

# Suicides following inpatient psychiatric hospitalization: A nationwide case control study



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## ABSTRACT

**Background:** Research shows the elevated risk of suicide associated with current or recent inpatient psychiatric hospitalization. However, it is unclear whether this applies in the area of post-communist Central and Eastern Europe where mental health care has not been deinstitutionalized yet. The present study aims to examine the rates of suicides among psychiatric patients during and shortly after discharge from inpatient hospitalization in the Czech Republic.

**Methods:** All inpatient psychiatric hospitalizations and all suicides committed between 2008 and 2012 have been merged on an individual data basis. The time horizon between the admission and two months after the discharge from inpatient psychiatric facility was utilized and multiple logistic regression was performed to calculate the odds of committing suicide.

**Results:** A total of 137,290 inpatients were hospitalized in Czech psychiatric facilities between 2008 and 2012, and 402 of the inpatients committed suicide during the hospitalization or within the 2 months after the discharge. Highly elevated risks of suicides were found to be associated with being a male, having a history of multiple hospitalizations, and having a diagnosis of affective, anxiety, or personality disorder.

**Limitations:** Limitations are related to the design of the study, and its reliance on routinely collected data. Also, it was not possible to assess the odds of suicide associated with inpatient psychiatric hospitalization against the odds of suicide in general population.

**Conclusions:** During psychiatric treatment and recovery, suicidal behavior and idealization is increased. In psychiatry, hospitalization may be a risky period for suicide behavior. Suicide rates during and soon after the psychiatric hospitalization identified in this study from Central and Eastern Europe are similar to the findings from Western Europe. Preventive strategies should be tailored accordingly.

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## 1. Background

For several years, decreasing suicides amongst psychiatric patients have been a primary objective of European governmental programmes (Dennehy et al., 1996; Hadlaczky et al., 2012). The Swedish government, for instance, enforced a national suicide preventive program which considers the systematical analyses of all suicides occurring during and shortly after hospitalization as one of the key preventative strategies (Hadlaczky et al., 2012). Such a prioritization is widely supported by research, which shows that suicides are frequently committed in association with

inpatient psychiatric hospitalization (Goldacre et al., 1993; Mortensen et al., 2000; Reutfors et al., 2010). The risks are especially elevated in the first few weeks after discharge (Dennehy et al., 1996; Lee and Lin, 2009; Madsen and Nordentoft, 2013; Qin et al., 2002; Reutfors et al., 2010).

In addition, the findings of highly elevated risks of suicide in the first few weeks after discharge triggered the scientific investigation into both, risk and protective factors associated with suicides occurring during and shortly after psychiatric hospitalization (Lin et al., 2014). Moreover, qualities of instruments designed to predict suicide were tested, and the predictivity of MINI Suicidal Scale, for example, seems to be acceptable, especially for those with a recognized history of suicidal and selfharm experiences (Roaldset et al., 2012). Also, preventive programmes were tailored for those leaving mental health care facilities. Implementations of such programmes have brought about inconclusive results

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(Gunnell et al., 2012; Pitman and Caine, 2012), but it seems that follow-up contact after psychiatric hospitalization might be a good strategy to pursue (Luxton et al., 2013).

The Czech Republic, despite of being a high-income country, is among the European countries that do not have a national suicide prevention strategy. In fact, a national strategy for suicide prevention is not even under development, and no setting-specific program for those discharged from psychiatric facilities exists. Also, it is unclear to what extent suicides occur among those who are, or have recently been hospitalized for psychiatric reasons and whether there are elevated risks for some of the subgroups of these patients. A dearth of research on suicide among psychiatric patients is generalizable for the vast majority of post-communist Central and Eastern European countries. This gap in suicide research imposes a question: to what extent are findings from other regions valid in the context of Central and East Europe? This study aims to assess the rates of suicides among current and recently discharged psychiatric inpatients in the Czech Republic and to identify those who are at the highest risk of suicide. Researchers anticipate this information will make it possible to demonstrate the extent of a problem to stakeholders and to develop an effective plan to prevent suicides after hospitalization for psychiatric reasons in the Czech Republic.

