Type II violence) is the most common type of reported workplace violence, relative to Type III (worker on worker), and Type IV (domestic violence spilling into the workplace). A variety of mental health effects on workers from Type II violence have been described across several studies [Pompeii et al., 2013]. These include anger and irritation, as well as fear [Fernandes et al., 2002; Findorff et al., 2005; Kowlaenko et al., 2005; Ayranci et al., 2006; El-Gilany et al., 2010]. Workers describe feelings of humiliation and self-blame [Fernandes et al., 2002; Findorff et al., 2005; Ayranci et al., 2006; El-Gilany et al., 2010], and they sometimes consider that reporting such events, even those involving physical violence, is a sign of weakness [Gacki-Smith et al., 2009]. Others report job dissatisfaction, making changes in their place of employment, and even considerations of leaving the health care profession [Fernandes et al., 2002; Kowlaenko et al., 2005; Ayranci et al., 2006; El-Gilany et al., 2010]. Under reporting of workplace violent events in the health care setting likely results in a substantial under estimate of adverse impacts.

Few studies have evaluated the association between exposure to workplace violence and use of mental health services or use of psychotropic medications. Exposure to work-related violence and incident use of anti-depressants, anxiolytics, and hypnotics was recently studied by Madsen et al. [2011]. A cross-sectional sample of 15,246 Danish employees not using psychotropic medications at baseline were linked to a national registry of prescription medication purchases to detect incident use of psychotropic medications over a 3.6 years follow-up period. Exposure to threats of violence or physical violence from patients and co-workers in the previous 12 months was assessed by a questionnaire. Exposure to work-related violence (threats or physical) was found to be associated with purchase of anti-depressants alone (RR = 1.38, 95% CI = 1.09–1.75) or in combination with anxiolytics (RR = 1.74, 95% CI = 1.13–2.70). No significant relationship was observed for purchase of hypnotics alone.

The objective of the current analyses was to specifically explore associations between reported Type II workplace violent events in hospitals and victims subsequent use of psychotropic medications or mental health services to treat depression or anxiety.

MATERIALS AND METHODS

Study Population Definition and Time at Risk

All data used for these analyses were obtained from the Duke Health and Safety Surveillance System (DHSSS) [Dement et al., 2004]. We have previously reported on the incidence of patient and visitor perpetrated violence (Type II) experienced by health care workers employed in three hospitals during 2004–2009 [Pompeii et al., 2013]. The study population for the current analyses was based on this cohort. Briefly, human resources' administrative data were used to define the study population at risk. Workers were included if they (i) contributed work hours during 2004 through 2009, (ii) worked as a nurse, nurses' aide, clinical technical worker (with the exception of those working a morgue or animal handling facility), police officer or security worker, and (iii) worked in one of the three health system hospitals. Type II violent events that were physical (versus verbal) in nature were identified using workers' compensation (WC) claims, incident reports in a safety reporting system, and Occupational Safety and Health Administration (OSHA) logs. Events were identified through a review of all text descriptions provided in each of these data sources. Time at risk for calculation of incidence rates was estimated for each follow-up year using data on workers' work schedules (hr/week) and months employed during a given study year and was expressed as full-time-equivalents (FTEs).

For the current analyses the original cohort was restricted to workers with at least 1 month of health plan participation during follow-up period. Cohort members were individually linked to files which defined health insurance participation, health claims, and prescription drug claims for each follow-up month during 2004–2009. All inpatient, outpatient, and pharmacy claims data were abstracted for study members for the period January 2004 through December 2009. Our data does not include health or pharmacy claims incurred as part of workers' compensation claims.

Identification of Prescriptions for Anti-Depression and Anti-Anxiety Drugs

National Drug Codes (NDC) contained within the line-item pharmacy claims were used to define the number of filled prescriptions for anti-depression and anti-anxiety drugs for each cohort member by month of follow-up. Anti-depressants were based on the National Committee for Quality Assurance (NCQA) list of anti-depression drugs as specified in the 2008 Healthcare Effectiveness Data and Information Set (HEDIS) [NCQA, 2008]. Some anti-depressants are also used for treatment of anxiety; however, benzodiazepines and buspirone are largely used for treatment of anxiety [National Institute of Mental Health, 2012] and these were classified as anxiolytics and considered separate from anti-depressants for some analyses.

In addition to evaluating prescription drug use through counts of pharmacy claims, we also estimated utilization by calculation of days of drug supply. Annual anti-depressant and anxiolytic supply for each cohort member was calculated by summing the days of supply listed for each filled prescription.

Identification of Mental Health Conditions Using Claims Data

Inpatient and outpatient line-item health claims were used to define mental health services utilization by cohort

members during each year of follow-up. Mental health claims were identified and categorized using the framework developed and evaluated by Frayne et al. [2010] in which a number of algorithms were evaluated to identify mental health conditions based on the *International Classification of Diseases*, *9*th *Revision* (ICD-9) codes found in health claims. A defined a list of ICD-9 codes expected (based on clinical expertise) to have a greater specificity for the presence of mental health conditions was arrived at by a panel of psychologists and psychiatrists using a Delphi technique. A list of these codes is provided in an appendix.

