Clinical risk factors of acute severe or fatal violence among forensic mental health patients

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ABSTRACT

Existing violence risk assessment studies of mental health patients focus mostly on the association of historical presence of clinical risk factors and long-term violence, with little emphasis on the short-term temporal proximity between clinically relevant risk factors and the occurrence of violent behaviors. This research examined the proximal clinical risk factors (within days to a week prior) of acute severe or fatal violence among a group of forensic patients with serious mental illness ($N = 287$) found Not Criminally Responsible for offenses that involved violence against person(s), based on file review. Command hallucinations (OR = 2.35, 95% CI = 1.05 – 5.24), Threat/control-override symptoms (OR = 3.10, 95% CI = 1.51 – 6.35) and Capgras syndrome (OR = 3.58, 95% CI = 1.06 – 12.15) were identified as independent significant risk factors associated with acute severe or fatal violence. First degree relatives and intimate partners were significantly associated with being a victim of acute severe or fatal violence. Gender, recent alcohol use and recent drug use were not significantly associated with acute severe or fatal violence. Clinical utilities of the results and future directions for research are discussed.

1. Introduction

Several epidemiological surveys and case register studies have indicated that psychosis alone contributed little or has no association with violence (Coid et al., 2006; Elbogen and Johnson, 2009; Fazel et al., 2009b, 2010b). At the same time, systematic reviews and meta-analyses have shown that persons with serious mental illness (SMI) that comprises schizophrenia and other psychoses were associated with increased risk of violence and serious violent offending, including homicide (Fazel et al., 2009a; Witt et al., 2013), when additional risk factors were considered. Dispositional, situational, disinhibiting and historical factors (Elbogen et al., 2016); and clinical and contextual factors (Lamsma and Harte, 2015; Varshney et al., 2016) have been identified as risk factors constituting possible pathways to violence among SMI individuals. Notwithstanding the findings of a significant correlation between psychosis and violence, the diverse outcome of violence ranging from verbal threats to homicide among these studies (Bo et al., 2011; Sariaslan et al., 2016; Witt et al., 2013) may mask the true risk of the level of severity of violence committed by persons with SMI (Davis, 1991), '…leaving unanswered the question of whether mental illness predicts some kinds of violence but not others' (Elbogen and Johnson, 2009, p.153). Furthermore, the extensive work on identifying clinical risk factors of violence among persons with SMI

focused mostly on the association of the historical presence of these factors and long-term violence. Such an approach provides little information on the causal link between proximal risk factors such as substance abuse and psychiatric symptoms that occurred recently and violence (Johnson et al., 2016; Ullrich et al., 2013). Identifying clinically relevant risk factors proximal to violence, especially severe or fatal violence, in clinical settings within days to a week following mental health evaluation of the person will be of practical utility to assist "…as soon as possible, in preventive clinical actions such as change in medication, monitoring, and admitting to or discharge from hospital" (Tardiff, 2008, p. 3).

This study aims to: (a) examine the association between proximal clinically relevant risks factors of severe or fatal violence identified in the literature and the occurrence of such violence committed by forensic patients with a diagnosis of SMI found Not found Criminally Responsible on account of Mental Disorder (NCRMD), and (b) explore if any of these risk factors can significantly discriminate severe or fatal violence from less severe violence against person(s) committed by this group of patients.

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2. Clinically relevant risk factors of severe or fatal violence

2.1. Substance misuse

A review on risk factors for violence among persons with schizophrenia identified a robust link between substance abuse and severe violence (Rund, 2018). Recent substance use (Witt et al., 2013) and comorbid substance use (Fazel et al., 2009a) were found to be associated with a higher risk of committing violent offenses among offenders with SMI. More than half (56%) of persons with SMI convicted of severe non-lethal offenses reported being intoxicated at the time of the offense (Yee et al., 2011). Substance intoxication was one of the significant triggers of violent crimes in the following week, with an adjusted OR ranged between 3.0 and 4.0 (Sariaslan et al., 2016). Binge drinking was also associated with higher risk (OR = 1.48) of serious violence among persons with SMI (Van Dorn et al., 2012). Similarly, substance misuse was found present among schizophrenia patients who committed homicide six months after discharge (Fazel et al., 2010a). About one-third (between 30% and 35%) of homicide offenders with SMI reported being intoxicated with alcohol or drugs at the time of the offense (Joyal et al., 2004; Nielssen et al., 2007), with a much higher risk (OR = 17.2) among male homicide offenders with schizophrenia and co-existing alcoholism, compared to those without such co-existing disorder (OR = 7.25) (Eronen et al., 1996).

