Frequency of rehospitalization after hospitalization for suicidal ideation or suicidal behavior in patients with depression

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ABSTRACT

This study sought to: 1. determine the frequency of rehospitalization with diagnosis of suicidal ideation or suicide attempt (SI/SA) within a year and how often patients had multiple rehospitalizations; 2. identify the time period for which the risk of rehospitalization is highest; and 3. determine the characteristics of patients with multiple rehospitalizations. We conducted a retrospective cohort study of adults with depression using 4 US health claims databases. We defined hospitalization as an inpatient or emergency room visit with codes indicating a suicide attempt or suicidal thoughts using a validated algorithm. Rates of rehospitalization with SI or SA were analyzed together and separately, including multiple re-hospitalizations with SI/SA. Across all databases 121,065 patients were hospitalized with a diagnosis of SI/SA. Rates of rehospitalization within a year ranged from 7.96% to 11.24%. The risk of rehospitalization with SI/SA is highest during the first month. Nearly 50% of rehospitalizations occurred within 3 months after initial hospitalization. Patients with rehospitalization (s) had more anxiety disorders, sleep disorders and substance use disorders than patients without. Among patients with depression hospitalized for SI/SA, rehospitalization for SI/SA within a year is not uncommon. Risk of rehospitalization with a diagnosis of SI/SA is highest during the first month.

1. Introduction

Suicide rates have increased over the past decade in the US (Johnson et al., 2014; Olfson, 2017). In 2016 the suicide rate was 15.6 per 100,000 people, and it is the 10th-ranked cause of death in the US (Simon et al., 2016; Stone et al., 2018).

Strategies aimed at identifying and monitoring patients at high risk of dying by suicide have been beneficial (Knox et al., 2010; Mann et al., 2005; Zalsman et al., 2016). Patients at high risk of dying by suicide are those who report thoughts of death or self-harm (Simon et al., 2016), patients discharged from psychiatric hospitals, and patients who specifically were admitted for suicidal ideation or attempts. A recent meta-analysis of 100 studies found that the suicide rate was 4 times higher in patients who were admitted with suicidal ideation or suicidal behavior compared with other psychiatric reasons for admission, and 2 times higher during the first 3 months after discharge from a psychiatric hospital (D. T. Chung et al., 2017).

Rehospitalization because of suicidal ideation or suicidal behavior could be used as an objective outcome to measure the effectiveness of treatments for depression in patients at risk for suicide or of strategies for suicide prevention (Gvion and Levi-Belz, 2018). However, there is

limited evidence on how frequently rehospitalization occurs among depressed patients after being admitted for suicidal ideation or suicide attempt, and how often these patients are rehospitalized during the next year. We sought to: 1. determine the frequency of rehospitalization with a diagnosis of suicidal ideation/suicidal behavior within a year and how often patients had more than one psychiatric rehospitalization within a year; 2. identify the time period for which the risk for rehospitalization is highest; and 3. determine the characteristics of patients who were rehospitalized.

2. Methods

We conducted a population-based retrospective cohort study using 4 US health claims databases. We included patients 18 years or older with a prior diagnosis of depressive disorder and with 180 days of continuous prior observation in the database, Appendix 2 has the list of concepts. The three most common included disorders were: major depression, single episode, moderate recurrent major depression and depressive disorder. We excluded people with psychosis, schizophrenia, bipolar disorder, or dementia.

We defined hospitalization as an inpatient or emergency room visit,

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with codes indicating a suicide attempt or suicidal thoughts occurring from January 1, 2015 to August 31, 2018. We followed the same procedure to define rehospitalization. A hospitalization counted as a rehospitalization if it occurred between 2 and 365 days following discharge from the initial hospitalization to account for administrative practices.

