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Research report

Hospital characteristics associated with post-discharge suicide of severely depressed patients

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Abstract

Purpose: To explore risk factors, such as characteristics of psychiatrist, patient and hospital at index hospitalization, associated with depressed patients who committed suicide within 3 months of discharge using a case-control design.
Methods: By linking the Taiwanese nationwide mortality database and the National Health Insurance dataset, all hospitalized patients with major depression who committed suicide within a 90-day period post-discharge during the years 2002–2004 were selected as a study cohort ($n=85$). We randomly selected 425 cases (five for every case in the study cohort) that were matched with the study cohort in terms of age, gender and date of discharge as a control cohort. Cox proportional hazard regression was carried out to compute the adjusted 90-day survival rate after adjusting for other factors.
Results: The majority of suicide occurred 30 days after discharge from hospitals, with a mean of 29.9 days. The adjusted hazard for committing suicide after hospital discharge for patients who left on their own initiative was 2.85 times (95% CI=1.387–5.856, $p=0.004$) greater than for those who were discharged with doctors' approval. Furthermore, the adjusted hazard for patients who were discharged from medical centers was higher than for patients discharged from regional hospitals, by a multiple of 3.38 (95% CI=1.421–8.055, $p=0.006$).
Limitations: Some patient-specific predictors of post-discharge suicide, such as suicidal ideation prior to admission, recent life events and social relationships with close relatives were not available.
Conclusion: We conclude that, in addition to patient characteristics, hospital characteristics also constitute important risk factors for suicide within 90 days of discharge for depressed patients.

Keywords: Depression; Suicide; Post-discharge suicide

1. Introduction

According to the World Health Organization, suicide is not only the leading cause of violent death worldwide (World Health Organization, 2004), it is also the major cause of death in mental illness (Mortensen et al., 2000;

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Harris and Barraclough, 1997). In both eastern (Cheng et al., 1997) and western countries (Harris and Barraclough, 1997; Diekstra, 1989), clinical studies have indicated higher suicide risk for psychiatric patients compared to the general population. Furthermore, a strong association between major depression and completed suicide has been consistently reported in numerous classic retrospective and psychological autopsy studies, with 60% to 90% of suicide victims suffering from major depressive disorders or other mood disorders (Harris and Barraclough, 1997; Cavanagh et al., 2003; Conwell et al., 1996; Appleby et al., 1999a; Dumais et al., 2005).

A critical period of particularly high risk of suicide has been documented for patients soon after discharge from hospitals (Appleby et al., 1999b; Goldacre et al., 1993). Nevertheless, the majority of previous studies related to suicide risk among patients discharged from psychiatric hospitals use patient samples pooled from different psychiatric diagnoses, resulting in difficulty identifying post-discharge suicide risk factors in studies mixing different mental disorders (Karvonen et al., 2007).

We note some studies report post-discharge suicide risk factors for patients with depressive disorder. For example, Sinclair et al. (2005) documented a history of deliberate self-harm and paid employment as significant risk factors for depressed patients who committed suicide within 12 months of hospital discharge. Another study reported that risk factors, such as history of deliberate self-harm and longer case notes, were associated with patients who committed suicide soon after hospital discharge (McKenzie and Wurr, 2001). Nonetheless, their study included not only depressed patients, but also patients with six different primary discharge diagnoses, hence the risk factors they found might not be identical to those associated with post-discharge suicide risk for depressive patients.

Furthermore, no study, according to our knowledge, has investigated whether or not the characteristics of mental healthcare providers such as hospitals and psychiatrists were associated with post-discharge suicide of depressed patients, although many studies have reported that patient care outcomes are significantly associated with the characteristics of the healthcare provider (Choudhry et al., 2005).

Therefore, by using a case-controlled design, and by linking the National Health Insurance Research Dataset (NHIRD) together with the Cause of Death file in Taiwan, we aim to explore the possible risk factors for 3-month post-discharge suicide among severely depressive patients, such as characteristics of psychiatrist, patient and hospital at index hospitalization, by using a case-controlled design.

