Clinical Decision-making About Inpatient Violence Risk at Admission to a Public-Sector Acute Psychiatric Hospital

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This is an examination of the extent to which patients who are violent in the hospital can be distinguished from nonviolent patients, based on information that is readily available at the time of admission to a state acute psychiatric hospital. The charts of 235 inpatients were examined retrospectively, by selecting 103 patients who had engaged in inpatient violence and comparing them with 132 randomly selected patients who had not during the same period. Data were gathered from initial psychiatric assessment and admissions face sheets in patients' charts, reflecting information available to a mental health professional within the first 24 hours of a patient's admission. Multivariate analysis showed that violent and nonviolent patients were distinguished by diagnosis, age, gender, estimated intelligence, psychiatric history, employment history, living situation, and agitated behavior. These factors led to an 80 percent correct classification of violent patients and thus may assist clinicians to structure decision-making about the risk of inpatient violence.

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Inpatient violence is of critical concern to mental health professionals and other individuals affected by psychiatric inpatients who engage in assaultive behavior. During acute psychiatric hospitalization, about 18 percent of civilly committed patients physically assault other individuals, and another 30 to 35 percent engage in fear-inducing behavior.[1,2] More than two-thirds of the patients committed as a danger to others are likely to engage in some type of violence within 72 hours after admission.[3] Violent acts by inpatients are a common cause of injury to staff in emergency and inpatient settings, with nursing staff sustaining the most injuries.[4–6] Staff injuries range from bites and bruises to head injuries.[4,7] One study found that more than 90 percent of physicians and nurses working in psychiatric hospitals have been subjected to violence from patients at some time during their careers.[8] Lost work days resulting from patient assault are not uncommon.[4,7] In addition to causing bodily harm, inpatient violence has the potential to affect the therapeutic climate negatively, to upset other patients, and to demoralize staff.[9]

Effective risk assessments help clinicians detect patients who are at high risk of violence, take appropriate steps in the hospital to manage the risk, and ultimately reduce the number of injuries incurred by staff and other patients. Several risk assessment instruments, which optimize predictions by using risk factors that have strong relationships with violence, have been developed for assessing violence risk in forensic settings and the community, but few such instruments are available for acute psychiatric facilities. Moreover, many of the existing measures are

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time consuming, rely heavily on historical factors, and predict violence over the long term,[10,11] whereas in inpatient settings, risk assessments must be performed quickly, historical information may not be available or reliable, and prediction is generally required over the short term.[9,11,12]

Clinicians working in acute psychiatric settings who are time pressured to make decisions may have less predictive historical information at their disposal compared with their counterparts in long-term inpatient settings.[13] Contextual information may be correspondingly difficult to obtain because of logistical constraints of the crisis center, because patients may be too psychotic to provide accurate information, or because patients refuse to sign releases of information when confronted with possible civil commitment.[14,15] On the other hand, results also suggest that it would be worthwhile for clinicians to increase efforts to obtain and document accurate risk information, to the extent possible. It is probable that increasing availability and accuracy of research risk factors in clinical practice would help improve risk assessments and enhance risk management of potentially violent patients.

As a result, in acute settings, there must be a balance between using empirically validated information on which to base a risk assessment and using readily available information on which to base a risk assessment that is necessarily time pressured. To our knowledge, two inpatient violence risk instruments have been validated in acute psychiatric facilities: the McNiel-Binder Violence Screening Checklist (VSC) and the Brøset Violence Checklist (BVC). The VSC[1,11,16] consists of four items that have been found to be closely related to inpatient aggression that occurs within 72 hours of admission to a university-based, short-term psychiatric inpatient unit: a history of physical attacks or fear-inducing behavior within two weeks before admission, absence of suicidal behavior within two weeks of admission, schizophrenic or manic diagnosis, and male gender. The BVC[9,17–19] was developed in a Norwegian maximum-security unit to identify behaviors that correlate with imminent patient violence, and it assesses six behaviors (confusion, irritability, boisterousness, physical threats, verbal threats, and attacks on objects) that have been identified as warnings of impending assaultive behavior.

Both the VSC and BVC rely on violence risk factors that are likely to be available at the time of hospital admission. However, the VSC was developed in a university-based psychiatric inpatient facility rather than a public-sector clinical population. The BVC was validated in a public-sector facility but relies solely on observed patient behaviors, therefore requiring continual staff training and documentation during each shift. Often, the resources to use this instrument reliably on an ongoing basis are not available in state hospitals, which are more likely to have high turnover in front-line staff and clinicians who are already overloaded with paperwork.

