

# Premature Mortality Among Patients Recently Discharged From Their First Inpatient Psychiatric Treatment

Florian Walter, MSc; Matthew J. Carr, PhD; Pearl L. H. Mok, PhD; Aske Astrup, MSc; Sussie Antonsen, MSc; Carsten B. Pedersen, DrMedSc; Jenny Shaw, PhD; Roger T. Webb, PhD

**IMPORTANCE** Nationwide cohorts provide sufficient statistical power for examining premature, cause-specific mortality in patients recently discharged from inpatient psychiatric services.

**OBJECTIVE** To investigate premature mortality in a nationwide cohort of patients recently discharged from inpatient psychiatric treatment at ages 15 to 44 years.

**DESIGN, SETTING, AND PARTICIPANTS** This single-cohort design included all persons born in Denmark (N = 1 683 385) between January 1, 1967, and December 31, 1996. Exactly 48 599 of these Danish residents were discharged from an inpatient psychiatric unit or ward on or after their 15th birthday, which took place during this study's observation period from January 1, 1982, through December 31, 2011. This group of patients was followed up beginning on their 15th birthday until their death, emigration, or December 31, 2011, whichever came first. Individuals discharged from inpatient psychiatric care at least once before their 15th birthday (n = 5882) were excluded from the study. All data were obtained from the Danish Civil Registration System, Psychiatric Central Research Register, and Register of Causes of Death. Data analysis took place between February 1, 2016, and December 10, 2016.

**MAIN OUTCOMES AND MEASURES** Incidence rates and incidence rate ratios (IRRs) for all-cause mortality and for an array of unnatural and natural causes of death among patients recently discharged from an inpatient psychiatric unit vs persons not admitted to a psychiatric facility. Primary analysis considered risk within the year of first discharge.

**RESULTS** Of the 48 599 discharged patients who were included in the study, 25 006 (51.4%) were female, 35 660 (73.4%) were aged 15 to 29 years, and 33 995 (70.0%) had a length of stay of 30 days or less. Compared with persons not admitted, patients discharged had an elevated risk for all-cause mortality within 1 year (IRR, 16.2; 95% CI, 14.5-18.0). The relative risk for unnatural death (IRR, 25.0; 95% CI, 22.0-28.4) was much higher than for natural death (IRR, 8.6; 95% CI, 7.0-10.7). The highest IRR found was for suicide at 66.9 (95% CI, 56.4-79.4), followed by alcohol-related death at 42.0 (95% CI, 26.6-66.1). Among the psychiatric diagnostic categories assessed, psychoactive substance abuse conferred the highest risk for all-cause mortality (IRR, 24.8; 95% CI, 21.0-29.4). Across the array of cause-specific outcomes examined, risk of premature death during the first year after discharge was markedly higher than the risk of death beyond the first year of discharge.

**CONCLUSIONS AND RELEVANCE** Clinicians may help protect patients after discharge by serving as a liaison between primary and secondary health services to ensure they are receiving holistic care. Early intervention programs for drug and alcohol misuse could substantially decrease the greatly elevated mortality risk among these patients.

JAMA Psychiatry. doi:10.1001/jamapsychiatry.2017.0071  
Published online March 15, 2017.

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**Author Affiliations:** Centre for Mental Health and Safety, University of Manchester, Manchester, England (Walter, Carr, Mok, Shaw, Webb); Centre for Integrated Register-based Research at Aarhus University, Aarhus, Denmark (Astrup, Antonsen, Pedersen); National Centre for Register-based Research, Business and Social Sciences, Aarhus University, Aarhus, Denmark (Astrup, Antonsen, Pedersen).

**Corresponding Author:** Roger T. Webb, PhD, Centre for Mental Health and Safety, University of Manchester, Jean McFarlane Building, Oxford Road, Manchester M13 9PL, England (roger.webb@manchester.ac.uk).

