

A Comparison of General Adult and Forensic Patients with Schizophrenia Living in the Community

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Schizophrenia is associated with an elevated risk for violence. The response has been to incarcerate people with schizophrenia and to increase the number of forensic beds. Most of these beds are filled by men with schizophrenic disorders with long histories of offending and of treatment in general psychiatry. Outcome from forensic, as compared to general psychiatric services, is unknown. The present study compared outcome defined as levels of positive and negative symptoms, readmission, and aggressive behavior for 248 men with schizophrenic disorders (150 discharged from forensic hospitals and 98 from general adult wards) during a two-year period after discharge from forensic and general psychiatric services. Patients were intensively assessed at discharge and four times during the subsequent two years. Illicit drug use was assessed both objectively and by self-report. More of the forensic than the general patients had failed to complete high school, had displayed a stable pattern of antisocial behavior since at least mid-adolescence, and had convictions for non-violent and violent offences. At discharge and throughout the follow-up period, general patients displayed higher levels of positive and negative symptoms than forensic patients, and more of them engaged in aggressive behavior towards others. Aggressive behavior was associated with positive symptoms and Antisocial Personality Disorder. Rates of readmission were similar for the two groups. The forensic approach that includes assessing and managing the risk of violence as well as treating symptoms of schizophrenia led to better outcome than that of general psychiatry.

Persons with severe mental illness, and most particularly those with schizophrenia and schizoaffective disorder, are at increased risk, as compared to the general population, to commit violent crimes (Hodgins, Mednick, Brennan, Schulsinger, &

Engberg, 1996). This is a robust finding. It has been reported by several independent research groups working in industrialized (Arseneault, Moffitt, Caspi, Taylor, & Silva, 2000; Brennan, Mednick, & Hodgins, 2000; Swanson, Holzer, Ganju, & Jono,

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1990; Tiihonen, Isohanni, Rasanen, Koironen, & Moring, 1997; Wallace, Mullen, & Burgess, 2004) and underdeveloped countries (Volavka et al., 1997) with distinct cultures, health, social service, and criminal justice systems. These researchers have examined different cohorts and samples using various experimental designs including prospective, longitudinal investigations on birth cohorts (Arseneault et al., 2000; Brennan et al., 2000; Tiihonen et al., 1997) and population cohorts (Wallace et al., 2004), follow-up studies comparing patients and their neighbors (Belfrage, 1998), random samples of incarcerated offenders (Fazel & Danesh, 2002), and complete cohorts of homicide offenders (Erb, Hodgins, Freese, Müller-Isberner, & Jöckel, 2001). The results using official criminal records of convictions for violent crimes (Brennan et al., 2000) and self and collateral reports of aggressive behavior (Swanson et al., 1990; Walsh et al., 2001) concur in observing an increased prevalence among people with schizophrenia. Given the suffering and financial burden resulting from crimes by people with schizophrenia, humane strategies for reducing violence in this population are urgently needed.

In recent years, there has been a dramatic increase in the numbers of persons with schizophrenia who are incarcerated in correctional facilities across many countries (Wallace et al., 2004) and in several European countries there has been a very dramatic increase in the number of forensic psychiatric beds (Priebe et al., 2005). Most of these forensic psychiatric beds are filled by men with schizophrenia who have a long history of treatment in general psychiatric services prior to admission to a forensic hospital. While in-and-out of general psychiatric services, these men continue to commit criminal offences, and after a particularly violent offence they are admitted to a forensic hospital (Hodgins & Müller-Isberner, 2004).

Perhaps surprisingly, naturalistic follow-up studies observe that after discharge from forensic hospitals, symptoms are controlled and criminal recidivism is low (Heilbrun & Peters, 2000). To the best of our knowledge, there are no effectiveness or efficacy trials of forensic treatment. Naturalistic follow-up studies, however, suggest that following treatment in forensic services there are important reductions in crime and improvements in compliance with medication. Recent studies of an inpatient

behavioral program (Kunz et al., 2004), specialized forensic community programs (Heilburn & Peters, 2000), the use of outpatient commitment orders, (Swartz & Swanson, 2004) and specific medications (Swanson, Swartz, & Elbogen, 2004; Swanson, Swartz, Elbogen & Van Dorn, 2004) have all reported favorable outcomes and low criminal recidivism rates.

It is important to establish if the impression given by the available evidence is accurate. Does treatment within forensic services lead to better control of psychotic symptoms and aggressive behavior and criminality than treatment within general psychiatry? Forensic and general psychiatric services differ as to cost and also as to approach. Forensic services treat both the severe mental illness and the criminality, while general adult services focus almost exclusively on the illness. If forensic services do lead to better outcome, then in a second step, it will be important to identify the components responsible for the good outcome. These components of treatment could then be implemented in general psychiatric services to prevent criminality.

