

Assessing the Risk of Inpatient Violence in Autism Spectrum Disorder

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The Historical Clinical and Risk Management scale (HCR-20) is a structured clinical judgment tool used to assess risk of violence in secure settings. But the scale does not account for difficulties typical of patients with autism spectrum disorder, which are thought to contribute to their engagement in violent behaviors. The present study is a preliminary investigation of the association between risk assessment and physical and verbal violence in patients with autism spectrum disorder in a secure psychiatric hospital. Scores from the third version of HCR-20 (HCR-20^{V3}) and violent episodes at three and six months following the initial assessment were extracted from an electronic record. The results support the use of the HCR-20^{V3} to assess the risk of overall and physical violence but not verbal aggression. Future studies are needed to identify which factors are associated with violent behaviors in patients with autism spectrum disorder.

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Autism spectrum disorder (ASD) is a lifelong developmental disorder characterized by communication difficulties, social impairment, and repetitive behaviors.¹ The condition is sometimes complicated by the co-occurrence of challenging and violent behaviors.^{2,3} Documentation of violence in ASD suggests that aggression toward other people and objects, property destruction, verbal aggression, disruptive behaviors (e.g., inappropriate sexual behavior), and self-injury may be the most common forms of violent behaviors.^{2,4-6}

It is commonly suggested that ASD-specific factors contribute to patient expression of violent or offending behaviors. These factors may include lack of social understanding, low empathy, failure to recognize consequences of one's actions, impaired understanding of social cues, and behaviors that are restricted and repetitive.⁷⁻⁹ Therefore, individuals

with ASD may not understand others' emotions or perspective, or could fail to acknowledge the social consequences of their actions, due to their focus on a limited range of interests.⁹ For example, in 2006, Katz and Zemishlany¹⁰ suggested that a man with Asperger's syndrome who harassed and threatened to kill a woman after his affection was not reciprocated may have lacked empathy toward the victim and a social understanding of the rejection.

Although a definitive association between violence and ASD has not yet been established,^{2,11,12} it is recognized that a minority of patients with ASD may come into contact with the forensic system.¹³ A recent systematic review¹⁴ indicates that the prevalence of offending behavior in individuals with ASD varies greatly across studies, with estimates ranging from 2.74 to 26 percent. Methodological differences limit the interpretation of these results, however, and future studies are required to provide an updated estimate.^{14,15}

Violence is a significant problem in inpatient settings, particularly in forensic mental health care.¹⁶ Research investigating violence in these settings has reported severe, immediate, and long-term physical and psychological consequences for both patients and staff, as well as an adverse impact on the quality of care provided and on associated costs (e.g., sick

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leave and injury compensation).¹⁷⁻¹⁹ A core responsibility of forensic mental health care is to implement interventions that reduce the risk of violence. It is therefore important to use tools that reliably assess the risk of future violence and support the implementation of risk-management procedures.

Different approaches have been historically used to assess risk for violence: unaided clinical judgment, which relies solely on the subjective judgment of risk; anamnestic assessment, which clinicians use to identify situations in which violence occurred, the context, the possible precipitators, and the personal characteristics associated with violence; actuarial tools, which provide a numerical estimate of the probability of offending; and structured clinical judgment, which calls for the use of predefined evidence-based factors known to predict violence. Structured clinical judgment tools, such as the Violence Risk Scale and the Historical Clinical and Management Risk-20 (HCR-20), are used to inform the final clinical judgment and provide guidance on intervention and risk management plan.²⁰⁻²²

The HCR-20²³ is among the most commonly used structured clinical judgment tools for assessing risk of violence in secure care settings.²⁴ The third version of the scale (HCR-20^{V3})²⁵ shows a moderate to large association ($r = .58-.91$) with the HCR-20^{V2}, which supports the continuity between the two versions,²⁶⁻³⁰ good to excellent interrater reliability,^{26,30-32} and satisfactory internal consistency.^{31,33,34}