2. Methods

2.1. Database

Two databases were used in this study. The first is the NHIRD, published by the National Health Research Institute in Taiwan. The NHIRD covers over 97% of the entire population of 23 million Taiwanese citizens, and it consists of comprehensive hospitalization data, such as medical claims for inpatient expenditures on admissions, details of inpatient orders, and a registry of contracted medical facilities, medical personnel, board-certified specialists and beneficiaries. The NHIRD is currently one of the largest population-based datasets available in the world.

The second database is the Cause of Death file, published by the Department of Health (DOH) in Taiwan. This database provides information on marital status, employment status, place of legal residence, date of birth and death, and the underlying cause of death (ICD-9-CM code) for all deaths in Taiwan. The registration of all deaths is mandatory in Taiwan, and, therefore, the data provided by the Cause of Death file are very accurate and comprehensive.

These two databases were linked with the assistance of the DOH in Taiwan. Since these were de-identified secondary data, released for public access for research purposes, the study was exempt from full review by the Internal Review Board (IRB).

2.2. Study sample

Our study design included a study cohort and a control cohort. The study cohort comprised all patients discharged from psychiatric departments of hospitals with a principal diagnosis of depression (any ICD-9-CM codes 296.2, 296.3, 300.4, and 311) from January 1, 2002 to December 31 2004 who committed suicide (ICD-9-CM codes E950-E959) within 90 days of discharge. We excluded those patients who had a diagnosis history of bipolar disorder (ICD-9 codes 296.0, 296.1, and 296.4–296.8), schizophrenia (ICD-9 code 295), other psychoses (ICD-9 codes 297–299, excluding 298.0), mental retardation (ICD-9 codes 317–319), or dementia/delirium (ICD-9 codes 290–294) within the two years prior to the index hospitalizations. Ultimately, 85 cases remained in the study cohort.

The control cohort comprised all surviving patients discharged from psychiatric departments of hospitals

with a principal diagnosis of depression during the same period. We also excluded patients from the control cohort who had any history of bipolar disorder, schizophrenia, other psychoses, mental retardation, or dementia/delirium within the past two years of the index hospitalizations. We further refined our criteria for the control group by randomly selecting 425 cases (five for every case in the study cohort) matched with the study cohort in terms of age, gender and date of discharge.

2.3. Key variables of interest

The dependent variable was whether a patient committed suicide or not within 90 days of the index discharge. Key independent variables consisted of hospital, psychiatrist and patient characteristics at index hospitalization. Hospital characteristics included type of ownership (public, not-for-profit or for-profit), geographical location (Northern, Central, Southern or Eastern Taiwan), teaching status (yes or no) and hospital level. Hospital level, which refers to the categorization of each hospital as a medical center (with a minimum of 500 beds), a regional hospital (minimum 250 beds) or a district hospital (minimum 20 beds), can be considered as a proxy for hospital size and clinical service capabilities.

Psychiatrist characteristics consisted of age and gender. The age of the psychiatrists was categorized into three groups ($\leq$34, 35–44 or $\geq$45). Patient characteristics included age (<30, 30–39, 40–49, >49), gender, monthly income, length of stay (LOS), whether or not the discharge was patient-initiated, and the number of hospitalizations for the treatment of depression within one year prior to index admission. The LOS was grouped into the following: <14, 14–26, 27–40 and >40 days in accordance with the method used by our prior study (Lin et al., 2006). In Taiwan, if patients request to leave the hospital without agreement from physicians, they will be asked by physicians to sign a DAA (Discharged Against Advice) form. We used the number of hospitalizations for the treatment of depression within one year prior to index admission as a proxy for severity of depression for patients. It was categorized into three groups: 0, 1 and >1.