We conducted a descriptive, naturalistic study to compare outcome over two years of men with schizophrenic disorders discharged from forensic and general psychiatric hospitals. Outcome was defined as clinically relevant symptom levels, readmission to hospital, and aggressive behavior. We also examined factors that may be associated with these outcomes including compliance with medication, court orders to comply with treatment, and use of alcohol and illicit drugs measured both objectively and subjectively. The patients were intensively assessed in the weeks preceding discharge. In the subsequent two years, they were interviewed at six-month intervals to prospectively assess symptoms, substance misuse, medication non-compliance, and aggressive behavior, and to collect samples of hair and urine to measure illicit drug use.

METHOD

Design

Forensic hospitals were identified in four countries that were responsible for large catchment areas, in which most, if not all, persons with a severe mental illness who were accused of a crime

underwent a pre-trial psychiatric assessment, and if it was judged that they had committed a crime, they were sent to the forensic hospital. The sites were Southern British Columbia, Canada; Finland; the state of Hessen, Germany; and Southern Sweden. Within each site, the forensic sample included consecutive discharges with a diagnosis of a severe mental illness (schizophrenic disorder, bipolar disorder, major depression or non-toxic psychosis). The comparison group included patients being discharged from general psychiatric hospitals within the same geographic regions as the forensic hospitals who were matched for sex, age, and principal diagnosis. The patients were assessed in the weeks preceding discharge and followed for two years, with interviews at six-month intervals.

Participants

Patients in the forensic hospitals with diagnoses of severe mental illness who were scheduled for discharge were invited to participate in the study. Written informed consent was obtained. A diagnostic interview was completed. If the diagnosis of a severe mental illness disorder was confirmed, the participant was included in the study and the other interviews and assessments were completed and information was collected from files. At study entry, participants were asked for permission to contact their mothers or an older sibling and at each follow-up interview, they provided the name of a collateral source who was in frequent contact with them. The same procedure was followed with the patients recruited in the general hospitals. In total, 73% of the male forensic patients and 58% of the male general psychiatric patients invited to participate consented. Almost all (96%) the patients were male with diagnoses of schizophrenic disorders (84%). Analyses were restricted to the 248 men with schizophrenic disorders, 150 from the forensic hospitals and 98 from general hospitals. Participants were not interviewed if they were too ill, in hospital, or if they refused.

Instruments and Sources of Information

Historical information. Information on socio-demographic variables, family history, childhood characteristics, and psychiatric treatment was

obtained from participants, family members, medical and social service files. Information on criminality was extracted from official records. Throughout, the term “convictions” is used to include judgments of non-responsibility due to a mental disorder. Violent crimes were defined as all offences causing physical harm, threat of violence or harassment, all types of sexual offences, illegal possession of firearms or explosives, all types of forcible confinement, arson and robbery. All other offences were defined as non-violent.

Diagnoses. Diagnoses were made using the Structured Clinical Interview for DSM-IV (SCID) for both axis I and II disorders (First, Spitzer, Gibbon, & Williams, 1996), administered by experienced psychiatrists who were trained and coached by the developers of the instrument, and based on information from multiple sources. As psychiatrists in the four sites all speak English, but use different languages with their participants, we could not estimate across site inter-reliabilities. Instead, SCID ratings were evaluated using videotaped interviews in English. Within each site, 15% of the participants were diagnosed a second time to establish within site inter-rater reliabilities. For principal diagnosis and the diagnosis of Antisocial Personality Disorder (ASPD) kappa statistics equaled one, for alcohol abuse/dependence 0.80, and for drug abuse/dependence 0.92.

Symptoms. Research psychiatrists were trained to use the Positive and Negative Symptom Scale (PANSS) (Kay, Fiszbein, & Opler, 1987). As noted in the PANSS manual, symptoms with a rating of 3 or higher are considered clinically relevant. Therefore, symptoms levels were defined as the number of symptoms rated 3 or higher. Intra-Class Correlations (ICC), calculated on 34 cases, reached 0.71 for positive symptoms and 0.52 for negative symptoms. Symptoms were assessed at discharge and at six month intervals.

Medication compliance. At each interview patients reported in detail on use of medication and the degree to which they took the medication as prescribed.

Alcohol and drug use. At each interview, participants reported on use of alcohol, and illicit drugs and provided urine and hair samples. Drug misuse was defined as either a self-report, or a result from urine and/or hair indicating the presence of an

illicit drug, or refusal to provide a sample of urine or hair.