## 2. Methods

### 2.1. Data and subjects

In the Czech Republic, every deceased person is examined by a physician who issues a *Death Certificate* and it is sent to the national Register Office. Based on this, the Register Office issues an official *Notification of death* which is then submitted to the Czech Statistical Office [CZSO] that maintains a database entitled, *Death* containing data on suicide since 1876. Every inpatient health facility is obliged to report all finished hospitalizations, which are collected and processed by the Institute for Health Information and Statistics.

The Czech database of all inpatient hospitalizations was utilized to extract all records of adult [above 18 years of age] hospitalizations in inpatient psychiatric facilities, i.e. psychiatric hospitals and psychiatric wards in other inpatient facilities, in the Czech Republic between the 1 January 2006 and 31 October 2012. The first date was used in order to allow for calculation of the overall number of inpatient psychiatric hospitalizations in two years preceding the last (index) hospitalization. The latter date was used in order to allow a period of 2 months between discharge from inpatient psychiatric facility and possible suicide to all of the subjects. The *Death* database was used to extract all records of suicides that occurred between 1 January 2008 and 31 December 2012. Then, both records were merged together on an individual level data basis.

Those who were hospitalized in a Czech inpatient psychiatric facility between 1 January 2008 and 31 October 2012 and committed suicide during hospitalization or within two months after hospitalization were defined as “cases”. Those who were hospitalized in a Czech inpatient psychiatric facility between 1 January 2008 and 31 October 2012 and did not commit suicide during hospitalization or within two months after hospitalization were defined as “controls”. Primary psychiatric diagnosis at the index hospitalization was categorized according to ICD-10: organic mental disorders [F00–F09], addictions [F10, F11–F19], psychosis [F20–F29], affective disorders [F30–F39], anxiety disorders [F40–F48], behavioral syndromes associated with physiological disturbances and physical factors [F50–F59], personality disorders [F60–F63, F68–F69] and other mental disorders [F64–F66, F70–F99].

### 2.2. Measures

#### 2.2.1. Statistical analysis

Descriptive statistics were conducted in order to characterize the sample in terms of age, gender, marital status, homelessness, occupation, type of the inpatient facility for the index hospitalization, length of the index hospitalization, number of hospitalizations in a two year period before the termination of the index hospitalization, and psychiatric diagnosis. Chi square tests were performed in order to assess the significance of differences in categories related to the above mentioned variables.

Multiple logistic regression analysis was utilized to assess odds of committing suicide for the categories where there were significant differences in distributions identified. The category related to subjects' employment status was transformed and subjects were divided into two groups, employed and unemployed. We did not include the type of the inpatient psychiatric facility and the length of stay of the index hospitalization into the regression model, as there were no significant differences in their distributions identified. We also did not include the category of homelessness as the results of descriptive statistics suggest that the data in this category are very likely unreliable. Statistical analysis were performed in SPSS.

## 3. Results

### 3.1. Participants

402 suicides during or within 2 months after hospitalization occurred among 137,290 adults hospitalized in the Czech inpatient psychiatric facilities between 1 January 2008 and 31 October 2012. Sociodemographics of both, cases and controls are described and *p*-Values of chi square tests for differences between the given categories are presented in [Table 1](#).

### 3.2. Outcomes

Significant differences in distributions in the following categories were identified via chi square tests on significance level 0.006 (Šidák correction of alfa level 0.05 for multiple comparisons was used): age, gender, marital status, occupation, number of hospitalizations in a two year period before the termination of the subject's index hospitalization, and psychiatric diagnosis [[Table 1](#)].

Thirty of all suicides [7.5%] occurred within the hospitalization, 36 [9%] occurred on the day of the discharge, 52 [12.9%] occurred within first three days after the discharge, 43 [10.7%], 44 [10.9%], 83 [20.6%] and 114 [28.4%] suicides followed between the 4th and 7th, 8th and 14th, 15th and 30th, and 30th and 60th day after the discharged from inpatient psychiatric facilities respectively. Chi square tests did not identify significant differences between those who committed suicide during the hospitalization and those who committed suicide within two months after the discharge.