The scale has been successfully used to assess physical violence toward others, property disruption, verbal threats, and sexual harassment in different diagnostic groups, including schizophrenia, personality disorder, organic disorder, intellectual disability, and substance use.³⁵⁻⁴⁵ Results of studies that investigated the scale's effectiveness at predicting inpatient violence are inconsistent, however. Some studies have found that the clinical scale is one of the stronger predictors of inpatient violence,³⁸⁻⁴⁰ whereas other investigations have shown that other factors (e.g., the scale total score, the risk-management scale, or the historical scale) are associated with inpatient violence.^{37,44,46,47}

Large differences in the study design and patient population explain the contradictory results. It is known that the ability of the HCR-20 to accurately assess risk for future inpatient violence varies across subscales and type of violent behavior assessed.^{37,41-43,45} For example, the clinical and risk subscales of the

HCR-20^{V3} are strongly associated with institutional violence in individuals with schizophrenia, mood, substance use, or personality disorders admitted to a secure psychiatric hospital.^{39,48} McDermott *et al.*⁴⁶ reported that the scale total score also significantly predicted institutional violence in patients with schizophrenia, mood, or substance use disorders.

The effectiveness of the scale at predicting inpatient aggression varies across type of violence. In 2006, Tengström *et al.*⁴³ found that the total score did not predict physical violence, although it moderately predicted verbal threats by patients with schizophrenia, personality disorders, and cognitive impairment. Furthermore, the score moderately predicted sexual harassment by patients with schizophrenia and cognitive impairment with area under the curve (AUC) values (0.74 and 0.72, respectively) larger than those reported for patients with personality disorder (AUC = 0.44). In contrast to these findings, others have reported that the historical scale was a good predictor of institutional violence in patients with psychosis, personality disorder, affective disorder, and organic disorder in secure care settings.³⁷

The scale is also effective for predicting institutional aggression in patients with intellectual disabilities.^{44,47,49,50} A recent study reported that the total score and the clinical and risk-management ratings significantly predicted the occurrence of violent episodes in a sample of 109 patients with intellectual disabilities in a secure psychiatric hospital after controlling for comorbid diagnosis, security level, length of hospitalization, and gender.⁵⁰

The predictive validity of the HCR-20 varies across diagnostic groups, and it is known to be more effective for patient groups most similar to those assessed in the validation sample (i.e., schizophrenia and personality disorder) compared with those with organic and developmental disorders.⁴¹ But the findings of those studies that investigated the ability of the scale to predict future violence in patients with intellectual disabilities support the view that the HCR-20 is useful to rate general risk factors, which are common across different diagnoses (e.g., prior violence, major mental illness).^{21,50} The heterogeneous results of these studies indicate that diagnoses and type of behavior assessed need to be accounted for when assessing risk for violence.

Currently little is known about the use of the HCR-20 in patients with ASD. A growing body of evidence suggests that the risk assessment for patients

with ASD should include ASD-specific risk factors, which may increase the likelihood of engaging in violent behaviors.^{2,51-54} It has been suggested that the HCR-20 may not be suitable to accurately assess risk of violence in this patient group.^{21,52,55} In 2013, for example, Murphy⁵² described the use of the HCR-20 to assess 20 patients with ASD in a high-security psychiatric hospital in England. He reported that nine out of 20 scale risk factors were present in 50 percent or less of patients with ASD, including substance misuse, major mental illness, and psychopathy from the historical scale; negative attitudes, active symptoms of major mental illness, impulsivity, and unresponsiveness to treatment from the clinical scale; and exposure to destabilizer and noncompliance with remediation attempts from the risk-management scale. Features typical of ASD, such as lack of central coherence, stereotypical interests, and deficits in social cognition, can account for the observations. For example, communication difficulties may mask symptoms of other major mental disorders.⁵⁶

Although questions have been raised about the ability of the HCR-20 to accurately assess risk of future violence in ASD, this has not been investigated in secure inpatient settings. The present study is a preliminary investigation of the association between the HCR-20^{V3} and inpatient violent behaviors in a small sample of male patients with ASD in a secure mental health hospital.²⁵

Methods

This study is a retrospective review of routinely collected outcome measures of subjects admitted to St. Andrew's Healthcare, a low- and medium-security psychiatric hospital in England that provides specialist psychiatric secure and forensic care across several services (e.g., personality disorder, ASD, learning disability, neuropsychiatric disorder). The study was approved as a service evaluation by the hospital clinical audit committee.

