

Utility of a Violence Screening Tool to Predict Recidivism in Offenders with Schizophrenia: A Total Forensic Cohort Study

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Abstract

The aim of the present study was to investigate the utility of the screening tool developed by Wootton and colleagues (2008) to predict recidivism in a total cohort of offenders diagnosed with schizophrenia-spectrum disorders in the Canton of Zürich, Switzerland. The sample consisted of violent (including sexual) offenders between the ages of 18 to 65 years with ICD-10 diagnoses of schizophrenia, schizoaffective disorder, affective psychosis, and delusional disorder, sentenced either to court-ordered therapy or at least 10 month's prison and discharged into the community ($N = 34$). The instrument was found to be useful in prospectively identifying low-risk individuals and retrospectively discriminating recidivists. Albeit the adaptation of the screening tool may have some usefulness when identifying low-risk individuals, caution is warranted when used in forensic samples.

Keywords: Risk Assessment, Violence, Crime, Forensic, Schizophrenia

As the number of forensic hospital beds has doubled in many Western countries over the past two decades (Priebe et al., 2008), valid violence-risk-assessment procedures are needed for severely mentally ill populations. Meta-analytic evidence suggests that risk-assessment instruments developed for such specific populations produce higher rates of predictive validity (Singh, Grann, Lichtenstein, Långström, & Fazel, 2012). Further, recent research confirms that instruments perform best when administered to samples similar to their calibration samples (Harris et al., 2003), inferring that measures designed for specific diagnostic groups may produce higher rates of accuracy than tools developed for heterogeneous psychiatric populations. This is supported by recent systematic reviews that have argued for the importance of violence risk assessment in psychiatric populations and have noted the need for diagnosis-specific assessments of dangerousness (Kumar & Simpson, 2005; Turgut, Lagace, Izmir, & Dursun, 2006; Woods & Ashley, 2007).

A systematic search for risk-assessment tools designed to assess the likelihood of community violence in psychiatric patients identified only one actuarial formula developed for individuals diagnosed with psychotic disorders (Singh, Serper, Reinharth, & Fazel, 2011). The scheme, developed by Wootton and colleagues (2008) as part of the UK700 study on case management for patients with schizophrenia-spectrum disorders in England, provides a violence screening tool using routinely available criminal history, demographic, and clinical information.

Given the authors' claims that the screening instrument may be useful in practice settings, the aim of the present study was to investigate its usefulness in a total forensic cohort of offenders diagnosed with schizophrenia in the Canton of Zürich, Switzerland.

Materials and Methods

Participants

The study sample comprised offenders from the Zürich Forensic Study, which examined all violent (including sexual) offenders enrolled in probation and/or correction services of the criminal justice system in the Canton of Zürich, Switzerland, in August 2000 ($N = 465$). The present study included those offenders between the ages of 18 to 65 years with ICD-10 diagnoses of schizophrenia, schizoaffective disorder, affective psychosis, and delusional disorder, sentenced either to court-ordered therapy or at least 10 month's prison and subsequently discharged into the community ($N = 34$). In Switzerland, an offender who is diagnosed with a mental illness that is deemed treatable and related to his or her increased recidivism risk is, as part of his or her sentence, assigned an individualized treatment plan that may consist of inpatient hospitalization, outpatient treatment, counseling, and/or medication amongst other services. Which services are received by which offender is determined by expert opinion. In the present study, psychiatric diagnoses were established by qualified clinicians using standard DSM-IV and ICD-10 criteria, relying upon a combination of interview and file review information.

Materials

The screening tool developed by Wootton and colleagues (2008) was designed to assess the likelihood of assaults by patients with psychosis in the community. The instrument was calibrated for a follow-up of two years and patients aged 18 to 65 years. The formula is composed of four criminal history, demographic, and clinical variables. These variables are combined using a simple scoring system developed by rounding the logistic regression coefficients from a multivariable model containing them:

Score 11 if assault in previous 2 years
add 2 if Male
add 6 if Drug use in the past year
add 20
subtract $0.3 \times \text{Age at discharge}$
Divide total by 3.5

The authors operationally defined previous assaults as self-reported incidents of “having committed an assault in the 2 years prior to study entry,” (p. 178) regardless of severity, and drug use as self-reported “use of any illicit drug in the last year or self-report of having used 2 or more illicit drugs in the last year” (p. 178-179). Since the usefulness of the screening tool may be limited in forensic populations as offenders may not have had a comparable opportunity to offend or use drugs compared to civil patients, two item adaptations were made: “assault within the last two years” was changed to “assault prior to the index offence” and the definition of drug use was changed from “drug use in the past year” to “diagnosis of drug use or dependency.”