Aggressive behavior. Information on physical aggression towards others was collected from the participant and a collateral source using the MacArthur Community Violence Interview (Steadman, et al., 1998). This instrument is widely used to collect information on aggressive behavior from patients with severe mental illness and collateral informants (Swanson, et al., 2006). Any aggressive behavior was defined as throwing something at someone, pushing, shoving, grabbing, slapping, kicking, biting, choking, or hitting someone, physically forcing someone to have sex against his/her will, threatening someone with a knife, gun or other weapon, and any other violent act towards another person as reported by either the participant and/or the collateral.

Obligatory care. Patients' legal status throughout the two-year period was documented from medical files. Obligatory care was defined to include criminal or civil orders requiring patients to participate in psychiatric treatment.

Statistical Analyses

Analyses were conducted in three steps. First, the patients recruited from the forensic and general hospitals were compared on data collected at discharge. Comparisons, controlling for site differences, were made using logistic regressions where the outcome was binary and linear regression where the outcome was continuous. Second, the two groups were compared as to outcome defined as symptom levels, readmission and aggressive behavior during the follow-up period. The numbers of positive and negative symptoms were compared using a Poisson regression with robust variance estimated by Generalized Estimating Equations (GEE) (Zeger & Liang, 1986) to take account of the longitudinal data. Site and follow-up period (hereafter referred to as 'time') were included as potential confounding factors, together with their interactions. For each of the comparisons, first a saturated model (including all main effects, two-way and three-way interactions) was used to check for three-way interactions. Then the three-way interaction term was removed and the two-way interactions examined. Finally, two-way interaction terms were removed in order to examine main effects. The

incidence rates of first readmission were compared using a Cox regression controlling for site differences and age. The presence of aggressive behavior was examined using a logistic regression controlling for site and group X site interactions. The third set of analyses used step-wise regression models to determine the association of type of service (forensic versus general) with each outcome variable, after taking account of other variables that we reasoned were associated with the dependent variable. In the analyses examining numbers of positive and negative symptoms, predictors (use of alcohol and illicit drugs, medication compliance, obligatory care) were split into a value for the first six months and a change component (difference between the first six months and the current interview) to make full use of the longitudinal information. These factors were consequently entered in pairs in the step-wise regression model.

RESULTS

At Discharge

Table 1 presents comparisons between the patients recruited from forensic and general hospitals at discharge controlled for site. The forensic and general patients were similar regarding the percentages of those who had been born outside the site country, age at index admission, principal diagnosis, diagnoses of alcohol and illicit drug abuse and dependence, and the mean number of hospitalizations. Only, three differences were observed: more of the forensic than the general patients met criteria for ASPD and had records of non-violent and violent crimes, and fewer of them had completed high school.

Follow-up Period

Data on hospitalizations throughout the follow-up period were available for 236 of the 248 participants. However, increasing proportions of patients were not interviewed as the study progressed. Of the forensic patients included at discharge, 93% were interviewed six months later, 89% 12 months later, 81% 18 months later, and 77% 24 months later. The comparable figures for the patients

Table 1
Comparisons of Men with Schizophrenia Recruited from Forensic and General Psychiatry Hospitals