Procedure

Demographic information, legal status, diagnosis per the International Statistical Classification of Diseases and Related Health Problems Revision 10 (ICD-10), index offense, HCR-20^{V3} scores after admission, and violent episodes recorded within three and within six months following the initial assessment were extracted from an electronic clinical database and used to build an anonymous dataset. The

following inclusion criteria were used to identify eligible participants:

- Admission to wards in the ASD service that offer specialist care to individuals diagnosed with ASD;

- ASD as the primary diagnosis by ICD-10 criteria, confirmed by a psychiatrist using standardized and validated assessment tools [e.g., the Autism Diagnostic Observation Schedule (ADOS),⁵⁷ the Autism Diagnostic Interview-Revised (ADI-R),⁵⁸ and the Diagnostic Interview for Social and Communication Disorders (DISCO)⁵⁹];

- Risk assessment completed after admission with HCR-20^{V3}, typically accomplished within the first three months after admission; and

- Patients admitted for at least six months after the initial assessment.

We identified 43 electronic records of patients assessed with HCR-20^{V3}. Patients with a diagnosis that did not meet the inclusion criteria, with missing information, or who had been admitted for less than six months were excluded ($n = 15$). The final sample consisted of 28 male inpatients admitted between 2014 and 2016.

Measures

Risk Assessment

The HCR-20^{V3} is a 20-item structured clinical judgment tool that provides clinicians with a framework to consider static and dynamic factors during the risk assessment.²⁵ The tool consists of three subscales: a historical (H) scale (10 items), which includes items related to the patient's history of violence; a clinical (C) scale (5 items), which reflects current clinical symptoms; and a risk management (R) scale (5 items), which provides an assessment of the patient's ability to adjust to future contexts.

Each item is rated as not present, partially present, or definitely present. Items can be omitted when insufficient information is available. Presence ratings were converted into numerical scores (not present = 0; partially present = 1; and definitely present = 2),²⁶ leading to a total score range of 0–40 with a maximum score of 20 for the historical subscale and 10 for each of the clinical and risk-management subscales. Cases were excluded from group analysis when more than five items were omitted or

missing (more than two items from the historical scale and one item from each of the clinical and risk management scales).²³ Values were prorated when the number of missing items did not exceed the specified limit.

The scale also includes three final Summary Risk Ratings (SRRs): risk for future violence or case prioritization; risk for serious physical harm; and risk for imminent violence over the coming hours, days, or weeks. Each SRR item was rated as low, moderate, or high and was converted into numerical scores (low = 0; moderate = 1; high = 2).²⁶

The risk assessment was completed by an experienced clinical psychologist or a supervised assistant psychologist using information pertaining to the subject's medical history, criminal or violent history, clinical symptoms, and anticipated future difficulties.²⁵ Information was gathered from historical files, interviews with subjects, and observations. The assessment is typically completed for all patients within three months of admission and repeated every six months thereafter, as indicated in the HCR-20^{V3} manual.²⁵ These time frames allow clinical staff to gather sufficient historical and clinical information.²⁵

The relevance scores of the HCR-20^{V3} were not recorded. The implications will be addressed in the Discussion section.