Procedure

Five Masters-level psychologists collected criminal history, demographic, and clinical information from correctional files. The files contained comprehensive personal details, including the circumstances of both previous and index offenses as well as psychiatric diagnoses. In a pilot study on a subsample of participants from the Zürich Forensic Study ($n = 30$, 6.5%), the interrater agreement for the collected information was determined to be substantial ($\kappa = 0.70$; Landis & Koch, 1977). The cohort was prospectively followed after release to the community and information on recidivism collected. Determinations of previous convictions and recidivism were based on criminal records, which included information on charges and convictions as well as violation of conditions of probation. A sensitive definition of recidivism was used including any charge or conviction for an offense committed after the index offense. This dichotomous outcome criterion did not include probation violations that did not constitute crimes.

Statistical Analysis

The predictive validity of the screening tool was measured using seven performance indicators including the area under the curve (AUC) as calculated using receiver operating characteristic (ROC) curve analysis. Additional indicators were calculated using a 2 x 2 contingency table (Figure 1) and the author-recommended cut-off score of +4. Using this tabular information, sensitivity (the percentage of recidivists who were judged to be at high risk), specificity (the percentage of non-recidivists who were judged to be at low risk), positive predictive value (PPV; the percentage of patients judged to be at high risk who went on to recidivate), negative predictive value (NPV; the percentage of low-risk individuals who did not go on to recidivate), number needed to detain (NND; the number of patients judged to be at high risk who would need to be detained to

prevent a single incident of recidivism in the community), and number safely discharged (NSD; the number of patients judged to be at low risk who could be discharged prior to a single incident of violent recidivism in the community) were calculated. These seven outcome statistics were selected as they provide measures of global utility (AUC) as well as usefulness in making “rule in” (sensitivity, PPV, and NND) and “rule out” (specificity, NPV, and NSS) decisions (Singh, Grann, & Fazel, 2011).

Analyses were conducted using SPSS 19 for Windows (SPSS Inc., 2010), STATA/IC 12.0 for Windows (StataCorp, 2012), and MedCalc 11.3.8.0 for Windows (MedCalc MedCalc Software, 2010). Two-tailed tests were used with a standard significance threshold of $\alpha=0.05$.

Results

Sample Characteristics

The sample for the present study was composed of 34 violent (including sexual) offenders diagnosed with schizophrenia-spectrum disorders sentenced to court-ordered therapy or prison and then discharged into the community (Table 1). All patients were male, with a mean age of 40.1 years (*range* = 26.0-66.1, *SD* = 9.0) at discharge. The majority of the participants were of Swiss nationality (70.6%, *n* = 24) and single at the time of the index offense (70.6%, *n* = 24). Half of the patients (50.0%, *n* = 17) had a conviction prior to the index offense. Regarding clinical diagnoses, 11.8% (*n* = 4) of the participants had a DSM-IV or ICD-10 comorbid personality disorder and 11.8% (*n* = 4) comorbid diagnosis of drug abuse or dependence. The majority of the sample (70.6%, *n* = 24) had been psychiatrically hospitalized prior to the index offense.

Table 1. Descriptive Characteristics of 34 Offenders Diagnosed with Schizophrenia-Spectrum Disorder in Switzerland.

Category	Subcategory	Calibration sample	Present sample
		<i>N</i> = 708 (%)	<i>N</i> = 34 (%)
Sex	Male	404 (57.1%)	34 (100.0%)
	Female	304 (42.9%)	0 (0.0%)
Nationality	Swiss	<i>NR</i>	24 (70.6%)
	Non-Swiss	<i>NR</i>	10 (29.4%)
Marital status	Single	464 (65.5%)	24 (70.6%)
	Not single	244 (34.5%)	10 (29.4%)
Age at discharge	Mean (<i>SD</i>)	38.2 (11.6)	40.1 (9.0)
Criminal history	Yes	122 (17.2%)	17 (50.0%)
	No	586 (82.8%)	17 (50.0%)
Personality disorder	Yes	186 (26.3%)	4 (11.8%)
	No	522 (73.7%)	30 (88.2%)
Illicit drug abuse or dependency	Yes	209 (29.5%)	4 (11.8%)
	No	499 (70.5%)	30 (88.2%)
Previous psychiatric hospitalization ¹	Yes	<i>NR</i>	24 (70.6%)
	No	<i>NR</i>	9 (26.5%)