Thus, it is not clear that variables found to increase risk of inpatient violence in one clinical setting are generalizable or easily measured across clinical settings. The purpose of the current research is to examine the extent to which patients who are violent in the hospital can be distinguished from nonviolent patients on the basis of readily available information in a state acute psychiatric hospital at the time of admission. The identification of a discrete set of patient characteristics associated with violence would be the first step in developing an inpatient violence risk instrument for acute psychiatric facilities.

Method

Sample

This study involved a retrospective analysis of information that is routinely collected in the course of providing clinical care to patients, as documented in the medical charts of adult inpatients (age 18 years and older) in the acute care unit of John Umstead Hospital (JUH) in Butner, North Carolina, between November 30, 2004, and November 30, 2007. Inclusion criteria for chart reviews included admission to JUH during that period and an admission assessment completed by a psychiatrist. There were no exclusion criteria based on age, gender, ethnicity, or race. The patient population of JUH consisted mainly of individuals admitted under involuntary civil commitment. JUH did not have a forensic unit at the time of this study. Patients were typically transported by county deputy sheriffs to JUH from other hospital emergency rooms or psychiatric wards.

A retrospective case-control method of sampling was used. Patients who committed three minor physical assaults (i.e., a physical attack on another individual that did not result in injuries requiring medical attention) or one major physical assault (i.e., a physical attack on another individual that resulted in

injuries requiring medical attention) during a single stay at JUH were identified as difficult-to-manage, violent patients. These criteria were used administratively to identify patients who were difficult to manage given the hospital's staffing resources, with the goal of developing tracking systems to assist in modifying and reducing inpatient violence risk. Violent patients were identified by hospital staff on the basis of standard hospital records in which incidents were described and corroborated by clinical staff.

All unduplicated cases of such patients admitted during the specified period were selected for review, for a total of 148 cases of assaultive patients. The medical charts of 45 of those cases had been transferred to other inpatient facilities, were otherwise unavailable, or were missing documentation of the initial psychiatric assessment. Medical chart data for the remaining 103 violent patients were compared with data for 132 cases selected at random from among the nonviolent patients admitted to the acute care unit during the specified period. None of the patients in the sample had more than one admission during the study period.

Procedure

The study protocol was reviewed and approved by the University of North Carolina Institutional Review Board and the JUH Scientific Committee. Data were collected from the clinical documentation consistently available to mental health professionals within the first 24 hours of a patient's admission: the admissions face sheet and the initial psychiatric assessment. In addition, patient arrest histories were gathered from an online, publicly available free search of North Carolina arrest records. Of the legal charges found in the arrest records, the following were considered to be violent criminal offenses for the purposes of this study: any form of assault, child abuse, murder, hit and run, kidnapping and abduction, resisting an officer, and robbery with a dangerous weapon.

The admissions face sheet and initial psychiatric assessment are standardized inventories used by inpatient facilities operating under the authority of the North Carolina Division of Mental Health, Developmental Disabilities, and Substance Abuse Services. The admissions face sheet consists of a single page that contains information regarding a patient's demographics (i.e., name and aliases, address, phone number, education level, date of birth, Social Security number, ethnicity, gender, marital status, veterans status, place of birth, primary spoken language, religion, parents' names, and living arrangements), medical insurance, legal status, commitment status, and personal contacts. The face sheet also indicates the date and time of the hospital admission, and the names of the admitting and attending physicians. This sheet is produced in the hospital's registration office and is placed at the front of the patient's medical chart.

The initial psychiatric assessment is a four-page document completed by the psychiatrist assigned to the patient's ward, within the first 24 hours of the patient's admission. The assessment includes brief narratives describing the patient's chief complaint, history of present illness, psychiatric history, medical history, and social history; a series of checkboxes that are used to indicate the patient's strengths (e.g., ability to feed self), suicide risk factors (e.g., recent bereavement), and protective factors (e.g., available support system); the results of a mental status examination; a diagnostic formulation and Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR) multiaxial assessment[20]; a 60-hour treatment plan; and discharge criteria. If the patient is not admitted, the last page of the assessment is completed. This page records the results of the physical examination and laboratory tests, the reason for denying the patient admission, and referrals made by the psychiatrist on the patient's behalf.