Violent Behavior

Electronic records of violent episodes occurring in each of the two three-month periods following risk assessment were extracted for each subject. Entries to the clinical data system were made on a daily basis by clinical staff. Violent incidents were recorded as physical aggression toward others or verbal aggression. An overall violence score was also computed by combining physical aggression toward others and verbal aggression into a single category. For each behavioral category, subjects with at least one episode of violence were assigned to the violent group; subjects who did not engage in any violent episode were assigned to the nonviolent group. Group assignment was done separately in each study period.

Statistical Analysis

Chi-square, Fisher exact, and independent *t* tests were conducted to compare sociodemographic and diagnostic characteristics of violent and nonviolent subjects. Because risk assessment takes place within the first three months of a subject's admission, the

average number of days between admission and the initial HCR-20^{V3} assessment was computed.

Risk assessment scores were not normally distributed; therefore, group differences were analyzed with the nonparametric Mann-Whitney *U* test. Data for overall violence, physical aggression toward others, and verbal aggression were analyzed separately. The effect size *r* was computed,⁶⁰ and Cohen's guidance⁶¹ was used to interpret the results: an effect size < .30 was considered small, < .50 was deemed to have a medium effect, and > .50 was interpreted as a large effect.

The receiver operating characteristic (ROC) curve was used to investigate the ability of the HCR-20^{V3} to accurately assess risk for institutional violence in the two follow-up periods separately. This statistical approach is not sensitive to the base rate,⁶² and it has been used previously to predict violence in small samples of mentally ill offenders.³⁷ The ROC analysis generates the AUC values, which range between 0 and 1. Values of .70 or above are considered moderate to large, and values of .75 or above are considered large.⁶³ Data were analyzed with IBM SPSS Statistics for Windows, version 18.0 (Armonk, New York).

Results

Most subjects (71.4%) were detained in low-security wards; 55 and 62 percent of subjects in low- and medium-security wards, respectively, engaged in violent behaviors. Result of a Fisher exact test on the occurrence of violent behaviors in low- and medium-security wards was not significant. Ninety violent episodes were recorded following the initial assessment, with 53 incidents in the first three-month period (physical aggression toward others = 46; verbal aggression = 7), and 37 violent episodes in the second three-month period (physical aggression toward others = 30; verbal aggression = 7). A total of 16 subjects (57.1%) engaged in violent behaviors (Table 1). Physical aggression toward others and verbal aggression were recorded in 14 and 11 subjects, respectively.

All subjects were detained under the 1983 Mental Health Act (MHA). Hospital order with restriction (section 37/41; patients admitted to hospital instead of prison with restrictions on leave and discharge) and admission for treatment (section 3; a qualified mental health professional requests admission of patients for assessment and treatment) were the most

Table 1 Patient Characteristics and Mental Health Section

	Non-violent	Violent
N (%)	12 (42.9)	16 (57.2)
Age at admission (mean, SD)	30.5 (10.6)	33.2 (11.4)
Physical aggression, N (%)	-	14 (50.0)
Verbal aggression, N (%)	-	11 (39.3)
Comorbidities N (%)		
Psychotic disorders	4 (33.3)	7 (43.8)
Affective disorders	2 (16.7)	1 (6.2)
Neurotic, stress related, somatoform	2 (16.7)	4 (25.0)
Personality disorders	4 (33.3)	1 (6.2)
Mental retardation	1 (8.3)	2 (12.5)
Hyperkinetic disorder	1 (8.3)	-
Section at admission N (%)*		
3 (admission for treatment)	1 (8.3)	8 (50.0)
37 (hospital order)	3 (25.0)	-
37/41 (hospital order with restriction)	5 (41.7)	5 (31.3)
47 notional s37 (transfer to hospital)	1 (8.3)	-
47/49 (transfer to hospital of prisoners with restriction order)	2 (16.7)	-
48/49 (transfer to hospital of prisoners on remand)	-	1 (6.2)
CPIA5 (Criminal Procedure Insanity)	-	2 (12.5)

*Sections of the Mental Health Act (1983).

frequent mental health section for nonviolent and violent subjects, respectively (Table 1). The remaining sections included section 37 (admission to hospital of patients convicted or responsible for an offense as ordered by a criminal court); section 47 notional s37 (transfer to hospital and treatment of a convicted prisoner); section 47/49 (transfer to hospital and treatment of a convicted prisoner with restriction on leave and discharge); section 48/49 (transfer to hospital of prisoners waiting to be sentenced with restriction on leave and discharge); CPIA5 (criminal procedure insanity: admission to hospital of a patient found not guilty by reason of insanity or unfit to plead).