Note. *N* = number of participants in sample; *SD* = standard deviation; *NR* = not reported. Diagnoses of schizophrenia, personality disorder, and drug abuse or dependency made using DSM-IV or ICD-10. Calibration estimates from Wootton and colleagues (2008).

¹ One case missing (2.9%)

All participants were followed for two years post-discharge (including periods of detention for non-violent crimes) and criminal registers were used to ascertain whether they had recidivated. Only one patient (2.9%) had been charged with a violent offense (sexual assault). This patient was a married Swiss national and was 31.2 years old at discharge. In respect to clinical characteristics, he had neither been diagnosed with comorbid drug abuse/dependence nor personality disorder, and had not been hospitalized psychiatrically prior to the index offense. However, he had been previously convicted of assault.

Predictive validity of adapted screening tool

The predictive validity of the adapted screening tool was assessed using both ROC and contingency table analyses (Table 2). ROC analysis revealed that the probability of a randomly selected recidivist having a higher risk classification than a randomly selected non-recidivist was 74.0%, using categorical estimates (i.e., high risk vs. low risk). The instrument was not found to be useful in prospectively predicting (PPV = 5.6%; NND = 18.0) but was found to be useful in retrospectively discriminating (sensitivity = 100%) recidivists (Figure 1). Although the instrument was able to prospectively identify low-risk individuals with a high level of accuracy (NPV = 100%) only around half of the non-recidivists were classified as low risk (specificity = 51.5%).

Table 2. Performance Indicators of an Adapted Version of a Violence Screening Tool for 34 Offenders Diagnosed with Schizophrenia-Spectrum Disorders in Switzerland.

Sample	ROC Curve Analysis ¹		Contingency Table Analysis ¹						
	AUC	Sensitivity	Specificity	PPV	NPV	NND	NSD	FPR	FNR
Calibration	0.71	65%	69%	NR	NR	2.67	NR	63%	13%
Present study sample ²	0.74	100%	51.5%	5.6%	100%	18.0	16	51.5%	0%

Note. ROC = receiver operating characteristic; AUC = area under the curve; PPV = positive predictive value; NPV = negative predictive value; NND = number needed to detain; NSD = number safely discharged; FPR = false-positive rate; FNR = false-negative rate; NR = not reported. Calibration estimates from Wootton and colleagues (2008).

¹ Calculated using categorical risk bins (scores <+4 vs. ≥+4).

² Adapted version of violence screening tool: previous assault = assault prior to index offense; drug use = diagnosis of drug abuse or dependency

Figure 1. 2 x 2 Contingency Table Comparing Predictions and Outcomes of an Adapted Version of a Violence Screening Tool for 34 Offenders Diagnosed with Schizophrenia-Spectrum Disorders in Switzerland.

		<u>Outcome</u>	
		Violent Recidivism	No Violent Recidivism
<u>Prediction</u>	High Risk	1	17
	Low Risk	0	16

Discussion

The aim of the present investigation was to examine the predictive validity of a screening tool designed to predict violence in patients diagnosed with psychotic disorders and discharged from forensic psychiatric care. Receiver operating characteristic and contingency table analyses revealed that the adapted version of the tool was useful in prospectively identifying low-risk individuals and retrospectively discriminating recidivists.

Implications

Reviews of the media literature (Klin & Lemish, 2008; Levey & Howells, 1994) and surveys conducted in Western countries (Luty, Fekadu, & Dhandayudham, 2006; National Alliance on Mental Illness, 2008; Pescosolido et al., 2010) have identified individuals with schizophrenia as the hospitalized group most commonly associated with violence. The findings of the present study, however, suggest that viewing patients diagnosed with schizophrenia as a major public-health and safety concern may be unwarranted. This supports recent large-scale epidemiological studies that have found individuals with severe mental illness to be responsible for only a small fraction of violent crimes (Fazel & Grann, 2006).