2.2. Active psychotic symptoms

Positive psychotic symptoms of persecutory ideation, paranoid delusions, command hallucinations, and Threat/Control Override (TCO) symptoms were recognized as significant clinical risk factors associated with violence by persons with SMI (Bo et al., 2011). Between 50% and 78% of offenders with a psychotic illness committed a severe violent offense due to presence of delusions and hallucinations or experienced paranoid delusion at the time of committing a severely violent offense (Nestor et al., 1995; Yee et al., 2011). Persecutory delusions had an increased risk (OR = 1.85) of serious violence among SMI (Van Dorn et al., 2012) and was the only significant independent factor associated with serious violence among discharged forensic patients (Ullrich et al., 2018). Similarly, homicide offenders with schizophrenia experienced significantly higher rates of auditory hallucinations (66% vs. 54%, $p = 0.04$) and delusional beliefs (77% vs. 67%, $p = 0.04$) within a month of committing homicide, compared to those who did not (El-Hadidy, 2012). Persecutory delusions (30%–57%) and command hallucinations (18%–22%) were the two most prominent triggers of homicide by offenders with schizophrenia (Golenkov et al., 2011; Joyal et al., 2004), with a majority of homicide offenders with schizophrenia (54%) experienced delusions and/or hallucinations prior to committing the violent act (Nordström et al., 2006). TCO symptoms were significantly associated with serious interpersonal violence (Green et al., 2009) and the only significant factor that differentiated the high-violence group (with offenses including murder, attempted murder and severe bodily injury) from the low-violence group among male offenders with schizophrenia found not guilty by reason of insanity (Stompe et al., 2004).

Capgras syndrome, a delusional belief that people familiar to the individual have been replaced by imposters (Carabellese et al., 2014), is most frequently developed and persisted in persons with schizophrenia (Aziz et al., 2005). Serious violent behavior was found to be significantly associated with a history of having had an experience of familiar persons being replaced by doubles and other delusional misidentification syndromes among a group of hospitalized inmates with SMI (Horn et al., 2018). A review of hospital records of 46 forensic patients with a diagnosis of SMI showed that patients in the severely violent group with charges of murder and serious assaults had a significantly higher percentage of imposter delusion at the time of the index admission compared with patients in the less violent group

(Nestor et al., 1995). Capgras syndrome and command hallucinations were found to be significantly associated with homicide among a group of male offenders "found of unsound minds" (Green et al., 2009).

Based on the above review, alcohol and drug use, and psychotic symptoms of persecutory delusions, command hallucinations, TCO symptoms and Capgras syndrome proximal and prior to the occurrence of violence against person(s) were selected as clinically relevant risk factors for this study. The goal of this study was to examine the potential association between these clinical risk factors and acute severe or fatal violence committed by forensic patients with SMI found Not Criminally Responsible on account of Mental Disorder (NCRMD) for a charge that involved violence against person(s).

3. Methodology

3.1. Research hypothesis

The following research hypothesis was proposed:
Ha. At least one of the clinical variables of psychotic symptoms of persecutory delusions, command hallucinations, threat/control-override (TCO) symptoms, Capgras syndrome, or substance (alcohol or drug) use, within days to a week before the index offense, was positively and significantly associated with acute severe or fatal violence committed by forensic patients with SMI found Not Criminally Responsible (NCR) for the charges.

3.2. Exclusion and inclusion criteria of the sample

The sample comprised of patients from the forensic program at the Centre for Addiction and Mental Health (CAMH) in Toronto, Canada, between November 2010 and June 2011. Initially, data were coded from available patient files ($N = 500$) found either Unfit to Stand Trial (UFST) or NCRMD. Of these, 416 patients were identified as having been found NCRMD. Among these 416 patients, 350 had a charge that involved violence against person(s). Within this subgroup, 287 patients with a diagnosis of a serious mental illness (i.e., schizophrenia, schizoaffective disorder, mood disorders and delusional disorder) were selected in the final sample. Chi Square tests showed no significant difference in age, gender, marital status and employment status between the group of patients with a diagnosis of a SMI and the group with other diagnoses among the 350 patients who had a charge that involved violence against person(s).