**M**ental disorders are associated with an elevated risk of premature mortality.<sup>1-3</sup> The inpatient psychiatric capacity in Western countries has been shrinking for several decades,<sup>4-7</sup> shifting mental health treatment to community and other institutional settings.<sup>8</sup> Consequently, patients with psychiatric care needs are, generally, the most severely ill and have a markedly elevated risk of dying prematurely.<sup>9</sup> Evidence from national registry studies indicates that this mortality risk is especially high soon after discharge from inpatient psychiatric services.<sup>10,11</sup> Previous study populations have differed in country and regional settings, study designs, mortality outcomes assessed, and types of individuals examined. Whereas some studies used national registry data that included large numbers of discharged patients,<sup>10-13</sup> other investigations were based on data from a single hospital or a small sample of units.<sup>14-16</sup>

This investigation, conducted on a national cohort of persons aged 15 to 44 years, focused on the first year after discharge (short-term follow-up) instead of beyond the first year after discharge (long-term follow-up).<sup>13,15</sup> Furthermore, in contrast to previous research,<sup>11,14</sup> this study considered a broad array of psychiatric diagnostic categories, including substance abuse disorders. To identify cause-specific mortality risk among recently discharged inpatients, we assessed the following outcomes:

1. All-cause mortality
2. All unnatural and all natural deaths
3. Suicides and unintentional deaths
4. Specific natural causes
5. Alcohol-related deaths

Examination of alcohol-related deaths was an especially novel feature of the investigation. Consistent with existing literature, we hypothesized mortality risk to be highest during the period soon after discharge.<sup>10,16</sup> To maximize clinical relevance, we primarily considered risk within the first year of discharge. To better understand and contextualize short-term risk, however, we examined mortality beyond the first year—to a maximum of 30 years. In addition, we hypothesized elevated risk across the full range of cause-specific mortality, and we anticipated the relative risk for unnatural death to be greater than that for natural death.<sup>11-13,16</sup>

## Methods

### Study Cohort Description

Information for this study was obtained from the Danish Civil Registration System, which has captured vital status information on all Danish residents since 1968 and can be linked with other national registers in Denmark using personal identification numbers issued at birth or on immigration.<sup>17</sup> At the individual level, we linked the Civil Registration System data with information from the Psychiatric Central Research Register<sup>18</sup> and the Register of Causes of Death.<sup>19</sup> For further information regarding the study data, see eAppendix 1 in the [Supplement](#). In accordance with Denmark's Act on Processing of Personal Data, anonymity and confidentiality were strictly maintained—for example, by replacing personal identifica-

### Key Points

**Question** How does the risk of dying prematurely among people recently discharged from psychiatric inpatient services compare with the risk among people never admitted for psychiatric treatment?

**Findings** In this national, register-based cohort study of 1 683 385 Danish residents, 48 599 of whom were discharged from inpatient psychiatric care for the first time, the risk of dying prematurely within the first year of discharge was 16 times higher than the risk for those who were not admitted to a psychiatric facility.

**Meaning** Because the risk of premature death from a range of natural and unnatural causes is markedly elevated for this patient population, clinicians, academics, and public health specialists need to carefully consider the multiple mechanisms for premature death that are likely implicated.

tion numbers with randomly generated identifiers. This study was approved by the Danish Data Protection Agency, and data access was granted by the State Serum Institute and Statistics Denmark. Because this investigation used only registry data, it did not need approval from the Danish National Committee on Health Research Ethics. Patient informed consent is not necessary because registry information is routinely collected, and Danish legislation allows the use of this information for research purposes.