Stratified Analyses

Because the study population for the current analyses represents a subset of all workers in our prior study, we first assessed the comparability of violent event rates with those reported for the original cohort. Using the current restricted cohort crude reported violent event rates (events per 100 FTE), rate ratios (RR), and 95% confidence intervals (CI) were estimated using univariate Poisson regression, with the natural log of full-time-equivalents as the offset.

Stratified analyses of prescription drugs and mental health services utilization for treatment of depression and anxiety were conducted in a manner comparable to those used for analyses of violent event rates. However, for prescription drugs and mental health services, utilization rates were expressed as health claims or days of drug supply per 100 months of insurance participation (instead of FTE's). Crude rates of utilization, rate ratios (RR), and 95% confidence intervals (CI) were estimated using Poisson regression, with the natural log of months of health plan participation as the offset.

Multivariate Analyses

We further evaluated the relationship between reported violent events and utilization rates for prescription drugs and mental health services in separate Poisson regression models that controlled for age, race, gender, and year of follow-up. All models included a binomial independent variable indicating occurrence of one or more violent events for cohort members in each follow-up year. To control for a history of anxiety or depression treatment at cohort entry, we developed dichotomous covariates indicating presence of depression or anxiety prescription or mental health claims during the initial 6 months of cohort follow-up. Individuals with claims in the first 6 months of follow-up were classified as having a history of utilization at cohort entry.

Separate models were developed for use of anti-depressants or anxiolytics combined and use of depression or anxiety-related mental health services combined. We also investigated use of anti-depressants and anxiolytics separately in additional models. The initial step in model building was to develop a baseline model incorporating the independent variables age, race, gender, and year of follow-up, interactions of baseline covariates, and the dichotomous covariates indicating presence of depression or anxiety at cohort entry. After the baseline model was defined the binomial independent variable indicating occurrence of one or more violent events was introduced and evaluated. We also explored differential effects of violent events by gender, race, and age through introduction of interactions. Model covariates and interactions were retained if their Type III likelihood ratio statistic was significant ($P < 0.05$) or their inclusion improved model fit by Akaike information criterion (AIC). To account for repeated observations of cohort members over the follow-up period, all final models were based on use of generalized estimating equations (GEE) with an exchangeable correlation structure implemented in the SAS GENMOD procedure.

Further analyses were restricted to individuals with one or more violent events during 2004–2009 in order to investigate use of anti-depressants, anxiolytics and mental health services before and after reported violent events. For each individual, the year of their first reported violent event was determined so that follow-up time could be divided between pre and post first reported violent event. Analyses were again based on GEE methods and were adjusted for age, gender, race, and calendar year and interactions of these covariates. Finally, as part of our sensitivity analyses, an additional model was constructed in which all time for those without a reported violent event was assigned as "pre-event," such that their anti-depressants and anxiolytics utilization rates were included in the baseline rate before an event.

All statistical analyses were conducted using SAS 9.3.

This study was reviewed and approved by the Duke University Health System Institutional Review Board. Study subjects did not sign an informed consent as analyses were conducted using de-identified data as described in our previous publication [Dement et al., 2004].

RESULTS

Reported Incidence of Workplace Violence

The study cohort included 9,884 workers who reported 387 Type II workplace physical violent events while working a total of 23,412 full-time-equivalents (FTEs). The 387 violent events were reported by 336 individual workers with the distribution of cases by worker as follows: one (293), two (38), three (2), and four (3). The distribution of reported violent events by data source was: workers' compensation only (79.0%), safety reporting system only (6.7%), OSHA logs (5.2%), and multiple sources (9.1%) and the distribution

of workers' compensation claims by type was: first aid only (54.2%), medical only (39.1%), and 1.1% indemnity (1.1%). While the study cohort is slightly smaller than the original cohort studied by Pompeii et al. [2013], the overall violent event rate of 1.65 per 100 FTEs (95% CI = 1.50–1.83) is comparable to that observed in the larger cohort (RR = 1.75, 95% CI = 1.60–1.91). Tables I and II provide comparable analyses of rates and rate ratios by worker demographics, work locations, job titles, and work units to that presented for the original cohort. Rate ratios were lower among females compared to males (RR: 0.80, 95% CI 0.64–1.01) and higher among black workers compared to whites (RR = 1.34, 95% CI = 1.07–1.67). Rates were highest among workers less than 30 years of age and decreased with increasing tenure (Table I). Occupational groups with higher rates included public safety workers (5.09 events per 100 FTEs) and nursing aides (4.29 events per 100 FTEs) compared to inpatient nurses (1.53 events per 100 FTEs) and clinical technical/professional workers (0.19 events per 100 FTEs) (Table II). Work locations with higher rates of violent events included psychiatry, police/security, emergency department, float pool, neurology, adult inpatient medicine, and ICU/CCU.