The study received ethics protocol approval from the Research Ethics Board of CAMH.

3.3. Data collection

The research employed secondary data analysis based on file review of the sample. Sources of information in the subjects' files include the police summary and the circumstances leading to the arrest, and whenever available, data from collateral sources such as health records from hospitals and agencies that provided services to the patient, and interviews with family members, friends, and/or others who could provide information about the personal history and/or mental health condition of the patient within days to a week before the index offense that led to the finding of NCRMD.

The study used a customized coding form to collect demographic information and data on the dependent variable and independent variables. A team of seven trained research assistants coded the research variables and each file was coded by one research assistant. Intraclass correlation coefficients of independent variables, based on a subset of the sample conducted prior to data collection, ranged between 0.66 (drug use days to a week before the index offense) and 0.96 (alcohol use days to a week before the index offense).

3.4. Measures

3.4.1. Dependent variable

3.4.1.1. Severity of acute violence. Acute violence refers to the abrupt onset, i.e., occurring within days to a week after manifestation of clinical risk factors, with rapid progression to violent behavior that needs urgent care to avoid harm. Violence is defined as a dichotomous variable of acute severe or fatal violence vs. less severe violence against person(s).

The most serious index offense that led to the patient's NCRMD finding was rated according to the Cormier-Lang System for Quantifying Criminal History (Quinsey et al., 1998). Offenses were classified into 15 categories that range from homicide (14) to non-violent acts (0). The four most serious categories of violence against persons (homicide, manslaughter, attempted murder and aggravated assault) were collapsed into severe or fatal violence and assigned a binary code of 1. The next seven categories of violence against person(s) (assault with a weapon, assault causing bodily harm, sexual assault, assault, robbery, criminal harassment and threats), were collapsed into less severe violence and assigned a binary code of 0. Forensic patients with SMI found NCRMD with index offenses that involved the last three categories of violent acts not against a person (arson, break and enter or theft, and mischief) and the category of non-violent acts were excluded from this study.

The research assistants recorded the actual description of the most serious index offense for each subject. The principal investigator, who was not involved in the data collection process, was responsible for transforming the descriptive charge of the most serious index offense into the binary coding system for data analysis. The research assistants were not privy to the categories that constituted the binary coding system.

3.4.2. Independent variables

3.4.2.1. Persecutory delusions. The coding for persecutory delusions was based on the definition of 'Persecutory Delusions' as presented in the Scale for the Assessment of Positive Symptoms (Andreasen, 1984).

3.4.2.2. Command hallucinations. The coding for command hallucinations was based on the following definition: 'Auditory hallucinations that orders particular acts…instructs a patient to act in a certain manner—ranging from making a gesture or grimace to committing suicide or homicidal acts' (Hellerstein et al., 1987, p. 219).

3.4.2.3. Capgras syndrome. The coding for Capgras syndrome was based on the following definition: '…the affected person delusionally believes that one or several people in the environment have experienced radical changes in psychological makeup without experiencing changes in physical appearance' (Silva et al., 1996, p. 641).

Based on the psychiatrist's report in the subject's file, the research assistants determined if any of the above psychotic symptoms were present within days to a week before the index offense. A score of 2 (definitely present) was assigned in cases where the psychotic symptoms were definitely present; a score of 1 (possibly present) was assigned if symptom(s) partially matched the definition of the psychotic symptoms; and a score of 0 (not present) was assigned where there was no mention of the psychotic symptoms being present within days to a week before the index offense.

3.4.2.4. Threat/control-override (TCO) symptoms. The coding of TCO symptoms was based on the six-item Observer Ratings of threat/control-override (TCO) Symptoms scale (Bjørkly and Havik, 2003). A score of 2 (definitely present) was assigned if two or more items of TCO symptoms were identified in the psychiatrist's report in the file; a score of 1 (possibly present) was assigned if one item of TCO symptoms was identified; and a score of 0 (not present) was assigned if the patient did

not exhibit any TCO symptoms within days to a week before the index offense.