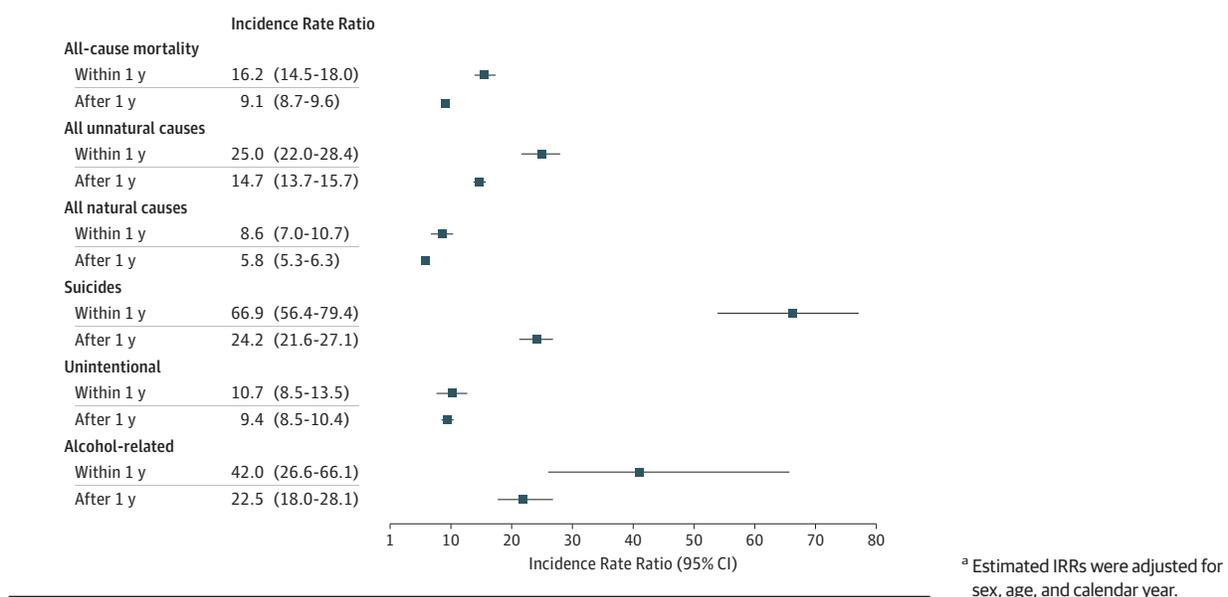
Cohort members (N = 1 683 385) were born in Denmark between January 1, 1967, and December 31, 1996; were alive and residing in the country on their 15th birthday; and had parents who were also Danish-born to eliminate the potential for confounding because of elevated psychopathology risk among immigrants.<sup>20</sup> Persons discharged from inpatient psychiatric care at least once before their 15th birthday (n = 5882) were excluded. Follow-up of cohort members commenced on their 15th birthday and was terminated on their death, emigration, or December 31, 2011, whichever came first. Within this single-cohort design, we identified individuals who experienced their first discharge from an inpatient psychiatric unit or a psychiatric ward in a general hospital during the study observation period from January 1, 1982, through December 31, 2011. We compared this exposure group with the remaining members of the cohort who had not experienced psychiatric admission (the reference group) (eAppendix 2 [which describes the fictitious person depicted in the eFigure] in the [Supplement](#)).

### Outcomes

Using the Danish Register of Causes of Death, we classified the underlying causes of death according to the *International Classification of Diseases, Eighth Revision (ICD-8)*<sup>21</sup> and *Tenth Revision (ICD-10)*<sup>22</sup> codes:

- Unnatural death: *ICD-8* E800-E999 and *ICD-10* V01-Y98
- Natural death: all other *ICD-8* and *ICD-10* codes
- Accidental death: *ICD-8* E800-E949 and *ICD-10* V01-X59 and Y85-Y86
- Suicide: *ICD-8* E950-E959 and *ICD-10* X60-X84 and Y87.0
- Unnatural death of undetermined intent: *ICD-8* E980-E989 (excluding E988.8) and *ICD-10* Y10-Y34 (excluding Y33.9) and Y87.2

**Figure. Incidence Rate Ratios (IRRs)<sup>a</sup> for All-Cause and Cause-Specific Mortality Within 1 Year and After 1 Year of First Discharge From Inpatient Psychiatric Care**



- Alcohol-related death: *ICD-10* F10, G31.2, G62.1, I42.6, K29.2, K70, K73, K74 (excluding K74.3-K74.5), K86.0, X45, X65, and Y15. (These codes were based on *International Classification of Diseases, Ninth Revision [ICD-9]* and *Tenth Revision [ICD-10]*, as defined by the Office for National Statistics for England and Wales.<sup>23</sup> Because *ICD-9* was never implemented in Denmark, only alcohol-related deaths that were assigned *ICD-10* codes and that occurred in 1994 and later years were included [eTable 1 in the Supplement]).

### Covariates

Time since first discharge, admission type (voluntary vs involuntary), and psychiatric diagnosis at first admission were obtained from the Danish Psychiatric Central Research Register. Primary and secondary diagnoses were classified using *ICD-8* and *ICD-10* codes as in previous Danish registry studies, following the *ICD-10* hierarchy<sup>24</sup> (eTable 2 in the Supplement). We have reported separate relative risks according to these covariates; adjustment for the potential confounding influences of sex, age, and time period is explained in the next subsection.