Eleven [16.7%] of those who committed suicide either, during the hospitalization or on the day of discharge, died at home, 12 [18.2%] at hospital, 18 [27.3%] in other medical institution, 16 [24.2%] in a public place, 1 [1.5%] during transportation and 8 [12.1%] in another places. There were 83 suicides among those with affective disorders, and 46 [55.4%] of these were committed by those with major depressive disorder, single episode [F32]. Within the cohort of psychiatric inpatients hospitalized between 2008 and 2012 in the Czech Republic, at least two times elevated odds ratios of committing suicide during or shortly after psychiatric hospitalization has been found for males, those who have a history of multiple psychiatric inpatient hospitalizations, and

**Table 1**  
Sample characteristics.

		Cases		Controls		p-Value for $\chi^2$		
		n	%	n	%			
Age	18–29	45	11.1	24,129	17.7	< 0.001		
	30–39	83	20.6	25,181	18.3			
	40–49	98	24.5	22,851	16.7			
	50–59	83	20.6	23,757	17.3			
	60–69	59	14.7	15,161	11.1			
	70+	34	8.5	25,746	18.9			
Gender	Male	274	68.2	70,017	51.2	< 0.001		
	Female	128	31.8	66,871	48.8			
Marital status	Undisclosed	11	2.7	6183	4.5	< 0.001		
	Unmarried	110	27.4	45,425	33.2			
	Married	148	36.8	42,623	31.1			
	Divorced	106	26.4	25,451	18.6			
	Widowed	27	6.7	17,206	12.6			
Homelessness	Yes	0	0	106	0.1	0.577		
	No	402	100	136,782	99.9			
Occupation	Unemployed	267	66.4	102,826	75.1	0.001		
	Managers	22	5.5	3779	2.8			
	Researchers and headworkers	6	1.5	1070	0.8			
	THE professionals	22	5.5	4702	3.4			
	Lower admin workers	10	2.5	2914	2.1			
	Employed in services	27	6.7	7520	5.5			
	Farm and forest workers	2	0.5	593	0.4			
	Skilled workers	23	5.7	8147	6			
	Operating personnel	7	1.7	1570	1.2			
	Unskilled workers	16	4	3767	2.7			
	Inpatient facility	Psychiatric hospital	270	67.2	95,202		69.55	0.265
		Psych dept in general hosp	129	32.1	39,833		29.1	
		Other inpatient med facilities	3	0.8	1853		1.35	
	No. of hosp. within 2 years before IH <sup>a</sup>	0	207	51.5	90,125		65.8	< 0.001
		1	90	22.4	27,050		19.8	
2		48	12	10,578	7.7			
3		21	5.2	4666	3.4			
4		17	4.2	2120	1.6			
5 and more		19	4.7	2349	1.8			
Length of IH <sup>a</sup>	1–3 days	40	10	10,057	7.4	0.145		
	4–7 days	52	13	17,536	12.8			
	8–14 days	48	12	16,995	12.4			
	15–30 days	96	23.8	29,985	21.8			
	1–2 months	94	23.4	30,290	22.1			
	2–3 months	31	7.6	15,410	11.3			
	3–4 months	12	3	5893	4.3			
	4–6 months	9	2.2	4092	3			
	6–12 months	10	2.5	3163	2.3			
	1–3 years	4	1	2290	1.7			
	More than 3 years	6	1.5	1177	0.9			
	Psychiatric diagnosis	F00–F09	36	9	22,060		16.1	< 0.001
		F10, F11–F19	69	17.1	34,991		25.6	

**Table 1 (continued)**

		Cases		Controls		p-Value for $\chi^2$
		n	%	n	%	
	F20–F29	68	16.9	21,567	15.8	
	F30–F39	83	20.7	12,341	9	
	F40–F48	97	24.1	26,018	19	
	F50–F59	0	0	1027	0.8	
	F60–F63; F68–F69	35	8.7	7584	5.5	
	F64–F66, F70–F99	14	3.5	12327	9	
	Total		402	100	136,888	

<sup>a</sup> Index hospitalization.

**Table 2**

Logistic regression analysis for suicide risks among all psychiatric inpatients aged 18 years and older hospitalized in the Czech Republic from 1.1.2008 until 31.10.2012.

