

Homicide in discharged patients with schizophrenia and other psychoses

A national case-control study

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Seena Fazel¹, Petra Buxrud², Vladislav Ruchkin³, Martin Grann²

Author Affiliations:

¹Department of Psychiatry, University of Oxford, Warneford Hospital, Oxford, UK;

²Centre for Violence Prevention, Karolinska Institutet, Stockholm, Sweden;

³Department of Social and Forensic Psychiatry, Division of Neuroscience, Karolinska Institutet, Stockholm, Sweden; and Forensic Psychiatric Clinic Sater, Sater, Sweden

Location of work:

Centre for Violence Prevention, Karolinska Institutet, Stockholm, Sweden.

Correspondence:

Dr Seena Fazel, University Department of Psychiatry, Warneford Hospital, Oxford OX3 7JX, UK. Tel: +44-1865226447; Fax: +44-1865793101; Email: seena.fazel@psych.ox.ac.uk

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ABSTRACT

Objective: To investigate factors associated with homicide after discharge from hospital in patients with schizophrenia and other psychoses.

Design: All homicides committed by patients with psychosis within 6 months of hospital discharge were identified in Sweden from 1988-2001 and compared with patients with psychoses discharged over the same time period who did not subsequently commit any violent offences. Medical records were then collected, and data extracted using a validated protocol. Inter-rater reliability tests were performed on a subsample, and variables with poor reliability excluded from subsequent analyses.

Results: We identified 47 cases who committed a homicide within 6 months of discharge, and 105 controls who did not commit any violent offence after discharge. On univariate analyses, clinical factors on admission associated with homicide included evidence of poor self-care, substance misuse, and being previously hospitalized for a violent episode. Inpatient characteristics included having a severe mental illness for one year prior to admission. After-care factors associated with homicide were evidence of medication non-compliance and substance misuse. The predictive validity of combining two or three of these factors was not high. Depression appeared to be inversely associated with homicide, and there was no relationship with the presence of delusions or hallucinations.

Conclusions: There are a number of potentially treatable factors that are associated with homicide in schizophrenia and other psychoses. Associations with substance misuse and treatment compliance could be the focus of therapeutic interventions if validated in other samples. However, their clinical utility in violence risk assessment remains uncertain.

Key words: schizophrenia/psychotic disorders/homicide/violence/case-control.

1. INTRODUCTION

Between 10-20 % of homicide perpetrators have psychosis (Eronen et al., 1996; Fazel and Grann 2004), an increased risk for homicide of around 20 times in individuals with schizophrenia and other psychoses compared with general population controls (Fazel et al., 2009). Although risk factors for violence in individuals with schizophrenia have been studied (Walsh et al., 2004; Soyka et al., 2007), little is known about what factors are associated with homicide in psychosis. Clinical studies investigating homicide perpetrators have focused on clinical characteristics, but without appropriate comparison groups, they are not able to explore potential risk factors. Within-group designs have demonstrated comorbid substance abuse significantly increases the risk of homicide in individuals with schizophrenia (Eronen et al., 1996; Schanda et al., 2004). In addition, there is evidence that treatment mediates risk. Those with first episode psychosis have higher rates of homicide than individuals after their first episode (Nielssen and Large 2008).

Therefore, we aimed to undertake a case control study to investigate factors associated with homicide after discharge from psychiatric hospital in individuals with psychosis. This design has two advantages. First, it allows identification of factors that distinguish patients who were at future risk at committing homicide from patients who were not. Second, by investigating homicide only after discharge from hospital, it has the potential to inform clinical risk assessment. To our knowledge, this is the first such study that uses a control population with psychosis. We hypothesized that important factors associated with homicide in schizophrenia would be potentially treatable.

2. METHODS

In Sweden, all residents are given a 10-digit unique identification number making linking of data in national registers possible. We linked two nationwide population-based registries in Sweden: The Hospital Discharge Registry (HDR; held at the National Board of Health and Welfare), and the National Crime Register (National Council for Crime Prevention).