As the use of risk-assessment instruments is recommended by a large body of researchers, they have gained widespread popularity in the evaluation of violence risk (Archer, Buffington-Vollum, Stredny, & Handel, 2006; Viljoen, McLachlan, & Vincent, 2010). However, Viljoen et al. (2010) argue that it is important to only use risk assessment instruments if risk is relevant for the legal issue at hand and to carefully

consider the appropriateness and limitations of different assessment instruments. Thus, related to the above implication, the very low base rate of violence in individuals diagnosed with schizophrenia (Large, Ryan, Singh, Paton, & Nielssen, 2011) has led some experts to argue that the use of violence-risk-assessment instruments may not be particularly useful in severely mentally ill populations (Szmukler, 2001).

Given that no participants judged to be at low risk went on to recidivate, the scheme may be useful in prospectively identifying low-risk individuals. An approach that could be considered to take advantage of the instrument's strengths would be to screen out patients at very low risk prior to in-depth risk assessments (Singh et al., 2012). Given how time consuming structured-risk-assessment instruments can be (Viljoen et al., 2010), screening tools that use routinely available file information and can quickly identify individuals at such low risk that they do not require further assessment of violence risk are potentially attractive. Similar stepped approaches are already widely used in other fields such as clinical medicine (Smith et al., 2011).

Limitations

There are several limitations to the present investigation. First, the small sample size likely resulted in insufficient power to detect small to moderate AUCs using ROC curve analysis and may have produced biased parameter estimates (Hanczar et al., 2010). Future studies may wish to further investigate the ability of the screening tool in prospectively predicting violent recidivism in larger samples of forensic psychiatric patients.

Second, only criminal records were used to identify cases of assault, potentially underestimating the prevalence of violent incidents in the sample. Were the base rate of violence higher, the screening instrument would likely have produced a higher PPV and NND as well as a lower NPV and NSD. Using a combination of criminal records, patient self-report, and collateral interviews (clinician, friends, family) is recommended to address this potential bias (cf. Monahan et al., 2001).

Third, the statistical model tested in the present investigation included modifications of several items in the original formula published by Wootton. Specifically, self-reported incidents of assault were replaced by incidents of assault prior to the index offense, and self-reported drug use was replaced by diagnoses of drug use or dependency. The former modification may have reduced the prevalence of prior aggressive incidents, as intra-institutional misconduct would not have been included. The latter modification may have reduced the prevalence of substance use, as formal DSM-IV and ICD-10 diagnoses were less likely to detect any drug use than self-report. The two modifications to the item content of the model, if they did have an effect, would have resulted in overall lower risk scores, producing a more sensitive model. However, the low PPVs and high NNDs found suggest that, even when the model is optimized in the identification of recidivists, the formula has difficulties prospectively identifying high-risk individuals.

Fourth, recent research has evidenced instability in group-based risk classifications such as those developed using statistical models such as that investigated in the present study (Cooke & Michie, 2010; Hart & Cooke, 2013; Hart, Michie, & Cooke, 2007). Hence, we advocate caution when making definitive decisions concerning individual liberty and resource allocation using the Wootton formula.

Fifth, the conclusions of the present investigation are circumscribed to ethnically Swiss men in forensic settings. Until further replication studies have been conducted, we cannot be certain that our findings would generalize to more diverse populations including women or men of different cultural backgrounds.

Conclusion

The routine assessment of violence risk in patients with schizophrenia is recommended by current clinical guidelines (American Psychiatric Association, 2004; National Institute for Health and Clinical Excellence, 2009). However, since the base rate of violence in individuals diagnosed with schizophrenia is very low (Large et al., 2011), screening tools that can quickly identify individuals at low risk, and do not require further assessment of violence risk, might be more attractive to use in severely mentally ill populations. The adaptation of the screening tool in the current study may have some utility when identifying low-risk individuals, but caution is warranted when used in other forensic samples. Future studies may also wish to explore the degree to which incidents of violent recidivism are related to schizophrenia-spectrum symptoms such as threat-control override symptoms (Link, Stueve, & Phelan, 1998), as well as the mediating effect of antipsychotic prescription and adherence (Swanson, Swartz, & Elbogen, 2004). When it comes to the issue of risk assessment in individuals with severe mental illness, the question is, indeed, not whether, but how.

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