To ensure interrater reliability in the extraction of data from medical records, three trained research assistants extracted data from the same five randomly selected charts, independent of one another. Kappa statistics for multiple raters[21] were calculated in SPSS,[22] and differences between raters were discussed to resolve differences and to increase future agreement on scoring strategies. The calculated κ was .87, which demonstrated very good agreement and reliable data collection methods from archival records. Data were entered directly into a Microsoft Excel spreadsheet. There were no missing data. After data entry was complete, one of the trained research assistants transferred the data to statistical software packages for analysis.

Measures

Study variables were chosen according to the conceptual model proposed by the MacArthur Violence Risk Assessment Study,[23] which identified four spe-

cific domains within which to categorize violence risk cues. First, dispositional cues refer to demographic, cognitive, and personality variables, the latter two of which are generally obtained through testing. Dispositional risk factors recorded on the admission documents used in the current study included age; race; gender; marital status; estimated levels of intelligence, judgment, and insight; history of head injury; chronic hostility; and behavior control and problem-solving abilities.

Second, historical factors include general social and specific violence histories. Historical factors used in the current study were education level; psychiatric history; history of childhood abuse, physical abuse, or sexual abuse; family history of mental illness, substance abuse, or suicide; employment history; evidence that the patient had been a recent victim of assaults or threats; history of significant relationships; history of violence; and history of violent criminal offenses in North Carolina.

Third, the contextual domain connotes aspects of an individual's situation that might either contribute to violence risk (e.g., access to weapons) or buffer against it (e.g., supportive social network). Contextual risk factors available for this study included living arrangements; availability of supportive family or friends; access to disability support; current employment status; and minor children living at home with the patient. Patient access to deadly weapons while in the hospital was considered unlikely, given that individuals were typically searched for weapons by deputy sheriffs before they were transported to JUH, again at the JUH admissions office, and once more on the patient care unit when an inventory was taken of the patient's possessions.

Fourth, clinical factors considered are those that enhance risk of violence, such as substance abuse or personality disorder. The clinical risk factors used in this study were history of alcohol or substance abuse; medical diagnoses (specifically, hypertension, diabetes, hyper- or hypothyroidism, obesity, head injury, and seizures); presence of auditory, visual, or olfactory hallucinations; suicidal or homicidal ideation; ability to care for self; level of aggression and agitation; mood lability; current treatment noncompliance; and DSM-IV-TR Axis I and II diagnoses on admission.

Analysis

SPSS 18.0 was used for univariate and bivariate analyses, and SAS 9.1 (SAS Institute Inc., Cary, NC) was used for multivariate analyses to generate a receiver operating characteristic curve. We first conducted descriptive analyses to determine types and frequencies of violence and aggressive inpatient behaviors and to provide basic information on clinical, historical, contextual, and demographic characteristics of the sample. We then conducted chi-square analyses, as appropriate, to determine bivariate differences between the violent and nonviolent patients on key clinical, historical, contextual, and demographic variables. Finally, for multivariate analyses, the identified factors from all domains were entered and subjected to stepwise deletion to obtain a reduced model; α was set at .05. These procedures for variable reduction have been used in other studies of violence and mental disorder (e.g. Swanson *et al.*[24]). Logistic regression was used because in SAS, these statistics identify variables that distinguish patients who had engaged in violence while hospitalized from nonviolent patients, and create a classification table based on group (violent versus nonviolent) derived from statistically significant independent risk factors.

Results

Table 1 shows the descriptive data for the full sample and the bivariate relationships between the violent and nonviolent patients with regard to violence risk factors available on admission. Using the Holm-Bonferroni method to correct for multiple comparisons, we found 10 items to be statistically significant ($p \leq .001$). Dispositional factors that were significantly related to inpatient violence included white race, below-average intelligence, poor judgment, and low insight. Of the historical factors tested, psychiatric history and history of employment were associated with violence. Living situation was the single contextual factor found to be related to violence. Finally, the clinical factors associated with violence were ability to care for self, aggression or agitation, and a diagnosis of a psychotic disorder.