The Hospital Discharge Register monitors all psychiatric hospitals and is the largest inpatient register worldwide. Reporting to the register is compulsory for all healthcare providers, including secure psychiatric hospitals and private hospitals. All patients are given one or more clinical diagnoses on discharge according to the *International Classification of Diseases* (ICD) revisions 9 (through 1996) and 10 (from 1997) registered by their unique identification number. The register is of high quality: of the 1,421,795 discharges from hospital for psychiatric diagnoses from 1988 through 2000, no personal identification number was available in 13,669 discharge episodes (1.0%) (Fazel and Grann 2006). Furthermore, this register has been demonstrated to be valid and reliable for diagnoses of psychosis (e.g., 86% of those diagnosed with schizophrenia had the same diagnosis confirmed by a file-based review by psychiatrists (Dalman et al., 2002)). Swedish HDR schizophrenia diagnoses show good concordance rates ($\kappa > 0.70$) with diagnoses based on OP-CRIT record review (a 90-item checklist of signs and symptoms generating DSM and ICD diagnoses developed for use in both European and US samples (Williams et al., 1996)) and interview (generating a DSM-IV diagnosis of schizophrenia) (Ekholm et al., 2005). For the purposes of this study, psychosis was defined as schizophrenia, bipolar affective disorder, and other psychoses (including drug-induced psychoses). Diagnoses were based on the principal discharge diagnosis of the first admission during the study period. For schizophrenia, these were 295 (except 295.7) (ICD-9) and F20 (ICD-10); for bipolar affective disorder, these were 296.0, 296.2-6 (ICD-9) and F31 (ICD-10); and for other psychoses, these were 291, 292, 295.7, 296.1, 296.8-9, 297, 298 (ICD-9) and x.5 in F10-F19, F21-F29, F32.3, F33.3 (ICD-10).

The Crime Register includes conviction data on all persons aged 15 (the age of criminal responsibility) and older. Conviction data were used because the Criminal Code in Sweden determines that individuals are convicted as guilty regardless of mental illness (i.e., being judged as not guilty by reason of insanity is not possible). Thus, conviction data included persons individuals transferred to forensic hospital (e.g. in individuals who were psychiatrically assessed and thought to have suffered from psychosis at the time of the offense). In addition, as plea-bargaining is not permitted in the Swedish legal system, conviction data more accurately reflect the extent of officially resolved criminality in the population. The crime register has total national coverage – only 0.05% of all registered convictions had incomplete personal identification numbers during 1988-2000 (Fazel and Grann 2006).

Homicide was defined as convictions for murder, manslaughter, attempted murder and attempted manslaughter, but not infanticide.

The proportion of homicides leading to conviction in Sweden was 69% over the period of the study, although this figure refers to all homicides rather than solely those committed by individuals with mental illness (Swedish National Council for Crime Prevention 2008).

2.1 Study design – identification of cases

We used a case control design as the outcome, homicide, is rare. Using the Crime Register, we identified all individuals convicted of homicide in Sweden during 1988-2001. Homicide convictions do not include infanticide. We merged the personal identification numbers of these homicide offenders with the HDR to identify those with schizophrenia or other psychoses. We then limited the cases to those who had been discharged from psychiatric hospital in the 6 months prior to the homicide date. We used the date of the offence (instead of arrest or conviction dates as these may occur at various times after the offence) and identified 47 cases. We requested the medical records of these 47 cases, and received them all. Four of these cases were discharged from high security hospitals, and the remainder from general psychiatric hospitals. Our choice of 6 months was predicated on the assumption that mental health services were likely to be held accountable for the actions of their discharged patients within this time frame, and that contact with mental health services would not have reduced to the extent that the quality of the medical records would be seriously compromised.

2.2 Controls

We aimed to identify two controls for each case. The criteria for controls were that they were: (a) from the same diagnostic subgroups (schizophrenia, bipolar disorder, and other psychoses), and (b) had not had any violent conviction subsequent to their hospital discharge (for the purposes of this study, a violent crime was defined as homicide, attempted homicide, aggravated assault, common assault, robbery, threatening behaviour, harassment, arson, and any sexual crime). We purposively sampled 250 controls from the same set of hospitals as the cases and with the closest hospitalization date over 1988-2001 who met the above criteria. We identified 243 addresses, and wrote to them to participate in the study as controls, and 143 consented for whom we requested medical records. We received medical records for the final sample of 105 controls. Socio-demographic information was extracted on the 38 controls that consented but we did not receive medical records. They included 3 women, with a mean age of 49 years (SD 8.5).