### Statistical Analyses

Data analysis took place between February 1, 2016, and December 10, 2016. We calculated incidence rates and incidence rate ratios (IRRs) to compare the mortality risk between individuals following their first discharge from inpatient psychiatric care and persons not admitted to a psychiatric unit. For persons recorded as dying on the same day as their discharge date, we could not distinguish whether the death happened before or after discharge; we delineated these cases as occurring before discharge. Aggregated person-time was modeled using Poisson regression to estimate IRRs and their 95% CIs, with adjustment for potential

confounding by sex and by age and calendar year fitted as time-dependent variables, which were categorized as 5-year bands. All analyses, except for the comparison of “within 1 year” with “after 1 year” after discharge (Figure), were restricted to deaths occurring within the first 365 days after discharge. We tested for Poisson overdispersion by additionally fitting negative binomial regression models<sup>25</sup> and comparing them with the originally fitted Poisson models. After sex, age, and calendar year adjustment, none of the models were overdispersed (eg, all-cause mortality among all persons: likelihood ratio test,  $P = .50$ ).

## Results

### Descriptive Statistics

The cohort consisted of 1 683 385 persons, of whom 48 599 were discharged from inpatient psychiatric care on or after their 15th birthday (from January 1, 1982, through December 31, 2011). There was a slight preponderance of female patients (25 006 [51.4%]) experiencing first discharge, almost three-quarters of patients (35 660 [73.4%]) were aged 15 to 29 years, and most patients (33 995 [70.0%]) had a length of stay of 30 days or less (Table 1). Most of these patients (45 643 [93.9%]) were admitted voluntarily, and one-fifth (9750 [20.1%]) had a history of attempted suicide before their first discharge. See eTable 3 in the Supplement for prevalence estimates of the physical illnesses delineated by the Charlson Comorbidity Index<sup>28</sup> for persons discharged from inpatient psychiatric care as well as for a randomly sampled age- and sex-matched comparison group. The prevalence of these conditions was greater among the postdischarge group (eAppendix 3 in the Supplement describes the methods used to generate these results).

**Table 1. Sociodemographic and Clinical Characteristics of Patients Experiencing First Discharge From Inpatient Psychiatric Care**

Characteristic	No. (%) (n = 48 599)
<b>Sex</b>	
Male	23 593 (48.6)
Female	25 006 (51.4)
<b>Age at first discharge, y</b>	
15-19	12 345 (25.4)
20-24	13 503 (27.8)
25-29	9812 (20.2)
30-34	7222 (14.9)
35-39	4286 (8.8)
≥40	1431 (2.9)
<b>Psychiatric diagnostic category</b>	
Psychoactive substance abuse	10 208 (21.0)
Schizophrenia and related disorders	7469 (15.4)
Mood disorders	10 828 (22.3)
Neurotic, stress-related, and somatoform disorders	11 809 (24.3)
All other disorders combined	8285 (17.0)
Comorbid mental illness + substance abuse diagnoses	5427 (11.2)
<b>Type of admission<sup>a</sup></b>	
Voluntary	45 643 (93.9)
Involuntary	2941 (6.1)
<b>Length of stay</b>	
≤7 d	21 247 (43.7)
8-30 d	12 748 (26.2)
31 d to 6 mo	12 997 (26.7)
>6 mo	1607 (3.3)
History of attempted suicide before first discharge <sup>b</sup>	9750 (20.1)

<sup>a</sup> Admission type was not recorded for 15 persons, who were omitted from the denominator for this prevalence estimate.