The index offense was available for 27 subjects and included assault (40.8%), arson (14.8%), sexual offense (18.5%), attempted murder (11.1%), threatening behavior or threatening murder (7.4%), possession of weapons (3.7%), and theft (3.7%). Violent and nonviolent subjects were comparable in terms of age [$t(26) = -.62, p = .54$].

Twenty-two subjects (78.6%) had one or more psychiatric comorbidities. Psychosis (ICD-10 codes F20 to F29) was the most frequent comorbid diagnosis (39.3%). Other comorbidities included neurotic, stress-related, and somatoform disorder (F40 to F48; 21.4%), personality disorder (F60 to F69; 17.9%), affective disorder (F30 to F39; 10.7%), mental retardation (F70 to F79; 10.7%), and hyperkinetic disorder (F90 to F98; 3.6%). Results of the Fisher exact tests indicate that violent and nonviolent subject groups were comparable on all comorbidities with all p values $> .05$ (psychoses, $p = .70$; affective disorders, $p = .56$; neurotic, stress-related, and somatoform disorders, $p = .67$; personality disorders, $p = .13$; mental retardation, $p = 1.0$; hyperkinetic disorders, $p = .42$).

HCR-20^{V3} Assessment

Days between admission and initial HCR-20^{V3} assessment did not significantly differ between non-violent ($M = 91.9$; $SD = 82.3$) and violent ($M = 72.9$; $SD = 24.8$) subjects [$t(12.4) = .77, p = .45$].

The scale median and score range for overall violence are reported in Table 2. Results of the Mann-Whitney U test revealed that violent subjects scored significantly higher compared with those in the non-violent group on the SRR for imminent violence ($p = .01$) with a large effect size. The historical, clinical, and risk-management subscales, the scale total

Table 2 HCR-20^{V3} Scores and Group Comparison for Overall Violence

	Non-violent <i>Mdn</i> (range)	Violent <i>Mdn</i> (range)	Mann-Whitney U	r
Historical	16.8 (12–20)	16.6 (10–20)	$U = 94.5, z = -.07$.01
Clinical	6.0 (3–9)	7.0 (4–10)	$U = 59.5, z = -1.74$.32
Risk management	8.0 (2–9)	8.5 (5–10)	$U = 70.5, z = -1.21$.22
Total score	30.1 (20–35)	30.5 (23–38)	$U = 77.5, z = -.86$.16
Future violence	1.0 (0–2)	1.0 (0–2)	$U = 49.0, z = -.40$.08
Serious harm	1.0 (0–2)	1.0 (0–2)	$U = 48.0, z = -.31$.06
Imminent violence	0.0 (0–1)	1.0 (0–2)	$U = 10.0, z = -2.37^*$.60

Mdn = median; Future violence N : non-violent = 9; violent = 12; Serious harm N : non-violent = 8; violent = 13; Imminent violence N : non-violent = 6; violent = 10; r = effect size.

* $p < .05$.