2.3 Data extraction

Data on cases and controls was extracted from hospital notes by a research assistant who is a registered nurse. Blinding for outcome was not possible. A structured extraction form was developed specifically for this study. The study protocol was a slightly adjusted version of data collection protocols that had been previously used and validated for studies of risk factors for suicide in psychiatric patients (Powell et al., 2000; King et al., 2001). The study protocol included 85 variables, most of which were trichotomous (absent/present/not known) in nature.

The data extracted include information on static factors such as previous psychiatric and violence history, and dynamic (or modifiable factors) such as symptoms and behaviours during hospitalization and subsequent outpatient care.

Key factors considered included: substance misuse, nature and severity of symptoms, components of aftercare at the time of the homicide, and final contact with services in the community before homicidal behavior. Risk assessment was based on unstructured clinical judgement.

Interrater reliability for all variables was tested on the 47 cases by a research nurse who worked independently from the research assistant who did the primary coding. Cohen's kappa interrater values were calculated. Of the 85 variables studied, 40 (47.1%) had kappa values above 0.6 (very good or excellent). None of the variables with kappas of less than 0.2 (very poor) were used in the analyses. A number of factors had kappas between 0.2 and 0.6, in the fair to moderate range, including poor self care on admission, drug and alcohol problems before admission, abnormal speech, previous convictions or prison sentence, and lack of compliance post-discharge.

2.4 Statistical analyses

Univariate analyses were conducted using SPSS, version 17.0 (SPSS Inc., Chicago, Ill.), generating odds ratios (ORs; the e^{β} estimate) with 95% confidence intervals of factors associated with homicide in cases compared with controls. With an estimated sample size of 50 cases and 100 controls, there was sufficient power (at the 0.05 level, assuming an alpha of 0.05) to determine a 2.5 fold difference in the prevalence of a particular risk factor. No odds ratios were calculated if any cell had less than 5 cases or controls. We also conducted multivariate analyses by selecting those variables which were significant at $p < 0.05$ level and entering them into a binary logistic regression model simultaneously. These models became unstable when variables with low absolute numbers were included, and we excluded those variables where either the numbers of cases or controls was less than 10.

To examine the clinical utility of these variables, we also reported on the sensitivity and specificity of combining factors that were significantly associated with increasing the risk of homicide on univariate analyses.

Research ethics approval was received from Regional Ethics Review Board, Stockholm #2004-764/3. Informed consent was not deemed necessary for the cases, but was obtained for the controls.

3. RESULTS

A total of 2 005 individuals committed 2,093 homicides 1988-2001. The average population in Sweden for those aged 15 and over was 7 176,361, which equates to an overall rate of 28 homicide perpetrators per 100 000 persons in the Swedish criminally responsible population. Overall, 409 homicide offenders had a psychosis diagnosis out of a total number of 98 092 patients discharged with schizophrenia and other psychoses (equivalent to a rate of 417 homicide perpetrators per 100 000 patients with psychosis). There were 1,596 homicide offenders without psychosis and 7 078 269 individuals without psychosis in the general population (a rate of 23 homicide offenders per 100 000 persons without psychosis diagnoses).

We identified 47 cases who committed a homicide within 6 months of discharge from psychiatric hospital, and 105 controls who did not commit any violent offence after discharge from hospital. There were 10 (21.3%) women among the cases, which was not significantly different to the proportion of women in the controls (24.8%, $n=26$). Mean ages of cases (35.5, $SD=11.0$) and controls (41.0, $SD=8.2$) were also similar. There were a number of associations with homicide in patient characteristics on admission, during hospitalization, and in the after-care period.

3.1 Characteristics on admission

A number of characteristics on admission were associated with increased risk of subsequent homicide in univariate analyses (Table 1). These were a history of recent unemployment, being forcibly admitted under mental health legislation, previous hospitalization for violence, any previous history of drug or alcohol misuse, and evidence of poor self-care. Homicidal ideas on admission, a history of convictions and prior prison sentences were also associated with homicide. Abnormal mood on admission was associated with a decreased risk. There was no evidence that the presence of delusions or hallucinations was associated with homicide.