The results of logistic regression showed that nine factors correlated significantly with incidents of inpatient violence: psychotic diagnosis, bipolar diagnosis, age younger than 35 years, male gender, below-average estimated intelligence, psychiatric history, no history of employment, homelessness, and aggressive or agitated behavior. The reliability of the overall model of these variables in distinguishing violent from nonviolent patients was statistically significant (-2 log likelihood $= 198.33$; $\chi^2(9) = 123.86$; $p <$

Table 1 Bivariate Associations Comparing Violent Patients to Nonviolent Patients on Violence Risk Factors

Risk Factor	Total With Factor *n* (%)	Nonviolent Group (*n* = 132) *n* (%)	Violent Group (*n* = 103) *n* (%)	χ^2	*p*
Dispositional factors					
Age younger than 35 years	124 (52.8)	63 (47.7)	61 (59.2)	3.068	.08
Race (white)	110 (46.8)	78 (59.1)	32 (31.1)	18.248	<.001
Male	142 (60.4)	85 (64.4)	57 (55.3)	1.983	.159
Married	29 (12.3)	23 (17.4)	6 (5.8)	7.195	.007
Below average intelligence	52 (22.1)	12 (9.1)	40 (38.8)	29.705	<.001
Poor judgment	183 (77.9)	91 (68.9)	92 (89.3)	13.947	<.001
Low insight	170 (72.3)	81 (61.4)	89 (86.4)	18.135	<.001
Chronic hostility	32 (13.6)	14 (10.6)	18 (17.5)	2.321	.128
Information on behavioral control available	86 (36.6)	52 (39.4)	34 (33)	1.016	.313
Historical factors					
High school or GED	81 (34.5)	55 (41.7)	26 (25.2)	6.909	.009
Past psychiatric history	202 (86)	101 (76.5)	101 (98.1)	22.245	<.001
Childhood abuse	24 (10.2)	18 (13.6)	6 (5.8)	3.85	.05
History of physical abuse	41 (17.4)	31 (23.5)	10 (9.7)	7.623	.006
History of sexual abuse	30 (12.8)	19 (14.4)	11 (10.7)	.717	.397
Family history of mental illness	74 (31.5)	46 (34.8)	28 (27.2)	1.575	.209
History of employment	84 (35.7)	64 (48.5)	20 (19.4)	21.283	<.001
Violence history available at admission	23 (9.8)	8 (6.1)	15 (14.6)	4.737	.03
History of violent criminal offense, from online search	34 (14.5)	17 (12.9)	17 (16.5)	.615	.433
Contextual factors					
Has a place to live	102 (43.4)	71 (53.8)	31 (30.1)	13.219	<.001
Supportive family or friends	76 (32.3)	50 (37.9)	26 (25.2)	4.222	.04
Disability support	31 (13.2)	13 (9.8)	18 (17.5)	2.939	.086
Clinical factors					
History of alcohol abuse	89 (37.9)	56 (42.4)	33 (32)	2.652	.103
History of substance abuse	113 (48.1)	72 (54.5)	41 (39.8)	5.035	.025
Auditory hallucinations	49 (20.9)	25 (18.9)	24 (23.3)	.667	.414
Visual hallucinations	29 (12.3)	14 (10.6)	15 (14.6)	.837	.36
Suicidal ideation	33 (14)	25 (18.9)	8 (7.8)	2.542	.111
Suicidal plan	21 (8.9)	16 (12.1)	5 (4.9)	.936	.333
Ability to care for self	160 (68.1)	102 (77.3)	58 (56.3)	11.699	.001
Aggression/agitation	65 (27.7)	24 (18.2)	41 (39.8)	13.52	<.001
Labile mood	54 (23)	28 (21.2)	26 (25.2)	.531	.466
Current treatment noncompliance	48 (20.4)	19 (14.4)	29 (28.2)	6.741	.009
Psychotic disorder	118 (50.2)	42 (31.8)	76 (73.8)	40.762	<.001
Bipolar disorder	28 (11.9)	14 (10.6)	14 (13.6)	.492	.483
Personality disorder	32 (13.6)	21 (15.9)	11 (10.7)	1.345	.246

.001), and the model correctly classified 80 percent of the cases. Regression coefficients are shown in Table 2, and the regression classifications are shown in Table 3.