2.4. Statistical analysis

The SAS statistical package (SAS System for Windows, Version 8.2) was used to perform the statistical analyses in this study. Pearson χ^2 tests were performed to explore whether there were distribution differences between the study and control cohorts in hospital, psychiatrist and patient characteristics at index hospitalization. Cox proportional hazard regression was carried out to compute the adjusted 90-day survival rate, following adjustment for other factors, which were significantly related to post-discharge suicide based on the χ^2 analyses. The hazard ratios (HR) are presented along with 95% confidence intervals (95% CI), a two-sided p value of <0.05 being considered statistically significant for this study.

3. Results

Table 1 describes the distributions of suicide methods, place and days after discharge of suicide for the sampled patients who committed suicide. Of the total sample of 85 deaths, about one-third (36.5%) selected hanging, strangulation and suffocation as their means of suicide. The percentage of patients committing suicides in their hometown was similar to that of those who committed suicide out of town. The mean interval from discharge to suicide was 29.9 (±26.0) days and the overwhelming majority of deaths occurred after 30 days of leaving the hospital.

Table 2 describes the distribution of characteristics of patient, psychiatrist and hospital at index hospitalization between study and cohort groups. The Pearson χ^2 tests show that there were significant differences between these two cohorts in terms of patient-initiated discharge (p=0.004) and hospital level (p=0.008). Patients who had initiated discharge were more likely to commit suicide than other patients. In addition, patients discharged from

Table 1
Suicidal methods, place and days of suicide after discharge among cases committing suicides in Taiwan, 2002–2004*

Variable	*n* (%)
Suicide method	
Poisoning by solid or liquid substances	14 (16.5)
Poisoning by other gases and vapors	13 (15.3)
Hanging, strangulation and suffocation	31 (36.5)
Submersion (drowning)	8 (9.4)
Firearms, air guns and explosives	1 (1.2)
Cutting and piercing instruments	1 (1.2)
Jumping from high place	15 (17.7)
Others and unspecified means	2 (2.4)
Suicide place	
Hometown	40 (47.1)
Out of town	38 (44.7)
Unspecified	7 (8.2)
Days of suicide after discharge, mean (SD), days	29.9 (26.0)
1–7	8 (9.4)
8–14	13 (15.3)
15–30	15 (17.7)
>30	49 (57.7)

Note: *Total sample number=85.

Table 2
Characteristics of patient, hospital and psychiatrist for index hospitalizations of the sampled patients in Taiwan, 2002–2004*

Variable	Study group (n=85)		Control group (n=425)		χ^2	p value
	Total no.	%	Total no.	%		
Patient characteristics						
Gender					0.000	1.000
Male	36	42.4	180	42.4		
Female	49	57.6	245	57.6		
Age					0.000	1.000
<45	46	54.1	230	54.1		
45–60	26	30.6	130	30.6		
>60	13	15.3	65	15.3		
Employment status					3.157	0.206
Unemployed	24	28.2	135	31.8		
Part-time employed	19	22.4	123	28.9		
Full-time employed	42	49.4	167	39.3		
Length of stay					1.078	0.583
≤7	33	38.8	182	42.8		
8–14	20	23.5	80	18.8		
≥15	32	37.7	163	38.4		
Number of hospitalizations within one year before index hospitalization					1.130	0.569
0	65	76.5	315	74.1		
1	10	11.8	42	9.9		
>1	10	11.8	68	16.0		
Patient-initiated discharge					8.539	0.004
Yes	14	16.5	29	6.8		
No	71	83.5	296	93.2		

Variable	Study group		Control group		χ^2	p value
	Total no.	%	Total no.	%		
Psychiatrist characteristics						
Gender					1.305	0.253
Male	74	87.1	387	91.1		
Female	11	12.9	38	8.9		
Age					0.882	0.643
<35	18	21.2	108	25.4		
35–44	52	61.2	238	56.0		
>44	15	17.6	79	18.6		
Hospital characteristics						
Hospital level					9.671	0.008
Medical center	38	44.7	125	29.4		
Regional hospital	40	47.1	224	52.7		
District hospital	7	8.2	76	17.9		
Hospital ownership					2.815	0.245
Public	43	50.6	239	56.2		
Private not-for-profit	36	42.4	142	33.4		
Private for-profit	6	7.1	44	10.4		
Geographical region					1.768	0.622
Northern	40	47.1	196	46.1		
Central	11	12.9	68	16.0		
Southern	32	37.7	141	33.2		
Eastern	2	2.4	20	4.7		
Teaching status					2.998	0.083
Yes	81	95.3	379	89.2		
No	4	4.7	46	10.8		

Note: *Total sample number=510.