	Forensic (<i>n</i> = 150)	General (<i>n</i> = 98)	Test (controlled for site differences)
Born outside site country	12% (18)	14% (14)	^A X ² (1, <i>n</i> = 248) = .03, <i>p</i> = .85
Mean age (in years)	40.02 (<i>SD</i> = 11.37)	36.30 (<i>SD</i> = 10.45)	^B <i>t</i> (243) = 1.58, <i>p</i> = .115
Age at last admission	36.15 (10.86)	35.74 (10.69)	^B <i>t</i> (243) = .61, <i>p</i> = .540
<u>Principal diagnosis</u>			
Schizophrenia	82% (123)	80% (78)	^A X ² (1, <i>N</i> = 248) = .06 <i>p</i> = .81 ignoring the Schizophreniform group
Schizo-affective disorder	17% (26)	20% (20)	
Schizophreniform disorder	1% (1)	0% (0)	
Number of positive symptoms	1.43 (1.64)	3.70 (2.02)	^B <i>t</i> (238) = 9.53, <i>p</i> = .00
Number of negative symptoms	3.43 (2.25)	4.60 (2.14)	^B <i>t</i> (238) = 3.08, <i>p</i> = .01
<u>Co-morbid diagnoses</u>			
Antisocial Personality	27% (40)	14% (14)	^A X ² (1, <i>N</i> = 248) = 5.63, <i>p</i> = .02
Drug abuse/dependence	46% (69)	52% (43)	^A X ² (1, <i>N</i> = 248) = 1.59, <i>p</i> = .21
Alcohol abuse/dependence	59% (89)	44% (51)	^A X ² (1, <i>N</i> = 248) = .50, <i>p</i> = .48
Both drug and alcohol abuse/dependence	31% (47)	30% (29)	^A X ² (1, <i>N</i> = 248) = .68, <i>p</i> = .41
<u>Psychosocial functioning</u> (GAF Score)	52.06 (12.95)	42.88 (10.70)	^B <i>t</i> (237) = 6.43, <i>p</i> = .00
<u>Childhood characteristics</u>			
Completed High School	26% (38)	45% (41)	^A X ² (1, <i>N</i> = 236) = 6.03, <i>p</i> = .01
Substance abuse before age 18	47% (68)	40% (36)	^v (1, <i>N</i> = 237) = 3.35, <i>p</i> = .07
<u>Psychiatric History</u>			
Mean number of hospitalizations ^C	8.10 (<i>SD</i> = 7.42)	8.15 (<i>SD</i> = 6.58)	^B <i>t</i> (243) = -.90, <i>p</i> = .37
Mean time hospitalized (in months) ^C	95.5 (<i>SD</i> = 83.4)	23.2 (<i>SD</i> = 23.9)	^B <i>t</i> (243) = 11.03, <i>p</i> = .00
Mean length of the index hospitalization (in months) ^C	47.06 (<i>SD</i> = 46.83)	6.78 (<i>SD</i> = 7.84)	^B <i>t</i> (243) = 14.28, <i>p</i> = .00
<u>Criminal History</u>			
At least one non-violent crime	70% (104)	37% (34)	^A X ² (1, <i>N</i> = 241) = 28.94, <i>p</i> = .00
At least one violent crime	95% (142)	18% (17)	^A X ² (1, <i>N</i> = 241) = 144.81, <i>p</i> = .00
At least one homicide	25% (37)	1% (1)	^A X ² (1, <i>N</i> = 241) = 20.87, <i>p</i> = .00

- A. Mantel-Haenszel test of relationship between group and outcome stratified by site
 B. Linear regression with site and group as covariates
 C. square root transformation

recruited from general psychiatric services are 88%, 83%, 77%, and 67%. The proportions of participants from forensic and general services who were assessed at each six-month period were compared using logistic regression estimated by GEE. No significant group difference was detected in attrition ($z = -1.05, p = 0.30$), there was a significant effect of time ($z = -10.29, p = .001$) indicating increasing loss of participants over time, no group X time interaction, and no group X site interaction.

Number of positive symptoms. As presented in Figure 1, the number of clinically significant positive symptoms was higher for the general than the forensic patients throughout the two year follow-up period ($z = 6.62, p = < .01$). Neither time nor group X site were significantly related to numbers of positive symptoms. Having shown that the general patients presented a greater number of positive symptoms at discharge and throughout the two year

period, we next conducted a step-wise multiple regression to determine if the type of service – forensic or general psychiatry- would continue to be associated with the level of symptoms after taking account of other variables that we reasoned might influence the number of positive symptoms - alcohol use at baseline and change in alcohol use throughout the two-year period, illicit drug use at baseline and change in use, medication non-compliance at baseline and change in medication compliance, and obligatory care and change in obligatory care. As presented in Table 2, four of the predictors were associated with increases in positive symptoms. The number of clinically significant positive symptoms was increased 1.61 times by treatment within general psychiatric services, 1.36 times by a change in medication compliance during the two-year period, 1.36 times by alcohol use during the first six months after discharge, and 1.39 times by use of illicit drugs in the first six months after discharge.

Table 2

Factors Associated with the Number of Clinically Significant Positive and Negative Symptoms During Two-year Follow-up Period

	Incident Rate Ratios ^A (95% Confidence Interval)	
	Levels of Positive Symptoms	Levels of Negative Symptoms
Forensic or general psychiatric service	1.61 (1.28-2.02)	1.65 (1.29-2.10)
Medication non-compliance in first six months after discharge	1.18 (0.85-1.63)	Not in final model
Change in medication compliance	1.36 (1.10-1.69)	Not in final model
Alcohol use in first six months after discharge	1.36 (1.05-1.77)	0.77 (0.60-0.99)
Change in the alcohol use over 2 years	0.99 (0.84-1.17)	0.95 (0.84-1.07)
Illicit drug use in first six months after discharge	1.39 (1.03-1.87)	0.80 (0.62-1.02)
Change in the use of illicit drugs over 2 years	1.04 (0.89-1.21)	0.83 (0.71-0.96)
Not under obligatory care in first six months after discharge	Not in final model	0.80 (0.62-1.03)
Change in obligatory care over 2 years	Not in final model	1.23 (1.04-1.47)