<sup>b</sup> Cases of attempted suicide were delineated using a previously applied algorithm<sup>26</sup> with data extracted from the Danish Psychiatric Central Research Register<sup>18</sup> and the Danish National Patient Register.<sup>27</sup>

**Incidence Rate Ratios for All-Cause Mortality and for All Unnatural and Natural Deaths**

People discharged from inpatient psychiatric services for the first time were at markedly elevated risk of dying prematurely than were individuals not admitted to psychiatric units (Table 2). All-cause mortality risk was 16 times higher in the first follow-up year (IRR, 16.2; 95% CI, 14.5-18.0), and no statistically significant evidence of a sex difference was observed ( $\chi^2 = 0.4$ ;  $P = .51$ ). Discharged persons had a much greater risk for unnatural deaths compared with those not admitted (IRR, 25.0; 95% CI, 22.0-28.4), with women having a higher relative risk than men (men: IRR, 21.8; 95% CI, 18.7-25.3; women: IRR, 39.0; 95% CI, 30.6-49.6) ( $\chi^2 = 13.0$ ;  $P < .001$ ). The relative risk of dying from natural causes was considerably lower than that from unnatural causes (IRR for dying from natural causes, 8.6; 95% CI, 7.0-10.7). Unlike in unnatural causes, no marked sex difference in relative risk was observed in natural deaths ( $\chi^2 = 0.0$ ;  $P = .95$ ). Table 3 presents the relative risks for all-cause mortality estimated separately according to salient clinical characteristics. Risks were highest among individuals who were diagnosed at first inpatient episode with psychoactive substance abuse disorders (IRR, 24.8; 95% CI, 21.0-29.4) and among those who were admitted involuntarily (IRR, 30.0; 95% CI, 22.4-40.2); risks were also greatest during the first month after discharge (IRR, 32.9; 95% CI, 25.5-42.5). Patients with comorbid substance abuse and mental illness diagnoses (IRR, 21.2; 95% CI, 16.4-27.3) were at higher risk than those with only a mental illness diagnosis (IRR, 13.1; 95% CI, 11.4-15.1). Similar patterns were observed regarding the risk of unnatural and natural death among persons discharged for the first time from inpatient psychiatric services vs those not admitted (eTables 4 and 5 in the Supplement).

**Incidence Rate Ratios for Cause-Specific Mortality**

Of the 245 cases of unnatural death within 1 year of first discharge, most (146 [59.6%]) were suicides (Table 4). Among all the specific causes examined, relative risk was highest for

**Table 2. Incidence Rate Ratios (IRRs) for All-Cause Mortality and Unnatural and Natural Deaths Within 1 Year After First Discharge From Inpatient Psychiatric Care**

Type of Death	Patients Discharged (n = 48 599)		Persons Without Psychiatric Admission (n = 1 634 786)		IRR (95% CI) <sup>a</sup>
	No. of Deaths	Incidence Rate per 100 000 Person-years	No. of Deaths	Incidence Rate per 100 000 Person-years	
<b>All-cause mortality<sup>b</sup></b>					
All persons	340	777.9	12 769	49.7	16.2 (14.5-18.0)
Male	231	1090.8	9040	68.8	15.8 (13.9-18.0)
Female	109	483.8	3729	29.7	17.2 (14.2-20.8)
<b>Unnatural death<sup>c</sup></b>					
All persons	245	560.6	6283	24.5	25.0 (22.0-28.4)
Male	174	821.7	5163	39.3	21.8 (18.7-25.3)
Female	71	315.1	1120	8.9	39.0 (30.6-49.6)
<b>Natural death<sup>d</sup></b>					
All persons	89	203.6	6037	23.5	8.6 (7.0-10.7)
Male	52	245.6	3535	26.9	8.7 (6.6-11.4)
Female	37	164.2	2502	19.9	8.6 (6.2-11.9)

<sup>a</sup> Estimated IRRs were adjusted for sex, age, and calendar year. Sex-specific IRRs were adjusted for age and calendar year.

<sup>b</sup> No significant interaction was observed between outcome and sex.

<sup>c</sup> Significant interaction was observed between outcome and sex ( $P < .001$ ).

<sup>d</sup> No significant interaction was observed between outcome and sex.