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Table 3 HCR-20^{v3} Scores and Group Comparison for Physical Aggression

	Non-violent <i>Mdn</i> (range)	Violent <i>Mdn</i> (range)	Mann-Whitney <i>U</i>	<i>r</i>
Historical	15.8 (10–20)	17.0 (11–20)	U = 76.5, z = –.99	.19
Clinical	6.0 (3–9)	7.5 (5–10)	U = 53.0, z = –2.10*	.40
Risk management	8.0 (2–9)	8.5 (5–10)	U = 69.5, z = –1.34	.25
Total score	29.1 (20–35)	32.1 (24–38)	U = 57.5, z = –1.86	.35
Future violence	1.0 (0–2)	1.0 (0–2)	U = 42.0, z = –1.03	.22
Serious harm	0.0 (0–2)	1.0 (0–2)	U = 51.0, z = –.23	.05
Imminent violence	0.0 (0–1)	1.0 (0–2)	U = 7.0, z = –2.84**	.71

Mdn = median; Future violence *N*: non-violent = 10; violent = 11; Serious harm *N*: non-violent = 9; violent = 12; Imminent violence *N*: non-violent = 7; violent = 9; *r* = effect size.

**p* < .05.

***p* < .01.

scores, and the SRR for future violence and serious physical harm did not differ significantly between violent and nonviolent subjects.

The scale median and score range for physical aggression toward others are reported in Table 3. Results of the Mann-Whitney *U* test showed that violent subjects scored significantly higher on the clinical scale (*p* = .03) with a medium effect size and the SRR for imminent violence (*p* = .005) with a large effect size when compared with nonviolent subjects.

The scale median and score range for verbal aggression are reported in Table 4. Results of the Mann-Whitney *U* test indicate that violent and non-violent subjects scored similarly across all HCR-20^{v3} measures.

Predictive Validity of the HCR-20^{v3}

Results of the ROC-AUC analyses for overall violence and physical aggression toward others in the two three-month periods are reported in Tables 5 and 6. The SRR rating for imminent violence was the most consistent predictor of violence during both periods, with large AUC values ranging from .84

to .92. The scale total score and the clinical and risk-management subscales significantly predicted overall and physical aggression during the second three-month period with moderate to large values.

Results of the ROC-AUC analyses for the two three-month periods for verbal aggression are reported in Table 7. The results revealed that none of the ROC-AUC values was statistically significant.

Discussion

This study was a preliminary investigation of the ability of the HCR-20^{v3} to assess future violence in a small sample of subjects with ASD in a secure psychiatric hospital. Violent episodes were recorded in more than 50 percent of subjects with ASD, with a higher proportion of physical aggression toward others than verbal aggression.

Only the clinical scores and the SRR for imminent violence significantly discriminated between groups, with violent subjects scoring significantly higher compared with nonviolent individuals. Static risk factors did not discriminate between violent and nonviolent subject groups, a finding that is consis-

Table 4 HCR-20^{v3} Scores and Group Comparison for Verbal Aggression

	Non-violent <i>Mdn</i> (range)	Violent <i>Mdn</i> (range)	Mann-Whitney <i>U</i>	<i>r</i>
Historical	17.0 (12;20)	16.2 (10;20)	U = 84.5, z = –.43	.08
Clinical	6.0 (3–10)	8.0 (4–9)	U = 63.0, z = –1.50	.28
Risk management	8.0 (2–10)	9.0 (5–10)	U = 61.5, z = –1.54	.30
Total score	30.0 (20–37)	33.2 (23–38)	U = 79.0, z = –.68	.13
Future violence	1.0 (0–2)	1.0 (0–2)	U = 40.5, z = –.93	.20
Serious harm	1.0 (0–2)	1.0 (0–2)	U = 54.0, z = –.00	.00
Imminent violence	0.0 (0–2)	1.0 (0–2)	U = 17.5, z = –1.49	.37

Mdn = median; Future violence *N*: non-violent = 13; violent = 8; Serious harm *N*: non-violent = 12; violent = 9; Imminent violence *N*: non-violent = 10; violent = 6; *r* = effect size.