3.2 Characteristics during hospitalization

Two factors were significantly associated with subsequent homicide (Table 2). Chronicity of mental illness increased the risk, and being prescribed antidepressant medication decreased it.

3.3 Discharge and after-care characteristics

Three variables were associated with increasing the risk of subsequent homicide on discharge and after leaving hospital (Table 3). These were poor recovery of the illness, lack of medication compliance, and any alcohol or drug misuse. Being prescribed lithium or antidepressants appeared to be associated with a reduced risk. There was no evidence of homicidal ideas being reported on last contact in the cases.

Table 1 Admission characteristics of patients with psychosis who committed homicide after discharge (cases) and patients who had no violent convictions (controls).

Variable	Cases, n		Controls, n		Odds ratio	95% Confidence interval
	(N =47)	Cases (%)	(N =105)	Controls (%)		
Male gender	37/47	78.7	79/105	75.2	1.2	0.5–2.8
History of educational problems ^a	6/11	54.5	26/43	60.5	0.8	0.2–3.0
Unemployed (prior to admission)	16/24	66.7	31/82	37.8	3.3	1.3–8.6
Single 20/31		64.5	56/88	63.6	1.0	0.4–2.4
Bipolar diagnosis	3/47	6.4	3/105	2.9	–	–
Violence or self harm main reason for admission	18/47	38.3	25/104	24.0	2.0	0.9–4.1
Admitted to locked ward	17/47	36.2	27/97	27.8	1.5	0.7–3.1
Admitted under legal order (i.e. sectioned or mandated)	20/47	42.6	26/100	26.0	2.1	1.1–4.4
Any psychosocial stressors prior to admission ^b	14/31	45.2	44/91	48.4	0.9	0.4–2.0
Evidence of poor self-care ^c	7/20	35.0	7/72	9.7	5.0	1.5–16.7
Abnormal behaviour at admission (retarded or agitated)	24/44	54.5	56/94	59.6	0.8	0.4–1.7
Abnormal speech at admission (retarded, slowed, speeded up, pressured or thought disordered)	24/42	57.1	55/95	57.9	1.0	0.5–2.0
Abnormal mood at admission (low, high, irritable, confused, suspicious, perplexed or depersonalised)	22/45	61.9	68/98	58.9	0.4	0.2–0.9
Delusions at admission	26/42	62.0	56/95	59.0	1.1	0.5–2.4
Hallucinations at admission	20/42	47.6	39/94	41.5	1.3	0.6–2.7
Suicidal ideas at admission	17/39	43.6	33/75	44.0	1.0	0.5–2.2
Homicidal ideas at admission	6/26	23.1	4/49	8.2	–	–
Drug or alcohol misuse pre-admission ^d	27/36	75.0	25/61	41.0	4.3	1.7–10.7
Previously hospitalized for violent episode	11/19	57.9	8/41	19.0	5.7	1.7–18.7
Any convictions or cautions in past	9/11	81.8	4/32	12.5	–	–
Any prison sentence in past	8/12	66.7	0/29	0.0	–	–

Notes: Variables in bold are significant at pb0.05 level. Denominators differ due to the prevalence of missing information.

^a Not completed elementary school or no qualifications.

^b Any stressors in the previous 12 months.

^c Noted to be smelly or dirty, dressed in dirty clothes or dishevelled.

^d Alcohol use exceeding recommended limits or features of alcohol dependence on admission

Table 2. Inpatient characteristics of patients with psychosis who committed homicide after discharge (cases) and patients who had no violent convictions (controls).