**Table 3. Incidence Rate Ratios (IRRs) for All-Cause Mortality by Clinical Subgroups Within 1 Year After First Discharge From Inpatient Psychiatric Care**

Clinical Subgroup	Patients Discharged (n = 48 599)		IRR (95% CI) <sup>a</sup>
	No. of Deaths	Incidence Rate per 100 000 Person-years	
All discharged patients	340	777.9	16.2 (14.5-18.0)
Time since discharge, d			
1-30	59	1576.3	32.9 (25.5-42.5)
31-90	69	945.3	19.7 (15.5-25.0)
91-180	75	690.3	14.4 (11.4-18.0)
181-365	137	628.5	13.0 (11.0-15.4)
Psychiatric diagnostic category			
Psychoactive substance abuse	138	1493.7	24.8 (21.0-29.4)
Schizophrenia and related disorders	53	837.8	16.7 (12.7-21.9)
Mood disorders	52	535.6	12.3 (9.4-16.2)
Neurotic, stress-related, and somatoform disorders	54	494.5	11.0 (8.4-14.3)
All other disorders combined	43	572.4	13.6 (10.1-18.3)
Mental illness and substance abuse comorbidity			
Mental illness diagnosis only	202	588.7	13.1 (11.4-15.1)
Substance abuse diagnosis only	79	1723.7	27.5 (22.1-34.4)
Mental illness + substance abuse diagnoses	59	1226.1	21.2 (16.4-27.3)
Type of admission			
Voluntary	295	717.4	15.1 (13.4-16.9)
Involuntary	45	1747.7	30.0 (22.4-40.2)

<sup>a</sup> Estimated IRRs were adjusted for sex, age, and calendar year.

**Table 4. Incidence Rate Ratios for Death by Specific Causes Within 1 Year After First Discharge From Inpatient Psychiatric Care**

Specific Cause of Death	Patients Discharged (n = 48 599)		Persons Without Psychiatric Admission (n = 1 634 786)		IRR (95% CI) <sup>a</sup>
	No. of Deaths	Incidence Rate per 100 000 Person-years	No. of Deaths	Incidence Rate per 100 000 Person-years	
Unnatural death					
Suicide	146	334.1	1362	5.3	66.9 (56.4-79.4)
Unintentional	72	164.7	4395	17.1	10.7 (8.5-13.5)
All other unnatural deaths combined	27	61.8	526	2.0	30.3 (20.6-44.7)
Natural death, by ICD-8 and ICD-10 chapter heading					
Infections and parasitic diseases	7	16.0	239	0.9	21.0 (9.9-44.6)
Neoplasms	16	36.6	2191	8.5	4.3 (2.6-7.0)
ENM diseases	8	18.3	358	1.4	12.6 (6.2-25.3)
Mental disorders	13	29.7	197	0.8	35.8 (20.4-62.9)
Circulatory system diseases	10	22.9	938	3.7	6.0 (3.2-11.3)
Digestive system diseases	14	32.0	273	1.1	28.9 (16.9-49.4)
Unspecified conditions	10	22.9	587	2.3	10.1 (5.4-18.8)
All other natural causes combined	11	25.2	1254	4.9	5.3 (3.0-9.7)

Abbreviations: ENM, endocrine, nutritional, and metabolic; ICD-8 and ICD-10, International Classification of Diseases, Eighth Revision and International Classification of Diseases, Tenth Revision; IRR, incidence rate ratio.

<sup>a</sup> Estimated IRRs were adjusted for sex, age, and calendar year.

suicide (IRR, 66.9; 95% CI, 56.4-79.4), with a strong sex interaction ( $\chi^2_1 = 24.5$ ;  $P < .001$ ): female IRR, 158.4 (95% CI, 114.1-219.9) vs male IRR, 52.9 (95% CI, 43.1-65.0). Risk of dying unintentionally was 10 times higher for persons discharged than for those not admitted (IRR, 10.7; 95% CI, 8.5-13.5), with no evidence of a sex interaction ( $\chi^2_1 = 0.6$ ;  $P = .42$ ). For all other unnatural causes combined (n = 27), almost all of which were

deaths of undetermined intent, the risk was 30 times higher among discharged persons (IRR, 30.3; 95% CI, 20.6-44.7). Compared with persons without inpatient admission, patients who were discharged were also at greater risk for each type of natural cause of death we examined, including (in order of elevations in risk) death by mental disorders, digestive system diseases, and infections and parasitic diseases. Of the 13 former

inpatients whose death was classified as being caused by a mental disorder, 9 (69.2%) died of illicit drug and alcohol misuse or dependence syndromes (IRR, 31.8; 95% CI, 16.2-62.35), and 9 of 14 deaths (64.3%) from digestive system diseases were attributed to alcohol-induced conditions. Human immunodeficiency virus (HIV) cases accounted for most of the 7 deaths from infections and parasitic diseases among recently discharged inpatients (IRR, 71.4; 95% CI, 25.3-201.3). Because HIV codes were unavailable in ICD-8, our analysis of this particular area was restricted to discharges occurring from 1994 onward. As was seen among individuals who were not admitted, the highest natural cause incidence rate observed among people who were discharged was for neoplasms (36.6 per 100 000 person-years at risk), although the elevation in risk was smaller than those for most of the other natural causes.