Stratified Analyses of Overall Psychotropic Drug and Mental Health Services Utilization

The cohort had a total of 28,935 years of insurance coverage during the follow-up period. Among the whole cohort, 14.8% of workers had a history of anti-depressants or anxiolytics use at cohort entry and 5.1% had a history of using mental services for depression or anxiety. Crude rates (claims per 100 insurance months and days of supply per 100 insurance months) and rate ratios for anti-depressants and anxiolytics combined by time period and cohort demographics are shown in Table III. Medication utilization, measured by both claims for prescriptions filled and days of supply, increased over the study period. Use was substantially higher for females compared to males, was higher for whites compared to blacks and other races, and increased with age.

TABLE I. Incidence Rates, Crude Rate Ratios and 95% Confidence Intervals of Reported Type II Violent Events Over Time and by Worker Demographics, 2004–2009

	FTEs	Number of events	Rate per 100 FTEs	Crude rate ratio	95% CI LB	95% CI UB
Follow-up year						
2004	3,443	54	1.57	1.00		
2005	3,553	44	1.24	0.79	0.53	1.18
2006	3,762	74	1.97	1.25	0.88	1.78
2007	3,996	68	1.70	1.08	0.76	1.55
2008	4,151	56	1.35	0.86	0.59	1.25
2009	4,507	91	2.02	1.29	0.92	1.80
Gender						
Male	4,842	95	1.96	1.00		
Female	18,570	292	1.57	0.80	0.64	1.01
Age (in years)						
<30	5,227	105	2.01	1.00		
30 to <40	6,147	108	1.76	0.87	0.67	1.14
40 to <50	6,189	86	1.39	0.69	0.52	0.92
50 to <60	4,824	73	1.51	0.75	0.56	1.02
60+	1,024	15	1.47	0.73	0.42	1.25
Tenure (in years)						
<5	11,895	260	2.19	1.00		
5 to <10	4,664	62	1.33	0.61	0.46	0.80
10 to <15	2,205	24	1.09	0.50	0.33	0.76
15+	4,648	41	0.88	0.40	0.29	0.56
Race						
White	15,849	241	1.52	1.00		
Black	5,610	114	2.03	1.34	1.07	1.67
Other[a]	1,949	32	1.64	1.08	0.75	1.56

[a]Includes Hispanic, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, Asian.

TABLE II. Incidence Rates and 95% Confidence Intervals of Reported Type II Violent Events by Characteristics of Employment, 2004–2009

	FTEs	Number of events	Rate per 100 FTEs	95% CI LB	95% CI UB
Work location					
University	658	35	5.42	3.82	7.42
Medical center	16,382	254	1.55	1.37	1.75
Community hospital 1	3,873	65	1.68	1.32	2.14
Community hospital 2	2,499	33	1.32	0.94	1.86
Job title					
Public safety	766	39	5.09	3.72	6.97
Nursing aides	2,124	91	4.29	3.49	5.26
Nursing inpatient	11,935	209	1.75	1.53	2.01
Respiratory care	757	12	1.58	0.90	2.79
Physical/occup therapy	662	13	1.96	1.14	3.38
Radiology & imaging	1,880	13	0.69	0.40	1.19
Other clinical tech/prof	5,284	10	0.19	0.10	0.35
Work unit[a]					
Psychiatry	215	17	7.90	4.91	12.71
Police/security	724	39	5.39	3.94	7.38
Float pool	498	27	5.42	3.71	7.89
Emergency	1,512	76	4.04	3.14	5.19
Neurology	756	24	3.17	2.13	4.74
Other adult inpatient	4,336	97	2.24	1.83	2.73
ICU/CCU	1,683	38	2.26	1.64	3.10
Respiratory care	779	13	1.67	0.97	2.87
PT/OT/rehab	855	12	1.40	0.80	2.47

[a]Data not shown for units with rates <1 per 100 FTE: anesthesia, surgery, radiology, pediatrics, women's, social work, pharmacy, parking/transportation.

The increase in utilization by age appeared to plateau for those older than 60 years.

Rates and rate ratios for health care claims related to depression and anxiety are presented in Table IV. Unlike drug utilization, rates of health insurance claims (claims per 100 insurance months) were substantially higher in 2004 than in subsequent years; however, patterns in rates of health plan utilization for depression and anxiety by race and gender were similar to those observed for prescription anti-depressants and anxiolytics.

Reported Violent Events and Anti-Depression and Anxiolytic Prescription Drug Use

Results of the multivariate Poisson regression models for use of anti-depressants or anxiolytics combined are shown in Table V. Race, gender, age, calendar time period, and baseline history of anti-depressants or anxiolytics use at cohort entry were all significant predictors of drug use over the study period. Significant interactions were observed for age and gender and age and race and these interaction terms were retained in the baseline models. After adjustment for all baseline covariates and interactions, workers experiencing workplace violent events were found to use significantly more anti-depressants and anxiolytics combined based on claims (RR = 1.45, 95% CI = 1.00–2.33) and increased utilization based on days of supply (RR = 1.33, 95% CI = 0.95–1.87). For both models AIC was marginally improved by inclusion of interaction terms for violent events and race and violent events and gender. Trends in the rate ratios are suggestive of a greater impact of workplace violence on use of anti-depressants and anxiolytics combined for females compared to males, as well as for black and other race groups compared to whites.