Variable	Cases, n (N =47)	Cases (%)	Controls, n (N =105)	Controls (%)	Odds ratio	95% Confidence interval
Length of admission > 21 days	17/47	36.2	48/105	45.7	0.7	0.3–1.4
Discontinuity of consultant (senior psychiatrist) care ^a	22/45	48.9	47/102	46.1	1.1	0.6–2.3
Discontinuity of nursing care ^b	17/46	37.0	39/101	38.6	0.9	0.5–1.9
Violence to others during admission ^c	11/47	23.4	12/98	12.2	2.2	0.9–5.4
Poor relationship with staff ^d	9/40	22.5	10/93	10.8	2.4	0.9–6.5
Any episodes of observation during admission ^e	5/38	13.2	17/96	17.7	0.7	0.2–2.1
Any episodes of restraint during admission ^f	4/41	9.8	8/99	8.1	–	–
Chronic mental illness ^g	36/38	94.7	69/93	74.2	6.3	1.4–28.0
Heritability	2/9	22.2	24/42	57.1	–	–
Antidepressant use	5/45	11.1	31/101	30.7	0.3	0.1–0.8
Hypnotic or anxiolytic use	27/45	60.0	63/101	62.4	0.9	0.4–1.9
Oral antipsychotic use	34/46	73.9	64/101	63.4	1.6	0.8–3.6
Lithium use	3/45	6.7	14/101	13.9	–	–
Anticonvulsant use	5/45	11.1	5/101	5.0	2.4	0.7–8.8
Depot antipsychotic use	12/46	26.1	15/101	14.9	2.0	0.9–4.8
Antiparkinson use	13/45	28.9	24/101	23.8	1.3	0.6–2.9
Antabuse or Methadone use	5/45	11.1	1/101	1.0	–	–
ECT during admission	1/45	2.2	5/101	5.0	–	–
Adverse effects of medication	11/17	64.7	29/54	53.7	1.6	0.5–4.9
Any acts of self harm during admission ^h	5/45	11.1	2/98	2.0	–	–

Notes: Variables in bold are significant at pb0.05 level. Denominators differ due to the prevalence of missing information.

^a Not completed elementary school or no qualifications.

^b Any stressors in the previous 12 months.

^c Noted to be smelly or dirty, dressed in dirty clothes or dishevelled.

^d Alcohol use exceeding recommended limits or features of alcohol dependence on admission

Table 3. Discharge and aftercare characteristics of patients with psychosis who committed homicide after discharge (cases) and patients who had no violent convictions (controls).

Variable	Cases, n (N =47)	Cases (%)	Controls, n (N =105)	Controls (%)	Odds ratio	95% Confidence interval
Poor/no degree of recovery on discharge^a	14/46	30.4	14/98	14.3	2.6	1.1–6.1
Poor living situation (alone/homeless)	24/42	57.1	48/94	51.1	1.3	0.6–2.7
Lack of supportive carer	3/25	12.0	1/81	1.2	–	–
Being prescribed medication	31/39	79.5	89/101	88.1	0.5	0.2–1.4
Lack of compliance post discharge	13/29	44.8	13/74	17.6	3.8	1.5–9.8
Any alcohol or drug misuse post discharge	27/38	71.1	25/58	43.1	3.2	1.3–7.8
Antidepressant use	3/41	7.3	33/101	32.7	–	–
Hypnotic or anxiolytic use	25/41	61.0	50/102	49.0	1.6	0.8–3.4
Oral antipsychotic post use	29/41	70.7	55/101	54.5	2.0	0.9–4.4
Lithium use	2/41	4.9	17/101	16.8	–	–
Anticonvulsant use	6/41	14.6	4/101	4.0	–	–
Depot antipsychotic use	11/41	26.8	14/101	13.9	2.3	0.9–5.6
Antiparkinson medication use	14/41	34.2	21/101	20.8	2.0	0.9–4.4
Antabuse or Methadone use	3/41	7.3	2/101	2.0	–	–
Last contact not routine apt. ^b	11/15	73.3	20/42	47.6	3.0	0.8–11.0
Being prescribed medication on last contact	12/14	85.7	29/38	76.3	1.9	0.4–9.9
Lack of compliance on last contact	6/10	60.0	7/26	26.9	4.1	0.9–18.9
Alcohol misuse on last contact	6/7	85.7	8/20	40.0	9.0	0.9–89.6
Drug misuse on last contact	3/4	75.0	6/23	26.1	–	–
Insomnia on last contact	2/7	28.6	10/27	37.0	–	–
Anxiety on last contact	4/7	57.1	15/33	45.5	–	–
Depressive symptoms on last contact	2/6	33.3	13/31	41.9	–	–
Delusions or hallucinations on last contact	5/9	55.6	9/35	25.7	3.6	0.8–16.5
Hostility on last contact	2/10	20.0	0/36	0.0	–	–
Loss of insight on last contact	4/7	57.1	13/34	38.2	–	–
Suicidal ideas on last contact	1/3	33.3	4/25	16.0	–	–
Homicidal ideas on last contact	0/1	0.0	0/23	0.0	–	–

Notes: Variables in bold are significant at pb0.05 level. Denominators differ due to the prevalence of missing information.