Table 5 ROC-AUC Results for Overall Violence

	First Three-Month Period		Second Three-Month Period	
	AUC	CI 95%	AUC	CI 95%
Historical	.42	.19-.64	.57	.36-.80
Clinical	.66	.45-.86	.74*	.54-.94
Risk management	.48	.26-.70	.76*	.59-.94
Total score	.48	.25-.71	.75*	.56-.94
Future violence	.61	.37-.86	.61	.37-.86
Serious harm	.45	.17-.72	.52	.24-.80
Imminent violence	.84*	.64-1.0	.84*	.64-1.0

AUC: area under the curve; CI: confidence interval.
**p* < .05.

tent with the view that individuals with a history of violence tend to score high on the historical scale.^{41,64}

Similarly, the risk-management score did not discriminate between violent and nonviolent subjects, indicating that the clinical staff did not consider violent subjects at higher risk of future difficulties. It is generally believed that the risk scale is among the stronger predictors of inpatient violence.^{35,37,46,65,66} Yet findings in the literature are inconsistent due to differences in study design and subjects populations. In a retrospective study of 124 subjects diagnosed with psychotic disorder, substance use disorder, and personality disorder, the risk-management scale failed to discriminate between violent and nonviolent forensic psychiatric patients.⁴⁸ In contrast, Hogan and Olver³⁹ reported a large association between inpatient violence and the risk-management scale in subjects with psychotic and substance use disorders.

Results of the ROC-AUC analyses revealed that the historical subscales of the HCR-20^{V3} and ratings of future violence and serious harm did not predict

Table 6 ROC-AUC Results for Physical Aggression

	First Three-Month Period		Second Three-Month Period	
	AUC	CI 95%	AUC	CI 95%
Historical	.54	.32-.77	.64	.44-.85
Clinical	.71	.51-.91	.80**	.62-.97
Risk management	.50	.27-.72	.77*	.59-.95
Total score	.60	.38-.82	.82**	.65-.98
Future violence	.70	.47-.92	.61	.37-.86
Serious harm	.51	.24-.78	.52	.24-.80
Imminent violence	.92**	.78-1.0	.84*	.64-1.0

AUC: area under the curve; CI: confidence interval.
**p* < .05.
***p* < .01.

Table 7 ROC-AUC Results for Verbal Aggression

	First Three-Month Period		Second Three-Month Period	
	AUC	CI 95%	AUC	CI 95%
Historical	.40	.07-.71	.44	.20-.69
Clinical	.52	.26-.78	.64	.40-.88
Risk management	.52	.25-.78	.72	.52-.92
Total score	.42	.11-.72	.60	.34-.87
Future violence	.52	.19-.86	.63	.39-.88
Serious harm	.37	.11-.61	.56	.30-.81
Imminent violence	.66	.34-.98	.81	.58-1.0

AUC: area under the curve; CI: confidence interval.

any violent episode above chance. In contrast to these findings, the clinical and risk-management scores, the total scale scores, and the risk assessment for imminent violence were sensitive to the occurrence of physical aggression toward others. This pattern of results is consistent with recent evidence that the dynamic factors, the scale total score, and the SRR for imminent violence are stronger predictors of future inpatient violence across different diagnostic groups, including patients with mood disorders, schizophrenia, personality disorder, and developmental, organic, and substance use disorders.^{37,39,41,48} The strong association of clinical factors with violent behaviors contradicts the results of Murphy,⁵² in which the majority of subjects with ASD did not endorse most clinical factors; methodological differences account for our findings. Murphy⁵² investigated the presence of items from the HCR-20^{V2} in subjects with ASD; in this study, we explored the predictive validity of the HCR-20^{V3}.