A. All analyses are adjusted for site, time, and their interactions, and age.

Figure 1
Mean Number of Positive Symptoms Displayed by Forensic and General Adult Patients During Two Years in the Community

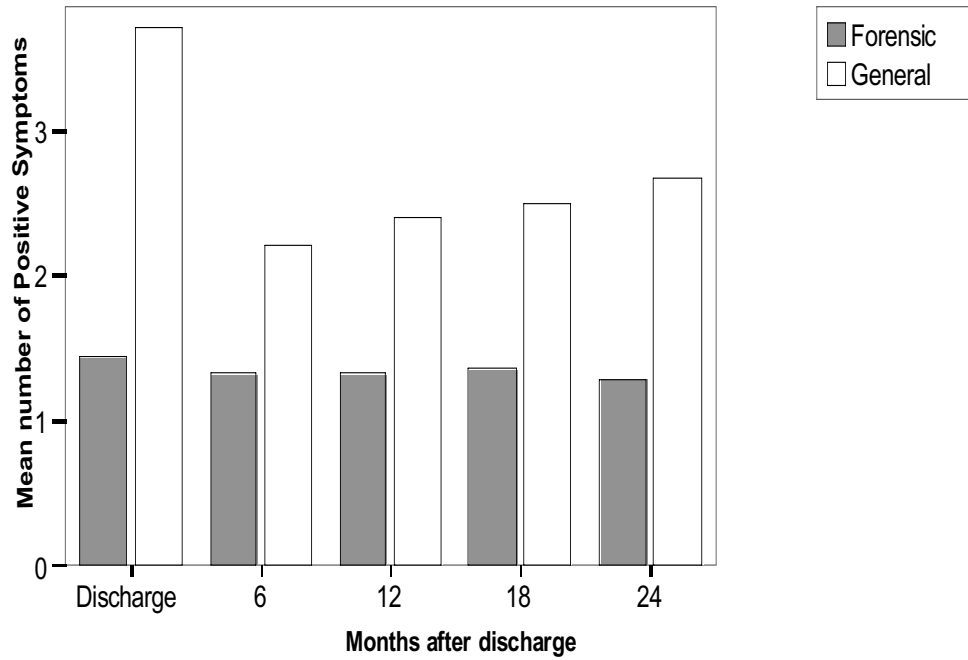
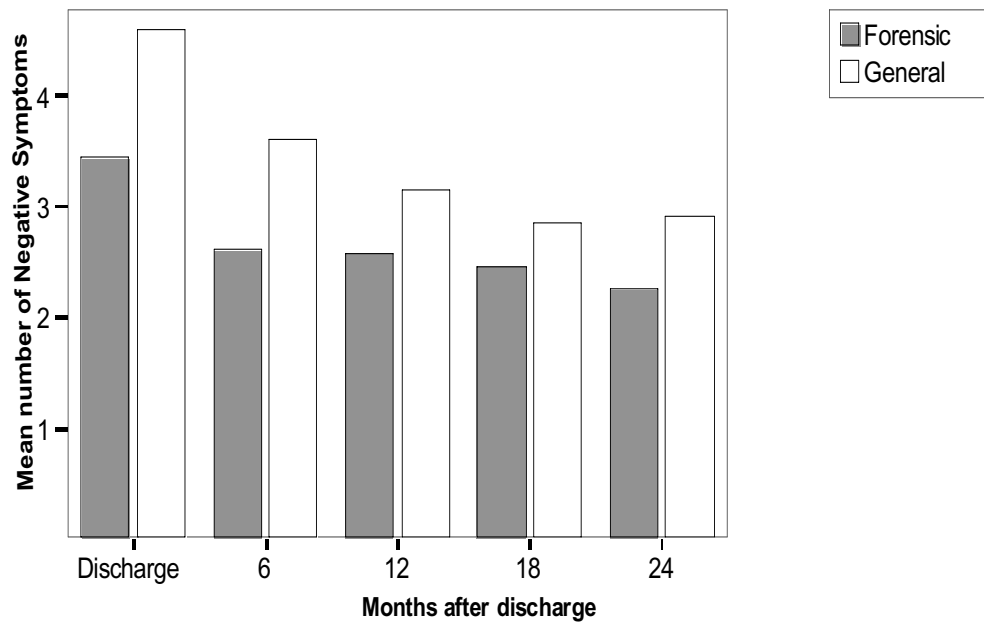


Figure 2
Mean Number of Negative Symptoms Displayed by Forensic and General Adult Patients During the Two Years in Community