^a Considered to have poor or no recovery on discharge.

^b Reason for the last contact could be assessment after violent episode or urgent request by patient, family or professional.

3.4 Combining factors

We examined the sensitivity and specificity of models that combined factors that were significantly associated with increased risk on univariate analyses. The number of cases with two or more factors was 35 (74.5%), and the controls 42 (40.4%), which equated to a sensitivity of 0.74 and specificity of 0.60. The number of cases with three or more factors was 24 (51.1%), and the controls 17 (16.2%), which equated to a sensitivity of 0.51 and specificity of 0.86.

3.5 Multivariate analyses

We further explored the data in multivariate models. For the characteristics on admission to hospital, only drug or alcohol misuse (OR=32, 95% CI: 3-395) remained significant, and of the after-care factors, non-compliance (OR=6.8, 1.8-26.1) and any drug or alcohol misuse (3.5, 1.2-10.7) remained significant.

3.6 Risk assessment

Information on risk assessment was extracted from the medical records on admission and discharge. On admission, 13 out of 40 cases with this information recorded (32.5%) were deemed to be a medium or high risk of violence compared with 5 out of a possible 99 controls (5.1%), which equates to an odds ratio of 4.2 (2.0-8.9). On discharge, 27 out of 45 cases with this information recorded (60.0%) were considered medium/high risk compared with 27 out of 103 controls (26.2%), an odds ratio of 9.1 (3.0-27.7).

4. DISCUSSION

We report a national case-control study of patients with psychosis, of whom 47 committed a homicide within 6 months of discharge. These were compared with 105 patients with psychosis who were not convicted of any violent offence after discharge. This design enabled exploration of factors associated with homicide in patients leaving hospital that could potentially inform violence risk assessment and management. As the number of cases was small, our findings should be interpreted primarily as hypothesis-generating.

We identified a number of potentially modifiable or dynamic factors that were associated with homicide. These included drug and alcohol misuse prior to admission and after discharge, chronicity of mental illness, and non-compliance with medication after discharge. These variables are similar to factors reported in other research that are associated with any violent outcomes in patients with schizophrenia. In particular, associations with comorbid substance abuse (Swartz et al., 1998; Munkner et al., 2005) and treatment adherence (Swartz et al., 1998; Swanson et al., 2004) have been demonstrated. Furthermore, the current study demonstrated some negative findings that concord with previous work in violence risk in severe mental illness. We reported no associations with the presence of delusions or hallucinations, findings that are consistent with the MacArthur Risk Assessment study, although the latter included a more heterogeneous diagnostic group of discharged patients (Appelbaum et al., 2000). Interestingly, we found a series of interrelated factors that suggested that comorbid depression was inversely related with future homicide. These variables were abnormal mood on admission, and antidepressant prescription during hospitalization and in the after-care period. A recent German study of violent convictions in patients with schizophrenia after discharge from hospital has also reported inverse associations with depression, and in a dose-response manner (Soyka et al., 2007). One explanation for this is that the antidepressants are treating the comorbid substance abuse by reducing craving for illicit drugs and alcohol (Wobrock and Soyka 2008), and it is the reduction in substance abuse that is actually decreasing risk. Alternatively, the mechanism may be directly through altering serotonin levels, which has been implicated in aggression in animal and human models (Olivier 2004). The current report also found markers of previous violence to be associated with homicide, which is also consistent with research examining risk factors for any violence in schizophrenia (Walsh et al., 2004; Swanson et al., 2006; Fazel et al., 2009). Some of the non-significant associations reported do not concord with previous work, such as male gender (Soyka et al., 2007), although caution is warranted as the sample size does not preclude potentially important differences not being demonstrated.