### Incidence Rate Ratios for Short-term vs Long-term Follow-up

In a comparison of the relative risk of dying between the first year after discharge (short-term follow-up) and beyond the first year after discharge (long-term follow-up), greater risk elevations for most cause-specific mortality categories were observed within the first year (Figure). Suicide represented the greatest differential between short-term (IRR, 66.9; 95% CI, 56.4-79.4) and long-term (IRR, 24.2; 95% CI, 21.6-27.1) follow-up. The Figure also presents large IRRs for alcohol-related death; the IRR point estimate for this category was almost twice as high in the short-term follow-up (IRR, 42.0; 95% CI, 26.6-66.1) as in the long-term follow-up (IRR, 22.5; 95% CI, 18.0-28.1).

## Discussion

### Summary of Findings

This national cohort study examined the full array of cause-specific mortality outcomes among patients recently discharged from inpatient psychiatric services. Compared with persons not admitted, these patients were at elevated risk for all types of mortality examined, and their risk for unnatural death soon after discharge was much greater than the risk for dying naturally. Clinical subgroups with particularly high risk included persons who were admitted involuntarily and those who had substance abuse disorders. The greatest relative risk observed was for suicide, followed by alcohol-related death. Among the natural causes of death, mental disorders and digestive diseases had the largest IRRs; these excess risks were largely explained by substance abuse disorders and alcohol-induced conditions, respectively. The large IRR for fatal infectious diseases can be explained by a preponderance of HIV cases,<sup>29</sup> although the number of observed deaths for this outcome was small. Death by neoplasm had the highest incidence among natural causes, but the elevation in risk for patients who were discharged was relatively modest, with a 4-fold increase over the risk observed for those not admitted. Risk of dying within the first year following first discharge from inpatient psychiatric care was consistently greater than the risk after 1 year, and

the differential in relative risk between these 2 periods was especially marked for suicide.

### Comparison With Existing Evidence and Interpretation

Our findings mostly concur with the published literature on premature mortality among patients discharged from inpatient psychiatric services. Several studies have reported that these patients are at high risk for dying prematurely<sup>10-16</sup> and that their risk of dying from unnatural causes is greater than that from natural causes.<sup>11-13,16</sup> The main reason for this finding is that suicide risk is high among this patient population.<sup>11-13,15,16</sup> A 10-fold increased risk for unintentional death among persons with mental illness has been reported,<sup>30-32</sup> although, to our knowledge, unintentional death specifically during the postdischarge period has not been highlighted in any published studies. One possible explanation for this elevated risk is comorbid substance abuse and mental illness diagnoses<sup>30</sup>; sleeping problems and chronic fatigue may also place former inpatients at greater risk for serious unintentional injuries.<sup>33,34</sup> Furthermore, intentional self-poisoning may often be misclassified as an unintentional poisoning.<sup>35</sup>

In earlier studies, suicide and attempted suicide risks after discharge were reported as being elevated.<sup>10,36</sup> Our study indicated that relative risks for suicide, and all of the other causes of death examined, decreased over time but remained elevated nonetheless. Incomplete recovery, exposure to stress, suboptimal professional care, and access to means of suicide are possible explanations for this postdischarge risk.<sup>10</sup> Stigma surrounding psychiatric disorders, resulting in reluctance to seek professional help, has also been considered a factor.<sup>37,38</sup> In our study, the period shortly after discharge was when suicide and other unnatural or natural deaths were most likely to occur, especially among those individuals diagnosed with psychoactive substance abuse disorders. We found that a large proportion of postdischarge deaths were directly or indirectly attributable to substance abuse.