Negative symptoms. As presented in Figure 2, the general patients also presented significantly higher levels of negative symptoms than the forensic patients throughout the follow-up period ($z = 3.21$, $p = .001$). There was a significant effect of time, with symptoms in both groups decreasing over time ($z = -6.44$, $p < .01$) but no group X time interaction. Having shown that the general patients had a greater number of negative symptoms throughout the two year period, we again conducted a step-wise multiple regression to determine if the type of service – forensic or general psychiatry- would continue to be associated with the level of symptoms after taking account of other variables that we reasoned might influence the number of negative symptoms - alcohol use at baseline and change in alcohol use throughout the two-year period, illicit drug use at baseline and change in use, medication non-compliance at baseline and change in compliance, and obligatory care and change in obligatory care. Treatment in general psychiatry was associated with a 1.65 times

increase in the number of clinically relevant negative symptoms. Use of alcohol in the six months after discharge and changes in illicit drug use were associated with significantly lower levels of negative symptoms, while the lifting of orders for community care was associated with higher levels of negative symptoms.

Readmissions. There was no difference in the likelihood of readmission for the patients from forensic and general services (Hazard ratio = 1.17, 0.76-1.81 adjusted for site and age). We conducted a step-wise regression to identify factors associated with readmission. Predictors included functioning in the six-month period prior to readmission indexed by number of positive and negative symptoms, alcohol use, illicit drug use, medication non-compliance, and obligatory care. As presented in Table 3, the risk of readmission was increased 1.36 times by each clinically significant positive symptom and 2.60 times by non-compliance with medication.

Table 3

Factors Associated with Readmission to Hospital During Two-year Follow-up Period

	Hazard Ratio ^A (95% Confidence Interval) Readmission
Forensic or general psychiatric service	0.59 (0.34-1.03)
Number of positive symptoms	1.36 (1.19-1.56)
Number of negative symptoms	Not in final model
Medication non-compliance	2.60 (1.39-4.87)
Alcohol use	Not in final model
Illicit drug use	0.48 (0.24-0.94)
Obligatory Care	Not in final model

A. Analyses adjusted for site and age.

Aggressive behavior. As presented in Figure 3, more of the general patients (29%) than the forensic patients (12%) engaged in aggressive behavior during the follow-up period ($z = 2.60, p = .009$). There were no incidents of rape or use of guns. There were five incidents involving knives, one of which led to death, one to a minor injury, and three in which the victim(s) was not injured. Two other incidents led to major injuries, 16 to minor injuries, and the other incidents caused no physical injuries to the victim. We examined the patients who had engaged in at least one aggressive incident and found that the average number of incidents perpetrated by those from forensic and general services did not differ. Importantly, the three incidents that caused severe injury to victims were perpetrated by forensic patients.

A step-wise regression was again used to determine if type of service – forensic or general – was associated with aggressive behavior after taking account of other factors that previous research has shown are associated with aggressive behavior. The predictors included a series of variables indexing functioning in each six month period (numbers of positive and negative symptoms, alcohol and drug use, medication non-compliance, and obligatory care), and prior violent crime and prior antisocial behavior as indexed by ASPD. Results indicated that the likelihood of an aggressive incident was increased 1.20 times by each clinically significant positive symptom, and 4.46 times by a history of antisocial behavior going back to at least mid-adolescence as indexed by ASPD.

Figure 3
Proportions of Forensic and General Adult Patients who Engaged in Aggressive Behavior During Two Years in the Community