		OR	95% CI for OR		p-Value
			Lower	Upper	
Age	18–29	1			
	30–39	1.46	0.99	2.13	0.054
	40–49	<b>1.73</b>	<b>1.16</b>	<b>2.59</b>	<b>0.008</b>
	50–59	1.40	0.92	2.13	0.121
	60–69	<b>1.85</b>	<b>1.17</b>	<b>2.94</b>	<b>0.009</b>
	70+	1.04	0.58	1.86	0.906
Gender	Female	1			
	Male	<b>2.46</b>	<b>1.97</b>	<b>3.07</b>	<b>&lt; 0.001</b>
Marital status	Unmarried	1			
	Married	<b>1.38</b>	<b>1.02</b>	<b>1.87</b>	<b>0.039</b>
	Divorced	<b>1.54</b>	<b>1.12</b>	<b>2.11</b>	<b>0.008</b>
	Widowed	1.34	0.80	2.25	0.267
	Undisclosed	0.83	0.44	1.56	0.570
Employment status	Employed	1			
	Unemployed	<b>0.79</b>	<b>0.62</b>	<b>0.99</b>	<b>0.042</b>
No. of hospital within 2 years before IH <sup>a</sup>	0 hospitalization	1			
	1 hospitalization	<b>1.47</b>	<b>1.14</b>	<b>1.88</b>	<b>0.003</b>
	2 hospitalizations	<b>1.98</b>	<b>1.44</b>	<b>2.72</b>	<b>&lt; 0.001</b>
	3 hospitalizations	<b>2.01</b>	<b>1.27</b>	<b>3.17</b>	<b>0.003</b>
	4 hospitalizations	<b>3.62</b>	<b>2.19</b>	<b>6.00</b>	<b>&lt; 0.001</b>
	5 hosp. and more	<b>3.84</b>	<b>2.37</b>	<b>6.23</b>	<b>&lt; 0.001</b>
Diagnosis	F00–F09	1			
	F10, F11–F19	0.77	0.48	1.22	0.259
	F20–F29	1.51	0.95	2.40	0.079
	F30–F39	<b>3.24</b>	<b>2.09</b>	<b>5.02</b>	<b>&lt; 0.001</b>
	F40–F48	<b>2.13</b>	<b>1.37</b>	<b>3.31</b>	<b>0.001</b>
	F50–F59	0.00	0.00		0.991
	F60–F63; F68–F69	<b>2.00</b>	<b>1.19</b>	<b>3.38</b>	<b>0.009</b>
	F64–F66, F70–F99	0.70	0.37	1.30	0.256

Entered variables: age categories, gender, marital status, employment status, no. of hospitalizations within 2 years before the index hospitalization, diagnosis.

<sup>a</sup> Index hospitalization.

those having a diagnosis of affective, anxiety or personality disorders [Table 2].

#### 4. Discussion

There is a strong tradition of suicide research in Hungary (Balazs et al., 2006; Rihmer et al., 1990; Rihmer et al., 2013; Szanto

et al., 2007), and modest tradition of suicide research in Lithuania (Kalediene, 1999; Kalediene and Petrauskienė, 2004), Estonia (Varnik, 1991; Varnik et al., 2005), Slovenia (Oravec et al., 2007; Zihor and Zalar, 2006) and Czech Republic (Dzurova et al., 2008). However, no nation wide study based on individual data from registers has been conducted in the region of post-communist Central and Eastern Europe.

There are three findings which are at odds with the research from western countries. First, the relatively low prevalence of homeless people hospitalized in inpatient psychiatric facilities, which may suggest that homeless people have rather limited access to mental health care in the Czech Republic. Second, results suggest that unemployment decreases the odds of committing suicide. However, this finding is on the edge of statistical significance, and could be explained by the fact that the status of being unemployed includes also those who are retired. Third, the highest rate of suicides among those with affective disorders was found for the diagnosis of major depressive disorder, single episode [F32]. This is not in line with the findings from Denmark (Qin, 2011), where the diagnosis of major depressive disorder, recurrent [F33] was found to be the most risky.