The factors that we have identified may serve as useful adjuncts to clinical risk assessment if validated in other datasets. Furthermore, as some of them are potentially modifiable, they could be the focus of therapeutic work as part of discharge planning and in outpatient reviews. In particular, treatment for comorbid substance abuse (Wobrock and Soyka 2008) and therapies to address non-compliance risk could be considered (Zygmunt et al., 2002).

However, we found that the clinical utility of these factors for violence risk assessment and prediction was weak. Our preliminary findings on the sensitivity and specificity of combining two or more factors suggested high false positive rates. When three or more factors were used, the sensitivity (true positive rate) was low at around 50%. Other work has questioned the predictive validity of detailed clinical information in the prediction of assault by patients with schizophrenia (Wootton et al., 2008).

The information on the risk assessment reported in the notes reflects the approach of mental health teams in Sweden over the duration of this study, and it is not known to what extent unstructured or structured assessments were made. It is notable that 26% of the controls were deemed at moderate or high risk did not violently offend after discharge from hospital.

4.1 Strengths and limitations

Study strengths include gathering a national sample of all homicide convictions in discharged patients with psychosis, and that all the medical records on these cases were collected. We used validated data extraction sheets, and we conducted an inter-rater reliability study to confirm those factors that were reliable for inclusion. However, the number of cases was small, and the study lacked statistical power to test the importance of some risk factors and their interaction by gender. Furthermore, it was a study based on medical records, which limited the depth and breadth of the factors investigated. For example, the contribution of comorbid personality disorder will not have been fully explored using this method. In particular, antisocial personality disorder and psychopathy may provide additional information discriminating between cases and controls, and may also mediate some of the associations that we have reported such as substance abuse. In support, substance abuse problems amongst inpatients with schizophrenia have been found to be correlated with psychopathy (Dolan and Davies 2006). Interviews with carers, mental health professionals and informants could study a broader range of potential risk factors including psychological variables that may be important such as anger, impulsivity, and hostility (Aleman and Kahn 2001). A prospective study might avoid problems associated with reliance on medical records and include items from validated violence risk assessment tools, but the rarity of homicide in this patient group means that it would have to be unfeasibly large. Nevertheless, the possible risk factors identified in the present report need validation in large independent datasets. We were not able to study contextual and situational factors at the time of the homicide. Research examining violent outcomes has demonstrated that the degree of neighborhood deprivation may modulate risk in mentally disordered persons (Silver 2000), and future research could examine this for homicide. A further limitation is that we may have underestimated the effect of some discharge and aftercare factors that were time-dependent (as the controls were followed up for 6 months, whereas the cases were not), such as lack of compliance and any substance misuse. On the other hand, the controls that consented to have participated in the study may have had better experiences with mental health services than the controls that did not, and this may have overestimated the effects of some factors for the cases including compliance, poor relationship with staff, and violent incidents during their admission.

The mean age of the cases and controls was older than that reported in a national study of all patients with schizophrenia (Fazel et al., 2009), but the gender breakdown similar. Although this meant that age is unlikely to have confounded any associations between cases and controls in this report, it suggests some caution is warranted in generalizing from the controls in this sample to all patients with schizophrenia.

5. CONCLUSION

Homicide by psychiatric patients is rare but an event of considerable consequences. In addition to the effects on the family and friends of victims, the impact on services and professionals is also noteworthy as questions of accountability and responsibility are inevitably raised. The public image of the psychiatry, stigma suffered by patients (Corrigan et al., 2002; Van Dorn et al., 2005), and even recruitment into the profession (Lambert et al., 2006) are likely longer term consequences of homicides by psychiatric patients. Our study found factors associated with violent risk in individuals with psychosis were similar in homicide. Psychiatric services should consider the nature and quality of the provision of substance abuse and treatment adherence therapy for those with psychosis. Furthermore, unless variables are identified that are associated with homicide have better rates of predictive validity, violence risk assessment will remain inexact. Based on our preliminary work, it is unlikely that clinicians will be able to identify on discharge many patients who subsequent kill other people.

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Kriminalvården

www.kriminalvarden.se
601 80 Norrköping
Telefon 077-228 08 00
Fax 011-496 36 40