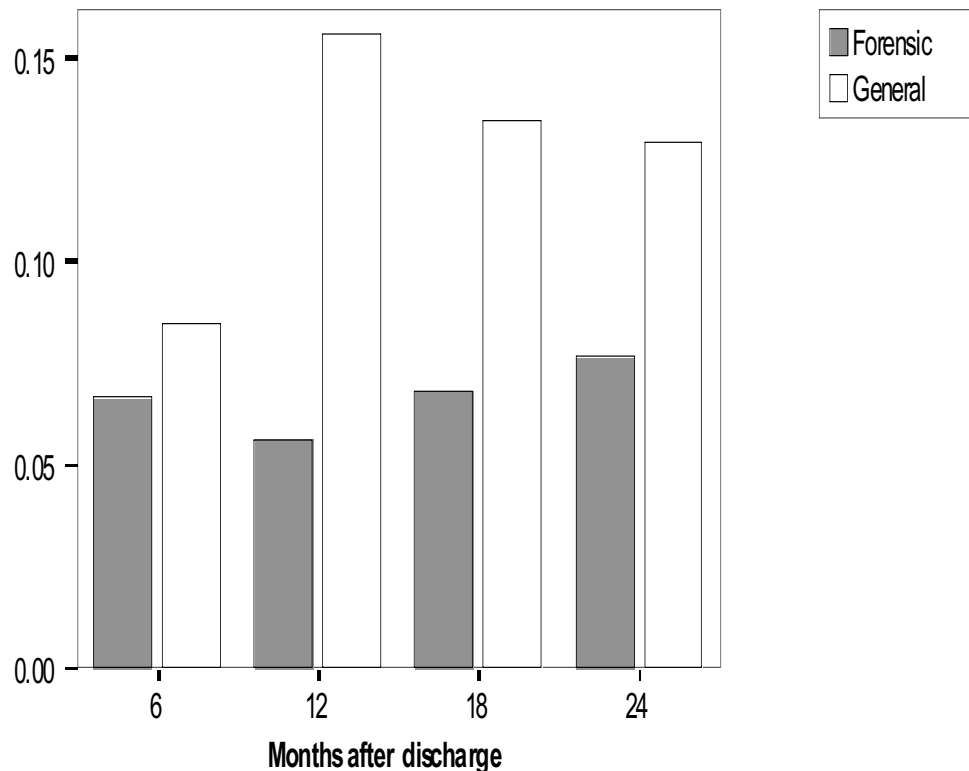


Table 4

Predictors of Aggressive Behavior During Two-year Follow-up Period

	Odds Ratios ^A (95% Confidence Interval) Presence of Aggressive behavior
Forensic or general psychiatric service	1.40 (0.65-3.02)
<u>Clinical functioning</u>	
Number of positive symptoms in previous 6 months	1.20 (1.01-1.44)
Number of negative symptoms in previous 6 months	Not in final model
Medication non-compliance in previous 6 months	Not in final model
Obligatory care in previous 6 months	Not in final model
Alcohol use at in previous 6 months	Not in final model
Drug use in previous 6 months	Not in final model
<u>Previous crime and antisocial behavior</u>	
At least one violent crime	Not in final model
Antisocial Personality Disorder	4.46 (2.21-8.99)

A All analyses are adjusted for site, time, and their interactions, and age.

DISCUSSION

Men, on average aged 40 years old, with schizophrenic disorders recruited from general adult services and from forensic hospitals in four countries were compared. The two groups of patients were similar with respect to the proportions born outside the site country, age, and prevalence of lifetime diagnoses of alcohol and drug abuse and dependence. More of the forensic than the general patients had not completed high school, displayed a pattern of antisocial behavior since at least mid-adolescence as indexed by ASPD, and had histories of non-violent and violent crimes.

At discharge and throughout the two-year follow-up period, the general patients continued to present higher levels of positive and negative symptoms than the forensic patients and more of them engaged in aggressive behavior. Readmission rates were similar for the two groups. The differences

between the forensic and general patients in levels of positive and negative symptoms remained after taking account of factors usually associated with symptom levels. The level of positive symptoms was positively associated with discharge from a general psychiatric ward, alcohol and illicit drug use in the first six months after discharge, and a change in medication compliance during the two-years after discharge. Court orders to participate in community treatment were not associated with positive symptom levels.

The level of negative symptoms was also positively associated with discharge from a general psychiatric ward. Further, results indicated that patients with lower levels of negative symptoms were using alcohol and drugs and that during the follow-up period their orders for compulsory treatment were changed. This perhaps surprising finding concurs with other results indicating that patients with schizophrenia and a history of antisocial behavior since childhood may be less compromised neuro-

logically than others with schizophrenia (Naudts & Hodgins, 2005), and might therefore show lower levels of negative symptoms known to be strongly associated with neurological abnormalities, pre-morbid adjustment, intelligence (McGlashan & Fenton, 1992) and impoverished social networks (Hamilton, Ponzoha, Cutler, & Weigel, 1989).

Readmission rates were similar for the forensic and general patients and were associated with levels of positive symptoms and non-compliance with medication. Given that the general patients were much more ill than the forensic patients throughout the two-period studied, the results suggest that the forensic services used a lower threshold of symptoms and non-compliance to warrant hospitalization than did the general psychiatric services.

Rates of aggressive behavior among the patients discharged from general adult services were 18% in the first year of follow-up and 22% in the second year. These are similar to the rates reported for the patients with schizophrenia in the year following discharge in the MacArthur multi-site study of general psychiatric patients in the US (Monahan et al., 2001). In the present study, however, none of the incidents involving general patients were severe enough to fit the MacArthur Project definition of violence (Monahan et al., 2001). The three incidents that caused major injuries, and that would fall into the MacArthur definition of "violence" were perpetrated by forensic patients. The rates observed in the current study among the patients in general psychiatric services were similar to the rates of assault reported in a British study of patients with psychotic disorders living in the community (Walsh et al., 2001). The rates for the forensic patients were significantly lower, 10% in the first year and 8% in the second year. This finding is consistent with results of follow-up studies of patients released from forensic hospitals showing good clinical outcome and low rates of criminal recidivism (Heilburn & Peters, 2000).