Models were developed to examine the relationship between workplace violence and outcomes of use anti-depressants and anxiolytics separately. Results for anti-depressant drug use alone are shown in Table VI and demonstrate a stronger association than the model which considered anti-depressants and anxiolytics together. Workplace violent events were significantly associated with use of anti-depressants as measured by drug claims (RR = 1.65, 95% CI = 1.10–2.28) or days of drug supply (RR = 1.45, 95% CI = 1.02–2.06). For anti-depressants, the impact of workplace violent events was greater for males (RR = 1.76, 95% CI = 1.08–2.88) compared to females (RR = 1.55, 95% CI = 1.04–2.33); however, utilization rate ratios based on

TABLE III. Anti-Depressant and Anxiolytic Prescription Drug Claim Rates, Days of Supply Rates, Crude Rate Ratios and 95% Confidence Intervals OverTime and by Worker Demographics, 2004–2009

		Anti-depressant and anxiolytic drug claims					Anti-depressant and anxiolytic drug supply				
	Insurance months	Number of claims	Rate per 100 months	Crude rate ratio	95% CI LB	95% CI UB	Total days of supply	Rate per 100 months	Crude rate ratio	95% CI LB	95% CI UB
Follow-up year											
2004	44,168	4,826	10.93	1.00			165,797	375.4	1.00		
2005	45,214	5,135	11.36	1.04	1.00	1.08	166,728	368.8	0.98	0.98	0.99
2006	48,117	6,368	13.23	1.21	1.17	1.26	205,930	428.0	1.14	1.13	1.15
2007	51,084	7,166	14.03	1.28	1.24	1.33	236,595	463.2	1.23	1.23	1.24
2008	53,661	8,043	14.99	1.37	1.32	1.42	262,760	489.7	1.30	1.30	1.31
2009	56,884	8,406	14.78	1.35	1.31	1.40	282,888	497.3	1.33	1.32	1.33
Gender											
Male	59,435	5,579	9.39	1.00			188,553	317.2	1.00		
Female	239,693	34,365	14.34	1.53	1.48	1.57	1,132,145	472.3	1.49	1.48	1.50
Age (in years)											
<30	65,265	4,786	7.33	1.00			138,136	211.7	1.00		
30 to <40	77,852	8,786	11.29	1.54	1.49	1.59	269,890	346.7	1.64	1.63	1.65
40 to <50	78,950	13,135	16.64	2.27	2.19	2.34	444,578	563.1	2.66	2.64	2.68
50 to <60	62,183	11,056	17.78	2.42	2.34	2.51	390,407	627.8	2.97	2.95	2.98
60+	14,878	2,181	14.66	2.00	1.90	2.10	14,878	522.2	2.47	2.44	2.49
Race											
White	203,675	34,899	17.13	1.00			1,173,019	575.9	1.00		
Black	70,719	4,256	6.02	0.35	0.34	0.36	122,374	173.0	0.30	0.28	0.31
Other[a]	24,685	789	3.20	0.19	0.17	0.20	25,305	102.5	0.18	0.17	0.19

[a]Includes Hispanic, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, Asian.

days of drug supply were comparable. The results by race suggest a greater effect of violent events on anti-depressant use alone for black and other race groups compared to effects observed for a mix of anti-depressants and anxiolytics together. We further explored differential effects of violent events for those with a history of anti-depressant use at baseline through inclusion of an interaction term in the final anti-depressant claims model; however, the interaction was not significant ($P = 0.15$), suggesting a more general effect rather than an effect restricted to those with pre-existing use of anti-depressants.

A separate model (not shown) was developed for anxiolytics. After control for baseline model covariates and interactions, the rates of anxiolytic use was elevated among those experiencing violent events; however, statistical significance was not achieved for drug claims (RR = 1.19, 95% CI = 0.96–1.47) or days of supply of anti-anxiety drugs (RR = 1.21, 0.97–1.51).

Reported Violent Events and Health Care Utilization for Depression or Anxiety

The relationship between violent events and health claims meeting the ICD-9 study definition of depression or anxiety was explored in a multivariate model that included race, gender, age, calendar time period, history of depression or anxiety at cohort entry, and interactions for age*violence and gender*violence. After adjustment for all baseline covariates and interactions, workers reporting workplace violence did not have a health insurance claims rate ratio significantly different from 1.0 (RR = 0.67, 95% CI = 0.36–1.24). Additionally, no significant associations were observed by gender or race.