Table 3
Adjusted hazard ratio of committing suicides within the 90-day follow-up period after index hospitalizations for the sampled patients ($n=510$)

Variable	Commit suicide		
	Hazard ratio	95% CI	p value
Patient characteristics			
Gender			
Male	1.204	0.735–1.974	0.461
Female	1.000		
Age			
<45	1.000		
45–60	1.136	0.654–1.974	0.650
>60	1.188	0.592–2.386	0.628
Patient-initiated discharge			
Yes	2.850	1.387–5.856	0.004
No	1.000		
Hospital characteristics			
Hospital level			
Medical center	3.383	1.421–8.055	0.006
Regional hospital	1.972	0.839–4.636	0.120
District hospital	1.000		

medical centers had a greater tendency to commit suicide compared to their counterparts discharged from regional or district hospitals.

The adjusted hazard ratios for the two cohorts of committing suicide are presented in Table 3. In this regression model, we only kept those variables which were significantly related to post-discharge suicide from the prior χ^2 analyses. The hazard of committing suicide among depression patients who initiated discharge themselves was significantly higher than for other patients, by a multiple of 2.85 (95% CI=1.387–5.856, $p=0.004$). The hazard of committing suicide among patients discharged from medical centers was 3.38 times (95% CI=1.421–8.055, $p=0.006$) that for their counterparts from regional hospitals.

4. Discussion

By combining a 3-year population-based NHIR dataset with the Cause of Death file for Taiwan, we analyzed the potential risk factors for 3-month post-discharge suicide among severely depressed patients. We found that one-third of suicide victims chose hanging, strangulation or suffocation as their means of suicide and 42% of suicides occurred within 30 days of hospital discharge. After adjusting for other factors, patients discharged from medical centers and those who discharged themselves had a greater tendency to commit suicide within the 3-month post-discharge period.

In contrast to a previous study, which reported that longer LOS of depression significantly associated with the risk of post-discharge suicide (Ho, 2006), this factor did not significantly relate to the post-discharge suicide risk in our study. In addition, contrary to findings reported by Sinclair and colleagues (Sinclair et al., 2005), we found that employment status did not contribute to post-discharge suicide significantly. The difference relating to employment status might be due to cultural differences between Taiwan and some Western countries, such as money saving habits. In contrast to the saving habits in many western countries, most Taiwan citizens are in the habit of saving money. Cultural values regarding working or self-sufficiency as a measure of individual worth may be another factor that could explain this difference. In Taiwan, the family bond is usually strong, and other family members usually give financial support to one who is currently experiencing crisis. In contrast, being able to support oneself is a significant measure of self worth in many Western countries. One famous study that synthesized data from a variety of carefully conducted questionnaire-based studies to create an index measuring degrees of individualism and collectivism, found that English speaking countries consistently ranked as the top five most individualist cultures out of 74 countries studied (Hofstede and Hofstede, 1993). In highly individualistic cultures, there may be shame associated with turning to others for financial assistance, even to one's family. In contrast, Taiwan ranked 64th on Hofstede's scale, well toward the collectivist side of the spectrum. Summarizing these cultural differences, the authors note that in extremely individualistic societies, "Neither practically nor psychologically is the healthy person…supposed to be dependent on a group (Hofstede and Hofstede, 1993)," whereas in more collectivist cultures, like Taiwan's, relationships of mutual dependence that are both practical and psychological between a person and various "in-groups," such as family or school cohort, function as "a major source of identity and the only secure protection one has against the hardships of life." Under such circumstances, patients with major depression might not confront overwhelming financial pressure and a sense of personal failure if they are currently out of the work force. As the result, the relationship between employment status and post-discharge suicide among patients with depression becomes insignificant.