To detect suicide attempts we approximated two validated algorithms created to identify suicide attempts in claims databases that were validated against medical chart review. In terms of accuracy these algorithms reported positive predictive values that ranged from 70% to 100% (Barak-Corren et al., 2017; Swain et al., 2019). Positive predictive value is the probability that a subject with the presence of the diagnosis code of interest had suicide attempts. We followed Simon's algorithm (Simon et al., 2018) with the exception of the inclusion of injuries of uncertain intent, as the Barak-Corren's algorithm found these codes to have low predictive values (Barak-Corren et al., 2017; Swain et al., 2019). The included codes were related to self-inflicted injury and drug poisoning. We added equivalent ICD-10 codes to cover the recent data (Hedegaard et al., 2018) and concepts/codes for suicidal ideation/thoughts, (Appendix 1 has the codes used to define the outcomes).

To identify any of the medical conditions in the databases, we used the systematized Nomenclature of Medicine-Clinical Terms (SNOMED). SNOMED is a standardized, multilingual vocabulary of clinical terminology that is used by physicians and other healthcare providers for the electronic exchange of clinical health information (Reich et al., 2012). The list of SNOMED concepts used in the study are found in Appendix 2.

Since lack of coverage for mental health could affect reimbursement for hospitalizations with mental health issues, we also estimated the frequency of rehospitalization for any reason. This estimate would provide a ceiling frequency of rehospitalization for suicide attempt or suicidal ideation.

2.1. Data sources

2.1.1. IBM marketscan® commercial claims and encounters (CCAE)

CCAE is a large US claims database that includes data from 142 million individuals enrolled in employer-sponsored insurance health plans. Data include adjudicated health insurance claims (e.g., inpatient, outpatient, and outpatient pharmacy) as well as enrollment data from large employers and health plans who provide private healthcare coverage to employees, their spouses, and dependents. Data elements are outpatient pharmacy dispensing claims (coded with National Drug Codes (NDC) and inpatient and outpatient medical claims which provide diagnosis codes (ICD-9-CM or ICD-10-CM).

2.1.2. IBM marketscan® multi-state medicaid (MDCD)

MDCD is an adjudicated health insurance claims database for 26 million Medicaid enrollees from multiple states and includes hospital discharge diagnoses, outpatient diagnoses, and outpatient pharmacy claims. Data elements are outpatient pharmacy dispensing claims (coded with NDC), and inpatient and outpatient medical claims and diagnosis codes (coded in ICD-9-CM or ICD-10-CM).

2.1.3. IBM marketscan® medicare supplemental (MDCR)

MDCR represents health services of 9 million retirees with primary or Medicare supplemental coverage through privately insured fee-for-service, point-of-service, or capitated health plans. These data include adjudicated health insurance claims (e.g., inpatient, outpatient, and outpatient pharmacy). Data elements are outpatient pharmacy dispensing claims (coded with NDC), and inpatient and outpatient medical claims which provide diagnosis codes (coded in ICD-9-CM or ICD-10-CM).

2.1.4. Optum© De-Identified Clinformatics® data mart

Optum© includes de-identified data from 84 million members with

private health insurance, who are fully insured in commercial plans or in administrative services only and Medicare Advantage (Medicare Advantage Prescription Drug coverage). The population is representative of US commercial claims patients (0–65 years old) with some Medicare (65+ years old). Data elements are outpatient pharmacy dispensing claims (coded with NDC), and inpatient and outpatient medical claims which provide diagnosis codes (coded in ICD-9-CM or ICD-10-CM).

Each database was converted to the OMOP Common Data Model that uses SNOMED as standardized terminology to identify medical conditions, ICD-9 and ICD-10 codes are mapped to SNOMED concepts (Reich et al., 2012).

The use of the IBM MarketScan and Optum claims databases was reviewed by the New England Institutional Review Board (IRB) and was determined to be exempt from broad IRB approval, as this research project did not involve human subjects research.

2.2. Analysis

To avoid selection bias, patients were not required to remain in the database for the entire year after the initial hospitalization with suicidal ideation or suicide attempt, resulting in a different number of patients at risk each month. We calculated rates of rehospitalization monthly by counting the patients at risk during that month and the number of patients who had a rehospitalization. We report the rate of hospitalization for each month and the entire year.

The number of patients who had 2 or more re-hospitalizations was also calculated. Additionally, we calculated rates of rehospitalization within a year separately for suicidal ideation and for suicidal behavior.