Otherwise, the results reflect the studies published in the West in regard to: the prevalence of suicides during or after psychiatric hospitalization (Goldacre et al., 1993), the highly increased risk of committing suicide for affective disorders (Qin, 2011; Reutfors et al., 2010), the first days after a patient has been discharged (Madsen and Nordentoft, 2013; Reutfors et al., 2010), and male psychiatric patients (Reutfors et al., 2010). These findings imply that prevention programmes for those leaving psychiatric inpatient facilities should be targeted accordingly.

Pirkola et al. (2007) suggested that trends in suicides related to inpatient psychiatric hospitalization might be related to the structure of mental health care and that deinstitutionalization in Finland might have contributed to the decreasing rates of these suicides. The mental health care system in the Czech Republic on large asylums and a shift of the locus of care towards the community is still in progress (Hoeschl et al., 2012). The shifting of care is similar all over the region of post-communist Central and Eastern Europe (Semrau et al., 2011). The reform processes should be conducted with caution, substantial effort and investments should be dedicated to increasing capacities for care in the community in order to replicate the Finish success.

#### 4.1. Limitations

The limitations of this study are of three-fold. First, the case control study design implies that there is a medium risk of confounding (Prince et al., 2003). In the case control studies, matching may be used in the design stage to adjust for possible confounding. However, the rationale of this study is to identify those who are at the highest risk of suicide during and after inpatient psychiatric hospitalization, and matching would lead to the decreased flexibility in analysis (Wacholder et al., 1992). Also, the sample size in this study is large enough to justify the unmatched design [see Table 1] and the use of multivariable logistic regression to adjust for possible confounders in the analysis stage. Second, the completeness and accuracy of the data might have been limited too. The suitability of the Czech registers for scientific purposes has not been established yet, which means that data might be somewhat imprecise in a way which is not entirely predictable. Third, the study was restricted to the databases of deaths and inpatient psychiatric hospitalizations [F00–F99], which did not allow for the comparison of the odds of committing suicide between those who were hospitalized in inpatient psychiatric facilities and the Czech general population. This also did not allow us to look at suicide attempts [X60–X84] which followed psychiatric hospital

discharge. Compared to completed suicides, suicide attempts might have had a different distribution and this could influence the difference between cases and controls.

#### 4.2. Conclusion

This nation-wide case control study of suicides related to inpatient psychiatric hospitalization in the Czech Republic shows that males who have a history of multiple psychiatric inpatient hospitalizations and a diagnosis of affective, anxiety or personality disorders are especially prone to commit suicide during or shortly after psychiatric inpatient hospitalization. The results call for the systematic prevention interventions of suicides occurring shortly after psychiatric hospitalization.

#### Role of the funding source

The funding body had no role whatsoever as far as the design of the study, methodology used, data collection, data analysis, data interpretation or writing the article are concerned.

#### Conflict of interest

None of the authors has conflict of interest as in regard to this study.

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#### Appendix A Background stats

##### Chi square vs. Fisher's exact test

Contingency tables for sample characteristic might seem a bit unbalanced which could mean that assumptions for the use of asymptotic method were not satisfied. We used the Fisher's exact tests to assess the significance of differences in categories related to these variables. Since the results of exact methods were the same as those of the asymptotic ones, we have reported more common chi square tests in our paper.

##### Time of the suicide since the index hospitalization

See Table A1 and Fig. A1

##### Logistic regression model evaluation

All independent variables which were identified by chi square tests as statistically significant were included into the regression model. The Nagelkerke *R* square for this regression model was 0.05, which is not unusual in epidemiologically oriented studies. Neither, excluding any of these variables or including any of other independent variables, did not increase the value of *R* square and the model with all statistically significant independent variables was found out to be the most suitable one.