3.4.2.5. Alcohol use or drug use within days to a week before the index offense. Based on the psychiatrist's report in the file, the research assistants rated alcohol or drug use within days to a week before the index offense separately, based on the following coding scheme: a score of 2 (definitely present) was assigned if there was clear indication that the patient was definitely using alcohol or drug; a score of 1 (possibly present) was assigned if there was a suggestion that the patient might have been using alcohol or drug; and a score of 0 (not present) was assigned if there was no indication that the patient was using alcohol or drug within days to a week before the index offense.

3.4.3. Demographic and other variables

The demographic variables comprised the patient's age, gender, marital status and employment status at the time of the finding of NCRMD. Victim relationship was also included as a binary variable of Close family (first degree relatives and persons in an intimate relationship with the subject) vs. others (professionals/acquaintances/strangers).

3.4.4. Missing values in independent variables

All subjects with missing values for any one of the independent variables were given a code of 99 and excluded from the descriptive, bivariate and binary logistic regression analyses. The percentage of missing values among the independent variables ranged between one and two percent.

3.5. Data analysis

Data analysis was conducted using version 20 of the Statistical Packages for Social Sciences. Chi-square test analyses were conducted to examine the association between the demographic variables (gender, marital status and employment status), psychiatric diagnoses and victim relationship variable, independent variables of clinical risk factors (psychotic symptoms and substance use) within days to a week before the index offense and the dependent variable (severity of violence). A *t*-test was employed to test the difference in the mean ages between the acute severe or fatal violence group and the less severe violence group. A binary logistic regression analysis using the enter method was also performed to identify independent significant variables that could discriminate acute severe or fatal violence from less severe violence among the subjects.

4. Results

4.1. Demographic characteristics of the sample

The ages of the 287 subjects, at the time of being found NCRMD, ranged between 17 and 69 years of age (M = 34.2, SD = 10.86). Two hundred and forty-two (84.3%) subjects were male. Seventy percent of the subjects were single and 13.5% were married or in a common-law relationship. Only 19.4% were employed either full- or part-time at the time of the index offense that led to the finding of NCRMD.

The prevalence of psychotic symptoms noted to be possibly or definitely present, within days to a week before the index offense were persecutory delusions (79.2%), command hallucinations (49.3%), TCO symptoms (48.3%) and Capgras syndrome (7.4%). About one-third of the subjects possibly or definitely used alcohol (33.8%) or illicit drugs (38.4%) within days to a week before the index offense.

Bivariate analyses showed that gender, (χ^2[1, n = 287)], = 0.34. p = 0.56), mean age (t[285] = −0.03. p = 0.98), marital status (χ^2[1, n = 281)], = 2.90. p = 0.09), employment status (χ^2[1, n = 259)], = 3.61. p = 0.06) and psychiatric diagnoses (χ^2[2, n = 287)], = 0.65. p = 0.72) did not differ significantly in the level of

Table 1
Demographic and clinical characteristics of the sample and their association with severity of violence.