Our findings confirm the results of previous studies that have documented worse outcomes, such as excessive mortality and a higher level of suicide, among patients who self-discharge (Brook et al., 2006; Pages et al., 1998). Our study found that not only were around one-quarter of post-discharge deaths among patients who discharged themselves, the hazard of committing suicide

for such patients was 2.85 times higher than for patients who received regular discharge. It seems possible that patients in Taiwan who discharge themselves are more individualistic than patients who do not, i.e., less willing to rely on and be controlled by others. The way they relate to the hospital may in some way reflect the way they relate to their families. Other studies have reported pessimistic attitudes toward treatment, antisocial attitudes and medication noncompliance as predictive factors for patient-initiated discharge (Brook et al., 2006; Yim et al., 2004). Chandrasena and Miller (1988) pointed out patients who accept hospitalization as a way to deal with an immediate stressor might request immediate discharge after the stressor situation appeared solved, although this kind of discharge seemed premature to the psychiatrist. All of the above factors might contribute to the less effective therapeutic results, hence increasing the risk of suicide among those patients who self-discharged from hospitals.

With regard to the hospital level and the suicide risk among depressed patients post-discharge, we did not expect to find patients who were discharged from medical centers were at 3.64 times higher risk of committing suicide than those discharged from district hospitals. The increased risk of suicide among patients discharged from medical centers might relate to the more impersonal atmosphere of large-scale institutions. This may be especially relevant to therapeutic efficacy of psychiatric care, as opposed to other types of medical care. People with emotional/mental problems need to feel "cared" for in a more personal way that large institutions with rotating staff may not provide as well as smaller ones where patients can become familiar with the professional care givers they come in contact with on a more regular basis.

Also, the fact that the dataset cannot give information on severity of mental illness may be another explanatory factor for why patients discharged from larger medical centers have a higher risk of suicide. Psychiatric patients in Taiwan are free to choose any mental healthcare services they wish, in contrast to the referral systems in most developed Western countries. Families of people who are more severely mentally ill may choose to take them to medical centers which have a better reputation for dealing with serious conditions (Lee and Wu, 2005), whereas district hospitals may seem less professional and less adequate for very serious situations. A more sophisticated risk adjustment model may be needed before any firm conclusion can be made.

One of the strengths of our study is that it combines two nationwide population-based datasets providing us a unique opportunity to analyze the risk factors associated with suicide victims who had depression as their principle diagnosis and who killed themselves within 90 days of discharge from hospital. Furthermore, avoidance of systematic recall bias among psychiatrists is an advantage of employing administrative datasets for this study. However, some inherent limitations to administrative datasets should be noted. One of the limitations is a lack of certain patient-specific clinical features, such as suicide ideation prior to admission, recent life events and social relationships with close relatives, which are important predictors of post-discharge suicide. In addition, the accuracy of psychiatric diagnoses reported by physicians might be lower than for diagnoses made in a face-to-face structured interview. Finally, the severity of the mental illness at admission is not possible to assess based on administrative datasets.

Regardless of these limitations, our findings indicate two noteworthy issues. First, although the majority of suicides occurred more than 30 days after discharge, still around 42% of suicides occurred within the first month of discharge from hospitals. Second, a significantly higher tendency toward suicide was noted among patients who discharged themselves. Both suggest that, not only the early stage post-discharge but also self-discharge increases the vulnerability of depressed patients to suicide. In this case, effective suicide prevention and intervention should be set up on at least two levels. Firstly, patients who are going to discharge themselves from hospitals should be well-informed of the potential consequences of their decision. Furthermore, a minimal discharge standard for depressed patients who are planning to self-discharge should be established or some intervention to reduce the rate of self-discharge should be designed. Secondly, early close follow-up programs, such as regular compulsory meetings with physicians or psychological counselors, should be executed for at least several months after patients are discharged from hospitals, even though patients who discharge themselves are by definition difficult to engage.

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Conflict of interest
No conflict declared.

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