We described the baseline characteristics of the patients one year prior to index date with no rehospitalization and the patients with at least 1 rehospitalization in terms of demographic characteristics, medical conditions and drug exposures. The medical conditions were grouped using SNOMED concepts and drugs grouped using the Anatomical Therapeutic Chemical (ATC) Classification System at level 2. We are reporting the conditions or drug classes where standardized difference was ≥0.03.

3. Results

Across all 4 databases, a total of 121,065 patients with a depression diagnosis code were hospitalized with a diagnosis of suicidal ideation or suicide attempt. The CCAE database had the most patients (53,625) and the MDCR database had the fewest with 1793.

On average, patients who were hospitalized with a diagnosis of suicidal ideation or suicide attempt were middle aged, with the exception of the MDCR population where the mean age was 73 years. The characteristics of the patients included are listed in Table 1.

The proportion of patients who were rehospitalized at least once with suicidal ideation or suicidal attempt within a year ranged from 7.96% to 11.24%. It was similar in all the databases with the exception of the MDCD database where it was higher, as shown in Fig. 1. The majority of rehospitalizations in all the databases were for suicidal ideation.

Approximately 1.5% of patients had more than one rehospitalization during the year with suicidal ideation or suicide attempt, however in the Medicaid database, a larger percentage of patients had more than 1 rehospitalization (2.57%), see Fig. 1.

The risk of having a rehospitalization with a diagnosis of suicidal ideation or suicide attempt was highest during the first month after the initial hospitalization Table 2, and almost 50% of rehospitalizations occurred during the first 3 months after the initial hospitalization in all the databases, as shown in Fig. 1.

Patients who had rehospitalization(s) had more comorbid anxiety disorders, sleep disorders and substance use disorders than patients with no rehospitalization. In terms of medications, patients who were

Table 1
Characteristics of patients who have no rehospitalizations vs patients who had 1 or more rehospitalizations with diagnosis of suicidal ideation or suicidal behavior.

	CCAE No rehospitalization	At least 1	Optum No rehospitalization	At least 1	Truven Medicaid No rehospitalization	At least 1	Truven Medicare No rehospitalization	At least 1
Number of patients	49,359	4266	32,560	3055	26,655	3377	1636	157
Mean age	33.5 ± 14.1	33.1 ± 14.4	41.6 ± 19.2	42.1 ± 19.1	35.4 ± 14.1	37.1 ± 13.5	73.5 ± 8.4	73.1 ± 7.8
Women (%)	57.8	58.1	55.4	53.8	62.2	51.2	51.7	49
Medical conditions								
Mean Charlson index	0.9 ± 1.7	1 ± 1.7	1.8 ± 2.8	1.9 ± 2.8	1.5 ± 2.4	1.6 ± 2.5	4.6 ± 3.6	4.7 ± 3.6
Opioid dependence (%)	5	6.4	6.6	9.9	14	21.8	4.6	6.4
Drug abuse (%)	3	4.2	3.5	5	9.9	16.1	1.5	0.6
Tobacco dependence syndrome (%)	5.9	7.4	7.1	8.6	29.3	40.3	4.6	7.6
Anxiety disorder (%)	58.2	64.7	61.7	69.1	54.6	59.4	52.4	57.3
Obsessive compulsive disorder (%)	2.2	3.3	1.9	2.8	1.2	1.3	0.8	1.9
Social phobia (%)	1.9	2.7	1.7	2.6	0.8	1	0.2	0
Eating disorder (%)	2.6	3.9	3.4	5.1	2	2.2	3.5	4.5
Insomnia (%)	14.2	17	18.9	22.2	10.8	12.7	19.7	22.9
Musculoskeletal pain (%)	23.4	25.9	29.9	33.7	34.2	37.5	44.1	43.3
Heart disease (%)	11.3	13.5	22	26.3	18.9	23.8	57.8	57.3
Medications prior to initial Hospitalization								
Antidepressants (%)	56.6	66.5	55.7	64.2	45.9	52.7	65.3	75.8
Opioids (%)	23.9	27.2	26.1	32.0	42.5	47.8	44.7	42.0
Psycholeptics (%)	42.1	50.4	41.4	51.9	41.4	49.8	60.1	56.7

rehospitalized were more likely to have dispensings for antidepressants, psycholeptics and opioids prior to the initial hospitalization than patients with no rehospitalization. However, patients in the Medicare database with at least 1 rehospitalization were more likely to be dispensed antidepressants than patients with no rehospitalization, but this was not the case for opioids or psycholeptics, where the exposure in both groups was similar, as shown in Table 1.