Multivariate Analyses Based on Those Reporting Type II Workplace Violent Events

In Tables VII and VIII results based on individuals with one or more reported violent events are presented. These results are similar but more positive than the prior results summarized in Table V using the whole cohort. Inclusion of tenure and occupational group did not significantly alter these results. Like the earlier analyses, use of anxiolytics alone was not significantly associated with violent events nor was health care claims for depression or anxiety. Analyses classifying all time for those without a reported violent event as "pre-event"

TABLE IV. Depression and Anxiety Health Claim Rates, Crude Rate Ratios and 95% Confidence Intervals OverTime and by Worker Demographics, 2004–2009

		Depression and anxiety health claims				
	Insurance months	Number of claims	Rate per 100 months	Crude rate ratio	95% CI LB	95% CI UB
Follow-up year						
2004	44,168	4,017	9.09	1.00		
2005	45,214	2,657	5.88	0.65	0.62	0.68
2006	48,117	2,919	6.07	0.67	0.64	0.70
2007	51,084	2,788	5.46	0.60	0.57	0.63
2008	53,661	3,693	6.88	0.76	0.72	0.79
2009	56,884	4,128	7.26	0.80	0.76	0.83
Gender						
Male	59,435	3,080	5.18	1.00		
Female	239,693	17,122	7.14	1.38	1.33	1.43
Age (in years)						
<30	65,265	3,181	4.87	1.00		
30 to <40	77,852	5,707	7.33	1.50	1.44	1.57
40 to <50	78,950	6,373	8.07	1.66	1.59	1.73
50 to <60	62,183	4,178	6.72	1.38	1.32	1.44
60+	14,878	763	5.13	1.05	0.97	1.14
Race						
White	203,675	17,554	6.45	1.00		
Black	70,719	2,014	6.27	0.33	0.32	0.35
Other[a]	24,685	634	7.82	0.30	0.28	0.32

[a]Includes Hispanic, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, Asian.

time resulted in similar findings (not shown); rate ratios were slightly lower as would be expected since some individuals included in the baseline rate likely had an unreported violent event and were thus misclassified.

In order to explore patterns of utilization over time an additional model was developed whereby follow-up time was partitioned into the year prior to the first reported violent event, year of the violent event and three additional years following the violent event. Rate ratios were adjusted for age, gender, race, time period, and use of anti-depressant or anxiolytic drugs at cohort entry. A GEE model failed to converge and results from the non-GEE Poisson regression

TABLE V. Multivariate Model Adjusted Rate Ratios for Anti-Depressant and Anxiolytic Drug Claims Combined and Days of Supply by Violent Event Category

	Anti-depressant and anxiolytic drug claims			Anti-depressant and anxiolytic drug days of supply		
	Adjusted rate ratio[a]	95% CI LB	95% CI UB	Adjusted rate ratio[a]	95% CI LB	95% CI UB
Overall	1.45	1.01	2.33	1.33	0.95	1.87
Gender						
Male	1.39	0.88	2.21	1.22	0.79	1.90
Female	1.51	1.03	2.22	1.45	1.03	2.03
Race						
White	0.98	0.79	1.22	1.04	0.84	1.29
Black	1.60	0.84	3.06	1.21	0.65	2.25
Other	1.94	0.80	4.67	1.87	0.89	3.91

[a]GEE Poisson regression rate ratios comparing rates for those reporting a violent event to those not reporting a violent event adjusted for age, gender, race, calendar year, and history of depression or anxiety at cohort entry.

TABLE VI. Multivariate Model Adjusted Rate Ratios for Anti-Depressant Drug Claims Alone and Days of Supply by Violent Event Category

	Anti-depressant drug claims			Anti-depressant drug days of supply		
	Adjusted rate ratio[a]	95% CI LB	95% CI UB	Adjusted rate ratio[a]	95% CI LB	95% CI UB
Overall	1.65	1.10	2.48	1.45	1.02	2.06
Gender						
Male	1.76	1.08	2.88	1.44	0.93	2.25
Female	1.55	1.04	2.33	1.45	1.02	2.05
Race						
White	1.08	0.88	1.33	1.13	0.93	1.38
Black	1.80	0.93	3.47	1.27	0.68	2.35
Other	2.34	0.88	6.22	2.11	0.94	4.73

[a]GEE Poisson regression rate ratios comparing rates for those reporting a violent event to those not reporting a violent event adjusted for age, gender, race, calendar year, and history of depression or anxiety at cohort entry.

TABLE VII. Multivariate Model Adjusted Rate Ratios for Anti-Depressant and Anxiolytic Drug Claims Combined and Days of Supply by Time Period for Employees Experiencing a Violent Event

	Anti-depressant and anxiolytic drug claims			Anti-depressant and anxiolytic drug days of supply		
	Adjusted rate ratio[a]	95% CI LB	95% CI UB	Adjusted rate ratio[a]	95% CI LB	95% CI UB
Overall	1.88	1.30	2.71	1.65	1.22	2.24
Gender						
Male	2.11	1.19	3.72	1.77	1.12	2.79
Female	1.67	1.20	2.33	1.55	1.17	2.05
Race						
White	1.28	0.91	1.80	1.31	1.00	1.72
Black	1.97	0.98	3.98	1.62	1.01	2.25
Other	2.60	1.52	4.46	2.12	1.21	3.72

[a]GEE Poisson regression rate ratios comparing rates before and after first reported violent event adjusted for age, gender, race, and calendar year.