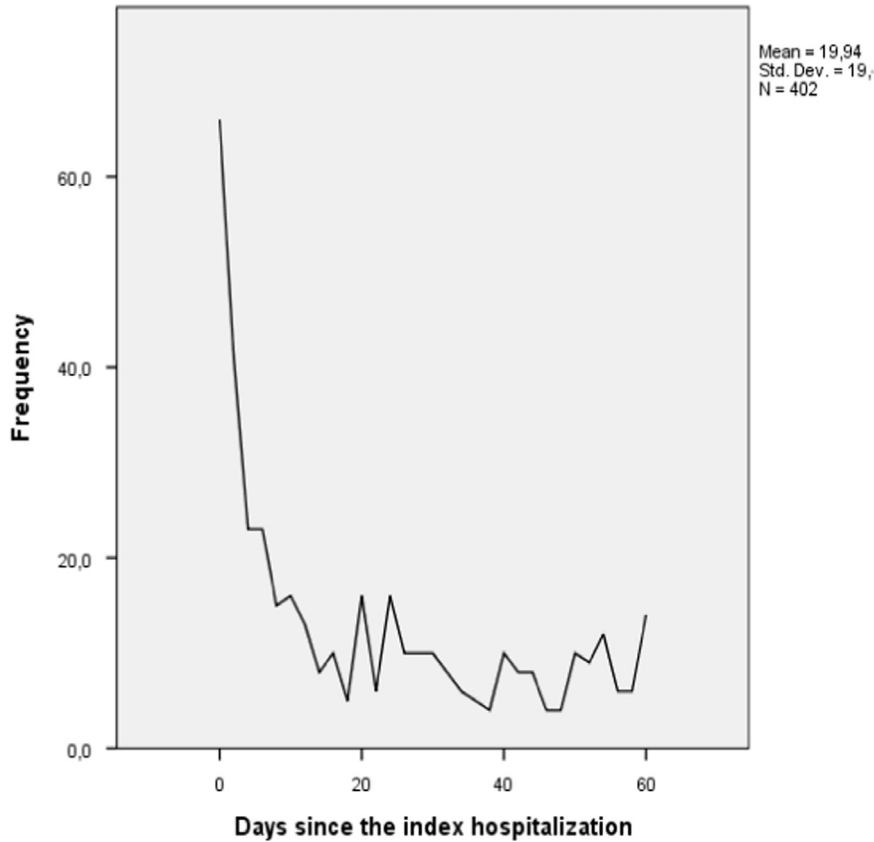
Entered variables	Nagelkerke <i>R</i> square
Age cat., gender, marital status, employment status, no. of hosp. within 2 years before IH <sup>a</sup> , diagnosis	0.05
Age cat., gender, marital status, employment status, diagnosis	0.04

Age cat., gender, marital status, no. of hosp. within 2 years before IH <sup>a</sup> , diagnosis	0.05
Age cat., gender, marital status, diagnosis	0.04
Age cat., gender, marital status, employment status, no. of hosp. within 2 years before IH <sup>a</sup> , length of stay of IH <sup>a</sup> , diagnosis	0.05

<sup>a</sup> Indexed hospitalization.

**Table A1**  
Time since the index hospitalization.

	n	%
Inpatient or the day of discharge	66	16.4
1–3 days	52	12.9
4–7 days	43	10.7
8–14 days	44	10.9
15–30 days	83	20.6
31–60 days	114	28.4
Total	402	100.0



**Fig. A1.** Frequency of suicides committed during hospitalization and within 60 days after the inpatient psychiatric hospitalization in CZ 2008–2012.

As the *p*-Value of Hosmer and Lemeshow test was 0.54 ( $\chi^2=7.0$ ; *df*=8) and the overall percentage in the classification table was 99.7, we considered this model to be applicable.

**Hosmer and Lemeshow test**

Chi-square	df	Sig.
7.007	8	.536

**Contingency table for Hosmer and Lemeshow test**

Suicide during hosp. or within 60 days after the discharge=0		Suicide during hosp. or within 60 days after the discharge=1		Total
Observed	Expected	Observed	Expected	
1 13,725	13723.0	5	7.0	13,730
2 13,714	13719.4	17	11.6	13,731
3 13,687	13682.8	12	16.2	13,699
4 13,908	13911.3	25	21.7	13,933



5	13,725	13724.6	26	26.4	13,751
6	13,750	13753.0	36	33.0	13,786
7	13,759	13751.6	32	39.4	13,791
8	13,693	13691.4	48	49.6	13,741
9	13,867	13863.5	67	70.5	13,934
10	13,060	13067.4	134	126.6	13,194

### Classification table

Observed	Predicted		Percentage correct
	Suicide during hospitalization or within 60 days after the discharge	0	
Suicide during hospitalization or within 60 days after the discharge	0	136,888	100.0
	1	402	0
Overall percentage			99.7

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