The SRR for imminent violence was the strongest and most consistent predictor of overall violence and physical aggression during both three-month periods, with AUC values ranging from .84 to .92. These values were larger compared with those produced by the clinical and risk subscales and suggest that the final SRR judgment for imminent violence may rely on factors not accounted for in the HCR20^{V3}, which is in line with the view that risk factors specific to patients with ASD need to be accounted for during the risk assessment.^{21,52}

None of the scores successfully predicted verbal violence in subjects with ASD. Earlier studies reported that the HCR-20 is sensitive to verbal aggression and that the clinical scale is among the stronger predictors of verbal aggression in subjects within se-

cure care.^{37,38,43} It is possible that the risk factors examined in the HCR-20 are not sensitive to verbal aggression in patients with ASD. For example, the scale does not include risk factors such as impaired social skills, which have been associated with the occurrence of verbal aggression.⁶⁷

The study provides preliminary findings on the assessment of violence in individuals with ASD, and caution is needed when interpreting these results. The high proportion of psychiatric comorbidities may have played a major role in the current results. Most subjects (78%) in this study had at least one comorbid psychiatric diagnosis, with almost 40 percent being diagnosed with psychosis. Earlier investigations reported a high proportion of psychosis in subjects with ASD admitted to secure psychiatric hospitals.⁶⁸⁻⁷⁰ For example, in 2013,⁶⁸ Haw and colleagues compared the characteristic of ASD and non-ASD subjects admitted to secure psychiatric care. The authors reported that up to 73 percent of subjects with ASD had a comorbid psychiatric diagnosis, with schizophrenia being the most frequent comorbidity and personality disorder the least common comorbidity. The presence of comorbid psychiatric conditions has often been associated with an increased risk of violent behaviors in patients with ASD in secure settings.^{51,53} The finding of a longitudinal registry study showed that rates of comorbidities, such as psychosis and personality disorders, were significant risk factors of criminal convictions in subjects with ASD.⁷¹

The high proportion of comorbid diagnoses in this small sample of subjects with ASD supports the view that the presence of psychiatric comorbidities is a significant risk factor and that ASD patients with comorbid diagnoses are more susceptible to engaging in challenging behaviors. Although these findings need replication with a larger sample, they support the need for a greater focus on the interplay of psychotic comorbidities and ASD when assessing and treating the risk of violence and re-offending.

The standard hospital approach to risk assessment may also have contributed to the high AUC values reported in this study. Items were coded by experienced clinical staff as part of a routine risk assessment within three months of admission using information from a variety of sources (e.g., medical and criminal records, interviews, observation). Episodes of violence may have occurred during the time between admission and assessment. It cannot, therefore, be

ruled out that being aware of or witnessing episodes of violence may have influenced the risk assessment of future violence. Thus, it is important to further investigate the role played by recent aggression on the predictive validity of inpatient violence.

Although the study identified significant differences between violent and nonviolent subjects with ASD across different subscales of the HCR-20^{V3}, the small sample size and the inclusion of only male subjects limit the generalizability of the results to other patient populations, and replication is needed with a larger sample. The HCR-20^{V3} requires scoring of the presence and relevance for each risk factor. Due to the high number of analyses conducted, it was decided to focus on the presence scores only. The risk assessment with the HCR-20 is time consuming, and the results of this study suggest that considering the total score for the presence of each risk factor is sufficient to predict risk of future inpatient violence. A growing body of evidence, however, indicates that some of the items may not be relevant to assess risk of violence in patients with ASD, such as history of substance misuse, treatment response, and compliance.^{52,72} Future studies will need to weight the presence and relevance of each risk factor in predicting violent behaviors.

Finally, in this study the occurrence of violence in low- and medium-security wards was comparable. But due to the small sample size, it cannot be ruled out that episodes of violence may vary across security levels. Future research is necessary to better understand the impact of level of security on occurrence of violent behaviors and the ability of the HCR-20^{V3} to accurately measure risk for violence to support the decision to transfer patients with ASD from high-security units to medium- and low-security units.

Conclusion

The results of this preliminary investigation support the use of the HCR-20^{V3} to assess risk for overall and physical violence, but not for verbal aggression, toward others in a small sample of male patients with ASD in a secure psychiatric hospital at six months. To enhance the reliability of current risk-assessment protocols and to devise interventions and risk-management plans that account for ASD-specific difficulties, future studies are needed to replicate these results with a larger sample and to determine

which factors are most relevant to risk assessment of inpatient violence.

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