TABLE VIII. Multivariate Model Adjusted Rate Ratios for Anti-Depressant Drug Claims Alone and Days of Supply by Time Period for Employees Experiencing a Violent Event

	Anti-depressant drug claims			Anti-depressant drug days of supply		
	Adjusted rate ratio[a]	95% CI LB	95% CI UB	Adjusted rate ratio[a]	95% CI LB	95% CI UB
Overall	2.11	1.45	3.05	1.72	1.28	2.32
Gender						
Male	2.58	1.51	4.41	1.95	1.24	3.08
Female	1.72	1.20	2.46	1.52	1.16	2.00
Race						
White	1.45	1.04	2.00	1.39	1.06	1.84
Black	2.01	0.87	4.71	1.60	1.00	2.58
Other	3.19	2.03	5.01	2.29	1.38	3.82

[a]GEE Poisson regression rate ratios comparing rates before and after first reported violent event adjusted for age, gender, race, and calendar year.

model are shown in Figure 1. Using the year prior to a reported violent event as the reference cell in the multivariate model, increasing rate ratios for anti-depressants or anxiolytics combined (days of supply) were observed through the second year following the violent event. While these results should be interpreted cautiously due to small numbers and limited follow-up time post-event, mean drug utilization rates in the third year following violent events approach pre-event values.

Sensitivity Analyses

Several additional analyses were undertaken to test sensitivity of the Poisson models to inclusion or exclusion of covariates. To test the adequacy of control for depression or anti-anxiety drug use at cohort entry, we ran additional analyses that restricted the cohort to those without evidence of use of anti-depressants or anxiolytics at baseline. The model based on the restricted cohort included 314 violence cases and 25,044 months of insurance eligibility. The GEE model failed to converge; however, the same non-GEE model but with scaled deviance to account for slight over dispersion resulted in a larger rate ratio for anti-depressant or anxiolytic claims combined (RR = 2.13, 95% CI = 1.16–3.91) and comparable trends by gender and race. A comparable model for days of supply for anti-depressants or anxiolytics also resulted in a slightly stronger association (RR = 2.04, 95% CI = 1.11–3.76). These results suggest some degree of over control for baseline drug use in our models; however, the GEE model results are preferred due to their superior control for correlated repeated measures.

We did not include occupational group or tenure in our models. We observed significantly different incidence rates of violent events by occupational group and hypothesized that inclusion of occupational group would inappropriately dampen associations between drug use and violent events. To test this hypothesis, we ran the same baseline models for anti-depressant and anxiolytic drug claims and days of drug supply with inclusion of a covariate for occupational group. The rate ratio for anti-depressant or anxiolytic claims combined was slightly reduced (1.43, 95% CI = 0.99–2.08) as was the rate ratio for days of drug supply (RR = 1.32, 95% CI = 0.95–1.83). Similar results were obtained for the models for anti-depressant claims alone (RR = 1.64, 95% CI = 1.10–2.45) and days of supply (RR = 1.45, 95% CI = 1.01–2.05). Inclusion of tenure in the models resulted in negligible changes in the rate ratios.

Similarly, occupation and tenure were not included in the models based on analyses of data restricted to those workers reporting violent events (Tables VII and VIII). However, we ran additional models that did include both occupation and tenure in the same models. Only minor changes in the rate ratios for anti-depressants or anxiolytics combined (RR = 1.89, 95% CI = 1.30–2.75) or anti-depressants alone (RR = 2.14, 95% CI = 1.46–3.14) were observed. Likewise, ratio ratios and patterns by race and gender were changed only slightly.

Our results support an association between use of psychotropic drugs, particularly anti-depressants but also anxiolytics, and Type II workplace violent events. However, a strong statistical association is only one component of evidence needed to establish a causal relationship and some