N = 287	n (%)	Less severe violence	Severe/fatal violence	p^a
Gender				0.56
Female	45 (15.7%)	32 (14.9%)	13 (17.8%)	
Male	242 (84.3%)	182 (85.1%)	60 (82.1%)	
Age				0.98
Mean		34.16	34.21	
Std. deviation		10.86	10.88	
Range		18–69	17–66	
Marital status (Married/common-law vs. not in a relationship) (N = 281)[b]				0.09
Married/common-law	38 (13.5%)	24 (11.52%)	14 (19.5%)	
Single	196 (69.8%)	153 (73.2%)	43 (59.7%)	
Divorced/separated/widowed	47 (16.7%)	32 (15.3%)	15 (20.8%)	
Employment status (Unemployed vs. full-time and part-time) (N = 259)[b]				0.06
Unemployed	209 (80.6%)	161 (83.4%)	48 (72.7%)	
Full-time	25 (9.7%)	12 (6.2%)	13 (19.7%)	
Part-time	25(9.7%)	20 (10.4%)	5 (7.6%)	
Primary diagnosis (N = 287)				0.72
Schizophrenia	255 (88.8%)	192 (89.7%)	63 (86.3%)	
Affective disorders	22 (7.7%)	15 (7%)	7 (9.6%)	
Delusional disorder	10 (3.5%)	7 (3.3%)	3 (4.1%)	
Victim relationship (close family vs. others) (N = 282)[b]				0.72
First degree relatives and intimate relationship	72 (25.5%)	44 (21.1%)	28 (38.4%)	
Acquaintances/strangers/professionals	210 (74.5%)	165 (78.9%)	45 (61.6%)	**p<0.01**
Paranoid delusion (N = 283)[b]				**p<0.01**
Not present	59 (20.8%)	49 (23.3%)	10 (13.7%)	
Possibly present	102 (36.0%)	82 (39.0%)	20 (27.4%)	
Definitely present	122 (43.2%)	79 (37.6%)	43 (58.9%)	
Command hallucinations (N = 284)[b]				**p<0.01**
Not present	144 (50.7%)	113 (53.6%)	31 (42.5%)	
Possibly present	101 (35.6%)	77 (36.5%)	24 (32.9%)	
Definitely present	39 (13.7%)	21 (9.9%)	18 (24.6%)	
Threat control-override (TCO) symptoms (N = 284)[b]				**p<0.0001**
Not present	144 (50.7%)	117 (55.5%)	27 (37.0%)	
Possibly present	81 (28.5%)	64 (30.3%)	17 (23.3%)	
Definitely present	59 (20.8%)	30 (14.2%)	29 (39.7%)	
Capgras syndrome (N = 284)[b]				**p<0.05**
Not present	263 (92.6%)	201 (95.3%)	62 (84.9%)	
Possibly present	8 (2.8%)	4 (1.9%)	4 (5.5%)	
Definitely present	13 (4.6%)	6 (2.8%)	7 (9.6%)	
Recent alcohol use (N = 281)[b]				0.87
Not present	186 (66.2%)	139 (66.5%)	47 (65.3%)	
Possibly present	79 (28.1%)	59 (28.2%)	20 (27.8%)	
Definitely present	16 (5.7%)	11 (5.3%)	5 (6.9%)	
Recent drug use (N = 281)[b]				0.35
Not present	173 (61.6%)	126 605.3%)	47 (65.3%)	
Possibly present	91 (32.4%)	72 (34.4%)	19 (26.4%)	
Definitely present	17 (6.0%)	11 (5.3%)	6 (8.3%)	

[a] Proportions were compared by chi square tests and means were compared by *t*-test.
[b] Missing data were not included in the analyses.

severity of violence in the index offense. Victim relationship, however, showed that first degree relatives and persons in an intimate relationship with the subject were significantly associated with being a victim of acute severe or fatal violence ($\chi^2[1, n = 282)]$, = 8.52. $p = 0.004$) [Table 1].

4.2. Test of association between the dependent variable and independent variables

Persecutory delusions ($\chi^2[2, n = 283] = 10.15, p < 0.01$), command hallucinations, ($\chi^2[2, n = 284] = 10.05, p < 0.01$), TCO symptoms ($\chi^2[2, n = 284] = 21.58, p < 0.0001$), and Capgras syndrome ($\chi^2[2, n = 284] = 8.49, p < 0.05$) were positively and significantly associated with acute severe or fatal violence. Alcohol $\chi^2[2, n = 281] = 0.28, p = 0.87$) and drug use ($\chi^2[2, n = 281] = 2.13, p = 0.35$) were not significantly associated with acute severe or fatal violence.

4.3. Logistic regression analysis

The clinical variables of persecutory delusions, command hallucinations, TCO symptoms, and Capgras syndrome were entered into the binary logistic regression analysis using enter method to identify the best model for classification. The model identified command hallucinations ($p < 0.05$), TCO symptoms ($p < 0.01$) and Capgras syndrome ($p < 0.05$) as independent significant risk factors associated with acute severe or fatal violence [Table 2]. The area under the receiver operating characteristic curve (AUC), a measure of predictive validity, of this

Table 2
Odds ratios (and 95% confidence intervals) from a logistic regression analysis evaluating the effects of proximal clinical risk factors on acute severe/fatal violence.