3.1. Rehospitalization for any reason

The risk of rehospitalization for any reason within 12 months was 25.90% in CCAE and 28.59% in Optum. It was 33.80% in the Medicare database and 41.14% the Medicaid population.
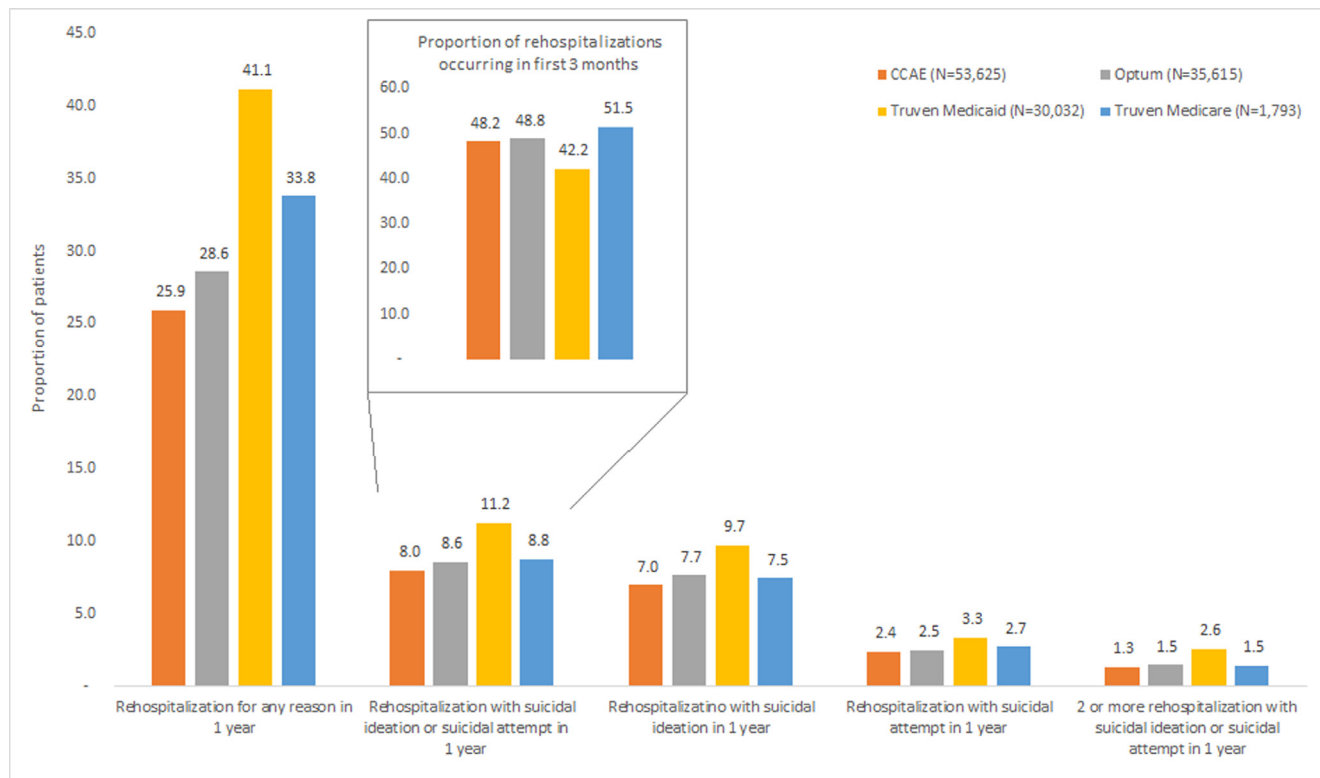

Fig. 1. Frequency of rehospitalization, percentage of patients with 1 or more rehospitalizations and percentage of rehospitalization due to suicidal ideation or suicidal behavior in the first 3 months in each of the databases.