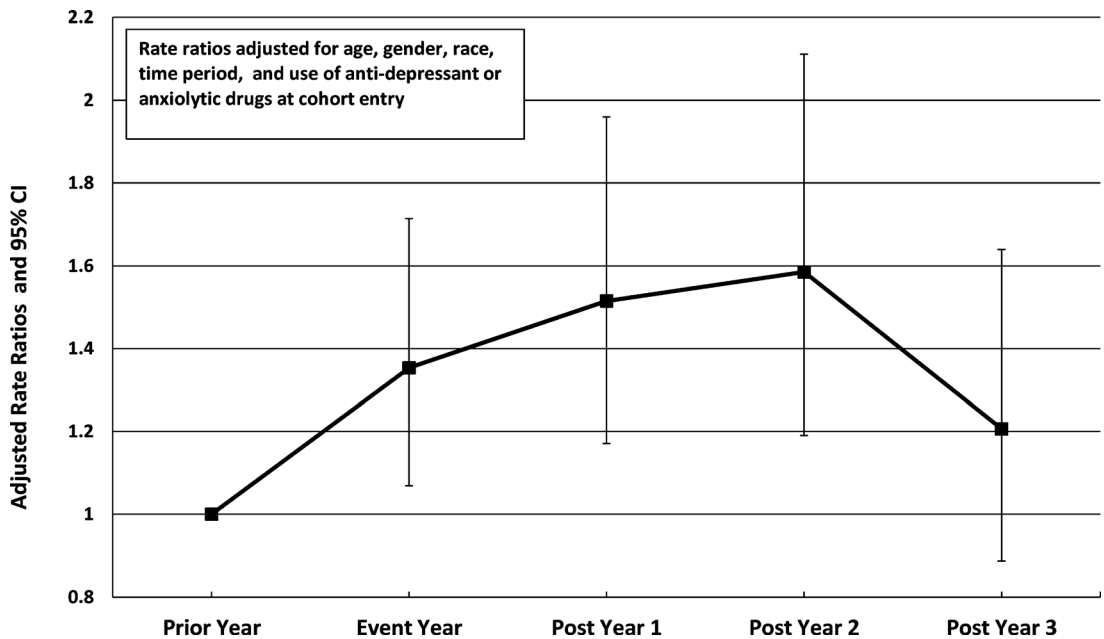

FIGURE 1. Anti-depressant and anxiolytic days of supply rate ratios before and after workplace violent events.

might suggest that the observed association is driven by a tendency of those with pre-existing anxiety or depression to report violent events. The analyses restricted to those reporting violent events (Tables VII and VIII) partially address this question as we observed significantly increased drug utilization following violent events, thus both increased risk and temporality were established. In addition, the crude utilization rate of anti-depressives or anxiolytics combined among workers with no reported violent event (13.26 claims per 100 insurance months) was actually higher than the pre-violent event drug utilization rate among workers reporting a violent event (10.34 claims per 100 insurance months). Finally, we developed a Poisson regression model for workplace violent events that included the covariates listed in Tables I and II. For each cohort member, a baseline (before a reported violent event) rate of utilization of anti-depressants or anxiolytics combined was calculated and included in the model. We found that the baseline use of anti-depressants or anxiolytics combined was not associated with the rate of reporting violent events ($P = 0.45$). Collectively, these analyses suggest that workers with pre-existing depression or anxiety, as measured by drug claims, were not more prone to report violence.

DISCUSSION

By individually linking health care claims with reports of exposure to Type II workplace violence among a large cohort of hospital workers we documented that Type II violence involving physical harm experienced by health care workers was associated with increased utilization of prescription drugs to treat depression and anxiety. Stronger associations were observed for use of anti-depressants than for anxiolytics. Interestingly, the rate ratio comparing the rate of anti-depressive drug use (alone) among those who reported exposure to workplace violence to the rate of those who did not was higher for males than it was for females. Additional research in other health care settings is needed to confirm this pattern.

We observed no significant association between reported Type II workplace violence and health care utilization claims (e.g., psychotherapy sessions) for depression or anxiety. Several factors may account for this lack of association. First, employees at the three study hospitals have access to a long-standing Employee Assistance Program (EAP) staffed by licensed mental health professionals. This EAP utilizes a consultation and short-term counseling model of up to eight sessions. Access to this service is encouraged and is without charge. Employees who experience Type II workplace violence can generally be offered a same day appointment. In fiscal year 2011–2012, the EAP enrolled 1,220 new clients and conducted 3,815 counseling sessions. The most frequent problems assessed by the EAP were emotional (anxiety, depression, grief, and stress) accounting for 34% of enrollees. Visits to the EAP were not captured in the health claims used for the current analyses, nor was any treatment that might have been secured through workers' compensation. Secondly, there is a growing trend for primary care providers to treat minor depression and anxiety. Pratt et al. [2011] noted that less than one-half of persons taking multiple anti-depressants had been seen by a mental health professional in the past year, indicating significant prescribing of these medications by other health providers, notably primary care providers. These observations taken together are consistent with our findings of increased use of anti-depressants and anxiolytics—without impact on mental health claims for care of depression or anxiety—among hospital workers who reported work-related violent events. The importance of an effective EAP as a component of secondary and tertiary prevention to reduce or mitigate adverse consequences of Type II violent events is recognized in the literature and incorporated into OSHA "Guidelines for Preventing Workplace Violence for Health Care & Social Service Workers" [OSHA, 2004].

Reports from several largely cross-sectional studies have documented associations between work-related violence and a number of outcomes including psychological stress, depression, anxiety, fatigue, job dissatisfaction, and work absence [Rogers and Kelloway, 1997; Menckel and Viitasara, 2002; Collins and Long, 2003; Hogh et al., 2003; Findorff et al., 2004; Gerberich et al., 2004; Magnavita, 2013]. These reports were not limited to Type II violence among health care workers, but they demonstrate global relevance to the work we report here on effects of work-related violence.

The most frequently reported consequences of physical and non-physical workplace violence among nurses in the U.S. were frustration, anger, fear/anxiety/stress, and irritability [Gerberich et al., 2004]. Among nurses in Turkey, the major effects of verbal and physical abuse were reported to be "disturbed mental health" and headache [Celik et al., 2007]. In a 15-month follow-up study of 5,076 Norwegian nurses' aides, frequent exposure to threats and violence was strongly associated with increased psychological stress [Eriksen et al., 2006]. It is noteworthy that significant effects were reported for verbal threats as well as physical assault. In fact, in one report higher proportions of nurses who had experienced verbal threats reported frustration (61%), anger (60%), or fear and anxiety (40%), compared to those who experienced physical violence (46%, 33%, and 23%, respectively) [Gerberich et al., 2004].