Our study found a markedly elevated risk of death from cancer among patients recently discharged from psychiatric hospitalization. Although the relative risk was the lowest among the natural causes of death we examined, the association was nonetheless substantial; this is a topic that has been much debated in the existing literature, with inconsistent findings reported.<sup>16,39,40</sup> Further research is needed to identify the types of cancer most commonly linked with premature, postdischarge deaths in this patient population.

### Strengths and Limitations

The main strength of this study is that it examined a comprehensive array of cause-specific mortality outcomes in the context of a range of psychiatric diagnoses. In addition, it used high-quality Danish registry data<sup>17</sup> and a large study cohort, enabling us to report on rare causes of death with statistical power and precision. An important limitation, which this study has in common with other registry studies,<sup>41</sup> is the scarcity of explanatory variables available. Specifically, we could not identify fatalities that happened on the same day a person was discharged from inpatient psychiatric care, which may have caused us to slightly underestimate the postdischarge rela-

tive risk. Furthermore, we could not distinguish between psychiatric unit types (eg, acute adult vs forensic), whether a patient was formally discharged or had absconded,<sup>42</sup> or whether a patient was discharged into the community or to another institution. Another study limitation is that, although we investigated 48 599 persons after their first discharge from inpatient psychiatric care, we lacked adequate power to examine specific psychiatric diagnostic categories, such as unipolar depression and bipolar disorder (which fall under the mood disorders category). A final limitation is that the maximum follow-up age was 44 years, which precludes the application of our findings to middle-aged and older patients. For example, suicide is less likely to be numerically predominant as a cause of death among persons discharged from inpatient psychiatric care across the entire adult age range through maturity and older age.<sup>11</sup>

## Conclusions

This study adds value to the existing literature in several ways. First, to our knowledge, we conducted the most comprehensive study to date of cause-specific natural and unnatural mortality in this patient population. Second, we examined alcohol-related death, an outcome that is underrepresented in the literature, and considered substance abuse disorder as a psy-

chiatric diagnostic category in contrast to previous studies that examined restricted sets of psychiatric diagnoses, such as schizophrenia and bipolar disorder.<sup>11</sup> Last, we focused on premature mortality risk within the year after discharge, the period of greatest clinical relevance.

For patients hospitalized with psychiatric disorders, the time shortly after discharge is the period in which they are at the highest risk for premature death from a variety of causes. Clinicians should keep these patients safe by serving as a liaison between primary and secondary health care services to ensure patients are receiving holistic care that meets their physical and mental health needs as well as addresses their psychosocial problems. Mental health facilities and their partner agencies need to work proactively and in unison to determine the risks likely to reemerge or become exacerbated at discharge and to provide extra support to ameliorate the greatly elevated risk of unnatural death. Patients with alcohol and drug use disorders and those admitted involuntarily should be monitored particularly closely, interventions targeting substance abuse should be offered to patients at early stages of their treatment, and dedicated care coordinators should provide appropriate levels of clinical surveillance. Given that risk is markedly elevated for so many causes of death, and especially so soon after discharge, clinicians, academics, and public health specialists should carefully consider the multiple mechanisms for premature death that are likely implicated.

## ARTICLE INFORMATION

**Accepted for Publication:** January 10, 2017.

**Published Online:** March 15, 2017.

doi:10.1001/jamapsychiatry.2017.0071

**Author Contributions:** Mr Walter had full access to all the data in the study and takes full responsibility for the integrity of the data and the accuracy of the data analysis.

**Study concept and design:** Walter, Carr, Mok, Astrup, Pedersen, Shaw, Webb.

**Acquisition, analysis, or interpretation of data:** All authors.

**Drafting of the manuscript:** Walter.

**Critical revision of the manuscript for important intellectual content:** Walter, Carr, Mok, Astrup,

Antonsen, Pedersen, Shaw, Webb.

**Statistical analysis:** Walter, Carr.

**Obtained funding:** Webb.

**Administrative, technical, or material support:**

Astrup, Antonsen, Pedersen, Webb.

**Study supervision:** Pedersen, Shaw, Webb.

**Conflict of Interest Disclosures:** None reported.

**Funding/Support:** This study was funded by a Medical Research Council Doctoral Training Partnership PhD studentship (Mr Walter) and by European Research Council starting grant 335905 (Dr Webb).

**Role of the Funder/Sponsor:** The funding sources had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

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