Table 2

Frequency of rehospitalization with diagnosis of suicidal ideation or suicide attempt by month.

Month	CCAE				Optum				Truven Medicaid				Truven Medicare			
	# rehospitalization	# patients	Prevalence	% of events	# rehospitalization	# patients	Prevalence	% of events	# rehospitalization	# patients	Prevalence	% of events	# rehospitalization	# patients	Prevalence	% of events
1	1731	53,591	0.03	26.61	1308	35,541	0.04	26.41	1357	29,974	0.05	21.29	80	1791	0.04	33.42
2	800	50,971	0.02	12.93	586	32,591	0.02	12.90	700	27,971	0.03	11.77	23	1706	0.01	10.09
3	498	47,535	0.01	8.63	395	29,786	0.01	9.52	505	25,844	0.02	9.19	17	1590	0.01	8.00
4	425	44,373	0.01	7.89	301	27,411	0.01	7.88	395	23,804	0.02	7.80	12	1480	0.01	6.07
5	356	41,268	0.01	7.11	247	25,184	0.01	7.04	328	21,748	0.02	7.09	13	1380	0.01	7.05
6	305	38,430	0.01	6.54	190	23,194	0.01	5.88	313	19,861	0.02	7.41	8	1284	0.01	4.66
7	246	35,766	0.01	5.67	174	21,414	0.01	5.83	241	17,957	0.01	6.31	11	1197	0.01	6.87
8	223	33,345	0.01	5.51	160	20,068	0.01	5.72	213	16,261	0.01	6.16	6	1124	0.01	3.99
9	177	31,153	0.01	4.68	147	18,671	0.01	5.65	167	14,598	0.01	5.38	9	1054	0.01	6.39
10	177	29,106	0.01	5.01	106	17,215	0.01	4.42	159	13,074	0.01	5.72	7	991	0.01	5.28
11	149	27,091	0.01	4.53	94	15,880	0.01	4.25	143	11,511	0.01	5.84	6	938	0.01	4.79
12	150	25,184	0.01	4.91	92	14,670	0.01	4.50	130	10,098	0.01	6.05	4	880	0.00	3.40

4. Discussion

We conducted a population-based study in 4 large US healthcare databases that cover diverse populations to determine the frequency of rehospitalization with suicidal ideation or suicide attempts in patients with depression. We found that the frequency of rehospitalization within a year ranged from 7.96% to 11.24%. The rate of rehospitalization was highest in the MDCD database. This is expected because patients in the MDCD database had a higher burden of medical and psychiatric co-occurring conditions.

The risk of having a rehospitalization with suicidal ideation or suicide attempt was highest during the first month after the initial hospitalization, and around 50% of hospitalizations with suicidal ideation or suicidal behaviors occurred during the first 3 months after the initial hospitalization. Similarly, other studies have shown that the risk of suicide is higher during the first 3 months after discharge from a psychiatric hospital (D. T. Chung et al., 2017) and highest during the first 4 weeks after discharge (D. Chung et al., 2019).

Our target population included patients with depression who were hospitalized with a diagnosis of suicidal ideation or suicide attempt. A small percentage of patients (less than 3%) had multiple hospitalizations within 1 year. Patients with 1 or more rehospitalizations had more psychiatric comorbidities than patients with no rehospitalizations. This finding aligns with previous work where strong predictors for suicidal behavior are substance use disorders, psychiatric disorders (Barak-Corren et al., 2017; Liotta et al., 2015; Mendez-Bustos et al., 2013) and prior suicide attempts (Andover et al., 2008).

We used healthcare claims databases that are created for administrative and reimbursement purposes and not for research purposes and although we capitalized on two validated algorithms to identify suicidal behavior, and we included only codes with high positive predictive value, the accuracy of the diagnosis codes is good but not perfect.