The associations we observed between exposure to workplace violence and use of anti-depressants and anxiolytics are comparable to those observed by Madsen et al. [2011]. While their measure of workplace violence exposure was based on self-reported data for the prior 12-month period, their risk ratios were 1.38 and 1.74, respectively, for use of anti-depressants alone and use of both anti-depressants and anxiolytics. Like our study, the association of workplace

violence appeared stronger for use of anti-depressants than for anxiolytics.

Our study has several strengths and weaknesses. The current longitudinal analyses have a number of distinct advantages over previous cross-sectional analyses and included a reasonably large cohort of health care workers who were followed over a 6-year period. Events of workplace violence were identified using multiple reporting systems [Pompeii et al., 2013] and we were able to link reported events to health care claims experience on an individual basis.

None-the-less, underreporting of workplace violence is a significant problem in surveillance systems and ours is no exception. Underreporting would result in some misclassification, which, if non-differential, typically dampens observed exposure-response relationships. Further, we expect that more serious events—specifically those involving physical assault—have a greater probability of being reported [Gerberich et al., 2004; Pompeii et al., 2013]; therefore, the patterns we observed may largely apply to more significant episodes of violence rather than all workplace violence. Additionally, our analyses did not include information concerning prescription drug use that may have been contained in workers' compensation case medical files; however, inclusion of any such data would increase rather than decrease our estimates of risk and would not alter study conclusions.

This study was based on a dynamic occupational cohort rather than an inception cohort restricted to members entering without a prior history of depression or anxiety. To help control for this issue in our statistical models, we used the first 6 months of cohort follow-up to define dichotomous variables for use of drugs or health claims for anxiety and depression at cohort entry. Our sensitivity analyses suggest that adequate control was achieved in our statistical models for prior drug or mental health claim history, with perhaps even some degree of over control. Our results are further supported by the analyses based only on those who reported violent events where we compared drug and mental health service use before and after reported violent events.

Observed patterns of anti-depressants or anxiolytics following workplace violent events suggest that usage peaks in about the second year with a decline to near pre-event rates in about the third year. These temporal patterns of anti-depressant use are consistent with American College of Physicians guidelines concerning use of second-generation anti-depressants to treat depressive disorders [Qaseem et al., 2008].

We performed a number of analyses to determine if prior use of anti-depressants and anxiolytics was associated with a greater tendency to report workplace violence. Given the observed crude rates of anti-depressive drug use at baseline and results of the Poisson models for reported violence rates, it is also reasonable to conclude that workers in this cohort with prior use of anti-depressive medications or anti-depressives plus anxiolytics were not more likely to report a violent event than those without prior psychotropic drug use.

While outside the scope of our study, we have conducted some preliminary analyses of employee turnover rates following violent events. The post-event turnover rate among workers experiencing a violent event involving first aid treatment only was 5.2% per year while the rate among those experiencing events requiring medical treatment or lost work time was 6.1% per year. Neither turnover rate was statistically different from the rate observed among workers not reporting a violent event (6.8% per year).

CONCLUSIONS

Despite the recognition that violence in health care is a growing public health concern, there has been very little research on the effects of such violence on the workforce. Through longitudinal analyses, we were able to observe that use of prescription drugs to treat depression and/or anxiety increased following reports of Type II violence involving physical harm—perpetrated by patients or visitors against staff—against hospital employees. The relationship of Type II workplace violence and use of anti-depressants appears stronger than that for anxiolytics alone and results suggest differential effects by gender and race. Collectively, these findings add to evidence of a causal link rather than just an association.

Increased drug use persisted for approximately 3 years following a workplace violent event, consistent with typical treatment patterns for depression and anxiety. Our estimates of patterns of drug use following violent events are somewhat imprecise and longer follow-up of this cohort, or other large work groups, is needed to further delineate longer term drug use and treatment patterns.

Given problems in retaining adequate health care staff, the findings have potential significance for workers and patients. Some higher risk work units are targets of ongoing efforts to identify risk factors as well as appropriate prevention/mitigation strategies.

We did not observe an association between Type II violence on use of mental health services for treatment of depression and anxiety through the employer provided health plans. However, we want to be clear that we are not suggesting drug treatment in the absence of MH counseling. In fact, we attribute this lack of effect, at least in part, to presence of a long-standing and well utilized EAP program which provided professional mental health counseling at no cost. While primary prevention of workplace violent events is most important, professional mental health counseling is a key component of secondary and tertiary prevention to minimize the effects of workplace violence.

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Table AI International Classification of Diseases, 9th Revision (ICD-9) Codes Used to Define Mental Health Conditions [Frayne et al., 2010][1]

Depressive disorder	29620–29625, 29630–29635, 29650–29655, 3004x, 3090x, 30928, 311xx
Anxiety	30000–30002, 30021–30023, 30029, 3003x, 3083x, 30924, 30981

[1] The subset of ICD-9 codes used in algorithm G (Delphi panel approach) published by Frayne et al. [2010].