Clinical risk factors	OR	95% CI	p
Command hallucinations	2.35	1.05–5.24	0.038
Threat control-override (TCO) symptoms	3.10	1.51–6.35	0.002
Capgras syndrome	3.58	1.06–12.15	0.041

model produces a value of 0.71 ($p < 0.000001$, 95% CI [0.65, 0.79]). This value is comparable to the accuracy estimates (0.72 [0.68–0.78]) of validated risk assessment tool for violent reoffending among mentally ill patients (Fazel et al., 2012). The model is statistically significant (χ^2 [8, $n = 283$] $= 34.25$, $p < 0.0001$), suggesting that there is 71% chance this model will be able to distinguish between acute severe or fatal violence and acute less severe violence.

5. Discussion

This research replicates the results of previous studies that identified paranoid delusions, command hallucinations (Golenkov et al., 2011; Joyal et al., 2004; Nordström et al., 2006), TCO symptoms (Green et al., 2009; Stompe et al., 2004) and Capgras syndrome (Bourget and Whitehurst, 2004; Green et al., 2009; Silva et al., 1996) as significant clinical risk factors associated with severe or fatal violence among persons with SMI. When adjusting for the effects of these psychotic symptoms, only command hallucinations, TCO symptoms and Capgras syndrome remained as independent significant risks factors that discriminated acute severe or fatal violence from less severe violence, with increased risk (OR) ranged between 2.35 and 3.58. The significant results using acute less severe violence as a reference condition suggests the potency of these clinical risk factors to significantly affect acute severe or fatal violence. Furthermore, the short-term temporal proximity between the clinical risk factors (present within days to a week prior) and the occurrence of acute severe or fatal violence offers a reasonable support to infer a causal link that these clinical risk factors might have set in motion the process of such violence.

The significant results of this study provide tentative support that command hallucinations, TCO symptoms and Capgras syndrome can be useful indicators to be included in clinical risk assessment of acute severe or fatal violence. However, command hallucinations have not been incorporated in existing violence risk assessment research despite its high prevalence (33%–74%) among persons who experience auditory hallucination (West, 2018). Similarly, the equivocal findings of a negative (Applebaum et al., 2000) or no association between TCO symptoms and violence (Haddock et al., 2013) alongside evidence of a positive significant association with severe or fatal violence cited in this study seems to have limited the role of TCO symptoms in violence risk assessment. Compared with other psychotic symptoms, the prevalence of Capgras syndrome is relatively low, with a recent study showing 14.1% among first episode psychotic disorder patients (Salvatore et al., 2014). Research on the relationship between Capgras syndrome and violence is scarce, usually with case reports that focused on its association with fatal violence involving family members (Carabellese et al., 2014; Klein and Hirachan, 2014). In view of the current status of these clinical variables in violence risk assessment literature and research, it is reasonable to speculate that assessment of these psychotic symptoms are not likely to be routinely included in clinical interaction with persons with SMI.

The significant association between being a close family member of forensic patients with SMI found NCRMD and a victim of acute severe or fatal violence also corroborates previous research results that family members comprised a significantly higher percentage among victims of homicide by offenders with SMI (Gottlieb et al., 1987; Hachtel et al., 2018; Nielssen et al., 2007), with a higher risk of being a victim of severe or fatal injury (Nordström and Kullgren, 2003). The finding reinforces the importance and the need to involve family members as active partners in the treatment and risk management plan of persons with SMI.

The results of this study indicate that gender of forensic patients with SMI found NCRMD did not discriminate the commission of acute severe or fatal violence from less severe violence. This contrasts the results from previous studies that male psychiatric outpatients were strongly associated with violence (Iozzino et al., 2015), had a higher risk of violence (OR = 1.6) than female among persons with a

psychotic illness (Witt et al., 2013), and more likely engaged in violence resulting in serious injury (Robbins et al., 2003). On the other hand, a study showed that female forensic psychiatric patients had a significantly higher percentage of being convicted of homicide and attempted homicide than their male counterparts (de Vogel and de Spa, 2018). Furthermore, a population-based study identified a significantly higher percentage of female homicide offenders with SMI and more likely to be mentally ill at the time of the offense compared to male homicide offenders (Flynn et al., 2011). The discrepant findings suggest additional factors may interact with gender to influence the pathway to different level of severity of violence. Future studies should focus on the context of violent acts to help clarify the association between gender and the severity of acute violence by persons with SMI.