Rates of rehospitalization for suicidal ideation or suicidal behavior may have been underestimated because the lack of mental health coverage may discourage psychiatric hospitalization, or the loss of health insurance due to severity of illness. To address these shortcomings, we determined the risk of rehospitalization for any reason so that we could have a ceiling for the rate of rehospitalization, and we included patients with no commercial insurance (Medicaid database). Nonetheless, the estimate in our study of rehospitalization with a diagnosis of suicidal ideation or suicidal behavior is similar to the 13% reported in a study of 103 patients, however these patients were followed for 6 months, not one year (Gaudiano et al., 2008), and to a study conducted in hospital database (Neslusan et al., 2019). In this current study we focused on rehospitalizations with suicidal ideation or suicidal behavior and not deaths from suicide outside the hospital or emergency department or attempts that do not require medical attention.

We found that the rate of rehospitalization in the MDCR database was similar to the CCAE and Optum databases that had younger patients. A European study found that older people make fewer suicide attempts than younger adults (De Leo et al., 2001). This difference could be explained by the population studied (US vs European countries) or the years the studies were conducted, late 80's versus most recent data in our study.

We assessed the risk and risk factors of rehospitalization with a diagnosis of suicidal ideation or suicide attempt in diverse populations in terms of age, burden of disease and economic status. Therefore, this study provides real world evidence of a public health problem with broader and more generalizable findings than traditional studies. Rehospitalization for suicidal ideation or suicide attempt within a year ranges from 7.96% to 11.24%. The risk of rehospitalization with a diagnosis of suicidal ideation or suicide attempt is highest during the first month after the initial hospitalization and almost 50% of rehospitalizations for suicidal ideation or suicidal behavior occurred during the first 3 months. Patients with 1 or more rehospitalizations with a diagnosis of suicidal ideation or suicide attempt had more

psychiatric comorbidities than patients with no rehospitalizations.

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Availability of data and material

The data that support the findings of this study are available from

IBM MarketScan® or Optum© De-Identified Clinformatics®, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available.

Declaration of Competing Interest

All authors are employees of Janssen Research & Development, LLC and stockholders of Johnson & Johnson. No mention of any drugs in the manuscript.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2020.112810.

Appendix 1. Codes used to identify suicide attempts and suicidal ideation

ICD 9 codes for suicide attempts	Description
E95*	Injuries of intentional intent
965.*	Poisoning by analgesics, antipyretics, and antirheumatics
967.*	Poisoning by sedatives and hypnotics
969.*	Poisoning by psychotropic agents
881.*	Open wound of elbow, forearm, and wrist
ICD 10 codes for suicide attempts	
X71–X83	Intentional self-harm due to drowning and submersion, firearms, explosive or thermal material, sharp or blunt objects, jumping from a high place, jumping or lying in front of a moving object, crashing of motor vehicle, and other specified means
T36–T50 with a 6th character of 2 (except for T36.9, T37.9, T39.9, T41.4, T42.7, T43.9, T45.9, T47.9, and T49.9, which are included if the 5th character is 2)	Intentional self-harm due to drug poisoning (overdose)
T51–T65 with a 6th character of 2 (except for T51.9, T52.9, T53.9, T54.9, T56.9, T57.9, T58.0, T58.1, T58.9, T59.9, T60.9, T61.0, T61.1, T61.9, T62.9, T63.9, T64.0, T64.8, and T65.9, which are included if the 5th character is 2)	Intentional self-harm due to toxic effects of nonmedicinal substances
ICD 9 codes for suicidal ideation	
V62.84	Suicidal ideation
ICD 10 codes for suicidal ideation	
R45.851	Suicidal ideations

Appendix 2. SNOMED concepts to identify subjects with depression

Adjustment disorder with depressed mood
Adjustment disorder with mixed emotional features
Depressive disorder
Dysthymia
Major depression, single episode
Moderate recurrent major depression
Recurrent depression
Recurrent major depression
Recurrent major depression in remission
Recurrent major depressive episodes
Severe major depression, single episode, with psychotic features
Severe recurrent major depression without psychotic features

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