Aggressive behavior was positively associated with the number of positive symptoms assessed prospectively and a history of antisocial behavior going back to at least age 15 as indexed by ASPD. Several studies have shown that among persons who develop schizophrenia, a pattern of antisocial behavior that emerges in childhood continues to be associated with aggressive behavior and violent

crime well into middle age (Fulwiler & Ruthazer, 1999; Mueser et al., 2006; Swanson et al., 2006). Despite the fact that the forensic sample included almost twice as many patients with ASPD as did the general sample, fewer of the forensic than the general patients engaged in aggressive behavior during the follow-up period. Results from the present study replicate previous work in showing that among men with schizophrenia living in the community positive symptoms of psychosis were associated with assaults on others (Hodgins, Hiscoke, & Freese, 2003; Swanson et al., 2006). Aggressive behavior was not associated with substance misuse. This is consistent with the results of previous studies suggesting that it is not substance misuse per se, but rather previous antisocial behavior that is associated with aggressive behavior (Mueser et al., 2006; Fulwiler & Ruthazer, 1999; Rice & Harris, 1995; Hodgins, Tiihonen, & Ross, 2005; Swanson et al., 2006; Tengström, Hodgins, Grann, Langström, & Kullgren, 2004). Unlike these studies, most investigations that have observed an association between substance misuse and aggressive behavior among men with schizophrenic disorders have not measured previous antisocial behavior.

Since similar results were observed across four different countries, they are important. They demonstrate that patients at high risk for violence have rather good outcomes following treatment in forensic services. Forensic care was associated with low rates of aggressive behavior in the two years following discharge among patients whose histories conferred high risk for further violence. In addition, forensic care was associated with low levels of symptoms. This is a good outcome for a difficult group of patients. This positive outcome among the forensic patients suggests that assessing and managing the risk of violence had positive consequences and is consistent with the conclusions of a review of naturalistic studies that found that specialized forensic community care was associated with good outcome (Heilburn & Peters, 2000). The sample recruited in general psychiatric hospitals may have included many chronically ill patients. As noted in the Method, more than 40% of the patients in general services who were invited to participate in the study refused. This limitation of the present study underlines the need for replication.

Despite lower levels of symptoms, proportionally as many forensic as general patients were re-admitted during the follow-up period. Both positive symptom levels and compliance were associated with readmission, suggesting perhaps, that the threshold for symptom levels and non-compliance that led to readmission was lower in the forensic than the general services. Studies (Bloom, Rogers, Manson, & Williams, 1986; Wiederanders, 1992) have reported that quick, short re-hospitalizations may be useful in stabilizing patients and preventing violent behavior. The results of the present study may be interpreted to suggest that the forensic services were more successful at preventing aggressive behavior because they more closely monitored levels of positive symptoms and medication compliance and intervened more quickly as symptoms increased or compliance waned.

Current understanding of risk for violence suggests that history of antisocial and aggressive behavior sets the level of risk which is then modified by clinical status and environmental factors (Webster, Douglas, Eaves, & Hart, 1997). The results of the present study indicated that positive symptom levels and ASPD were associated with aggressive behavior. General psychiatric services usually do not investigate patients' history of antisocial and aggressive behavior. Yet, a history of antisocial behavior going back to childhood is associated with aggressive behavior in middle age, as well as with violent criminality throughout adulthood (Hodgins et al., 2005; Mueser et al., 2006; Swanson et al., 2006). Since general psychiatric services do not usually assess risk for future violence, they do not provide treatments to target aggressive behavior, nor do they actively manage the risk of future aggressive behavior. The results of the present study suggest that when this is done, similar patients have good outcomes.

The findings from the present study suggest that the approach of forensic services of treating the illness and the violent behavior was associated with relatively good outcome. The finding that both previous antisocial behavior, as indexed by ASPD, and positive symptoms were associated with aggressive behavior underlines the necessity of simultaneously attending to both the illness and antisocial and aggressive behavior. By contrast, the approach taken in general adult services to focus

exclusively on the treatment of the schizophrenic disorder with little or no attention paid to assessing and managing the risk of violent behavior was associated with high levels of both symptoms and aggressive behavior. The results can be interpreted to suggest that treatment may be more effective if it takes account of the whole individual with all of his/her problems. This interpretation of the findings needs to be tested empirically.

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