Likewise, recent drug or alcohol use (within days to a week prior) in this sample did not discriminate acute severe or fatal violence from less severe violence. The results seem to contradict previous findings that comorbid substance abuse was a significant risk factor with an increased risk of violence among persons with SMI (Fazel et al., 2009b). Nevertheless, new studies have found that recent alcohol and drug misuse were significant risk factors for violence in general (Elbogen et al., 2016) or both less severe violence and severe violence (Witt et al., 2013). These recent findings suggest that both recent alcohol and drug use might have a disinhibitory effect that could manifest in violence not necessarily restricted to severe or fatal level. Future studies should focus on exploring the possible differential pathways of recent alcohol or drug use as clinical risk factors on the severity of acute violence.

5.1. Limitations

The design of retrospective chart review of this study presents a major limitation due to the reliance of accuracy and adequacy in the inclusion of pertinent information in the files compatible with the purpose of this research (Hess, 2004). Nonetheless, the sources of information for the psycholegal assessment comprised the police summary of arrest, prior hospital treatment record(s) and collateral informants with knowledge pertaining to the subject's mental status within days to a week prior to the index offense. It is reasonable to assume that the triangulation of information from these reliable collateral sources, when available, would assist the psychiatrist to formulate a valid description of the clinical symptoms manifested in the subject proximal and prior to the index offense.

The retrospective design of this study cannot establish a causal link between the clinical risks factors and acute severe or fatal violence. However, the coding of file information pertaining to subjects' clinical symptoms within days to a week before the index offense approximates the short-term temporal proximity of the independent variables and the dependent variable. The findings of independent significant association of the proximal presence of these clinical risk factors and the occurrence of acute severe or fatal violence may offer initial support to generate hypotheses for future studies to explore a possible causal relationship between these two sets of variables in future research (Hess, 2004).

The research assistants were partially blind to the hypothesis of this study, with the knowledge of the general purpose of the study of exploring the connection between clinical risk factors and violence among forensic mental health patients. They were required to code all available files of patients found either UFST or NCRMD. They were not involved in the screening of the sample to include only patients with a diagnosis of a serious mental illness and found NCRMD. They were also not responsible, and thus not privy, to the final binary coding of the dependent variable of severity of violence. Such arrangements should serve to mitigate the potential subjective classification bias of overestimating the association between the independent variables and dependent variable (Gearing et al., 2006).

5.2. Implications for service provision and research

Clinicians can incorporate the assessment of command hallucinations, TCO symptoms and Capgras syndrome as standard procedure in clinical interaction with persons with SMI and family members to monitor risk of acute severe or fatal violence. In addition, the significant results may serve to guide clinicians to develop interventions to empower subjects and their family members in this specific sample to monitor and manage the risk of acute severe or fatal violence. Family members can benefit from psychoeducation programs that incorporate the knowledge of the association of these significant risk factors with acute severe violence and other topics related to family violence (Kageyama et al., 2018). Patients can be assisted through cognitive behavioral therapy that targets these significant risks factors as adjunct treatment to complement medication treatment (Quinn and Kolla, 2017).

The findings of this study cannot be generalized to other forensic settings or civic psychiatric populations without corroboration from additional studies. However, the significant findings and the comparable AUC value with those of validated risk assessment instruments offer strong support for future research to replicate and improve the study design in other forensic settings to examine the generalizability of the current study results.

5.3. Conclusion

Homicide (and incidents of severe non-fatal injury) is a traumatic event to family members of the victim (Connolly and Gordon, 2015) and may also affect the perpetrator (Bromley, 2016). The tragic event can have serious impact on the emotional and physical health, family relationships and financial situation of the family system, with the potential of re-victimization due to stigma attached to circumstances of the homicide and lack of support from the environment in the grieving process (Costa et al., 2017). Intervention that focus on addressing validated clinical risk factors of acute severe or fatal violence as part of the risk management plan can help mitigate the occurrence of these tragic incidents and the associated negative impact on the quality of life of those being affected. This research provides preliminary findings on clinical risk factors of acute severe or fatal violence, with credible predictive validity. The results, if corroborated through replicative studies in forensic and general psychiatric settings, will provide a significant contribution to the assessment and management of the risk of acute severe or fatal violence among persons with SMI.

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