Discussion

The purpose of the current research was to examine the extent to which patients who engage in violence in the hospital can be distinguished from nonviolent patients on the basis of readily available information in a state acute psychiatric hospital at the time of admission. Hospital admission documents were retrospectively analyzed for dispositional, historical, contextual, and clinical factors that distinguished patients who were violent during hospitalization from nonviolent patients. The results of a logistic regression showed that patient violence was associated with the following available variables: diagnosis of psychotic disorder or bipolar disorder, age younger than 35 years, male gender, below-average estimated intelligence, psychiatric history, no history of employment, homelessness, and aggressive or ag-

Table 2 Regression Coefficients for Variables Associated With Inpatient Violence

Variable	B	SE	Wald	*df*	*p*	OR	95% CI
Age <35 years	.965	.367	6.907	1	.0086	2.624	1.278–5.389
Male	.932	.398	5.486	1	.0192	2.538	1.164–5.534
Low intelligence	1.789	.49	13.318	1	.0003	5.984	2.289–15.642
Past psychiatric history	2.411	.812	8.812	1	.003	11.15	2.269–54.792
Employment history	−.882	.396	4.977	1	.0257	.414	.191–.898
Has a place to live	−.88	.379	5.39	1	.0203	.415	.197–.872
Aggression/agitation	1.029	.401	6.574	1	.0103	2.799	1.274–6.148
Psychotic disorder	2.344	.447	27.495	1	<.0001	10.427	4.341–25.046
Bipolar disorder	1.934	.564	11.755	1	.0006	6.92	2.29–20.91

R^2 = .5479; AUC = .881. χ^2 = 123.5278; *df* = 9; p <.0001.

itated behavior. These nine factors correctly classified 80 percent of the violent patients. Furthermore, these risk factors may be easily assessed on admission to a psychiatric facility, thus eliminating the need for extensive collateral information or staff training.

Several of the risk factors identified in this study have been significantly associated with inpatient violence in the existing research literature. On the whole, studies have confirmed that patients with a diagnosis of schizophrenia, bipolar disorder, and mental retardation are more likely to engage in violent acts in the hospital than are patients with other diagnoses.[25–27] The presence of schizophrenic or manic symptoms is a violence risk factor on the VSC, and a higher prevalence of violence in chronic psychiatric patients[25,28–30] and in patients actively experiencing symptoms of psychosis[25,27,31] has been reported in other studies. The current results support these previous findings; patients with low estimated intelligence and histories of serious mental illness were more likely to engage in violence. Aggressive and agitated behavior was also found to be associated with the violent group in this study. Similar variables have been included on both the VSC (i.e., physical attacks or fear-inducing behavior within the past two weeks), and the BVC (i.e., boisterousness, physical threats, verbal threats, or attacks on objects), which suggests that this risk factor may generalize across clinical settings.

Table 3 Regression Classification

	Predicted		
Observed	Nonviolent	Violent	% Correct
Nonviolent	112	20	84.8
Violent	27	76	73.8
Overall percentage			80.0

The association between the remaining risk factors found in the current study and inpatient violence is less clear. Although young age is a well-established risk factor for violence in the community, its role as a factor in inpatient violence has not been firmly established.[25,27,32] Similarly, some studies of inpatient violence have found that males tend to show more violent behavior in the hospital, while other studies have not. The VSC includes male gender as a risk factor for fear-inducing behavior as well as physical assaults.[1,11] However, when violence was defined as physical aggression against other people, several other studies found that female inpatients were more violent than male inpatients,[1,33–35] and only a single study[30] found that male inpatients were more violent than female inpatients. In general, however, researchers have reported that no relationship was found between inpatient gender and acts of physical aggression.[7,25,27,32,36–41]

Lack of employment history and housing do not appear to have been studied previously as risk factors for inpatient violence. However, these variables may be indicators of poor social functioning, which has been correlated with violence in a small number of studies.[42–44] Thus, although the current study found that patients with limited employment histories and those who did not have places to live were more likely to engage in violence, additional research is needed to establish these patient characteristics as risk factors for inpatient violence. This study also did not consider environmental factors within the hospital setting, such as ward environment, staffing level, staff qualification, quality of treatment, and concentration of potentially violent patients on a single ward, all of which have been previously correlated with inpatient violence.[27]

In addition, a patient's history of violent criminal offense and substance abuse, which correlated signif-

icantly with inpatient violence in other research,[27,32,45–47] were not significantly associated with inpatient violence in the current study. Although information regarding criminal offenders convicted in North Carolina is freely available to the public, the results of this study suggest that routine searches of the Department of Correction offender database may not contribute significantly to a determination of a patient's risk of violent behavior while in the hospital.

Our findings did not agree with those of research that has shown that patients with histories of substance dependence or abuse are likely to engage in violence during psychiatric hospitalization,[45–47] particularly when they have a diagnosis of a serious mental disorder.[40,48] Drug withdrawal may induce cognitive impairment in the form of delirium or confusion, which can lead to aggressive behavior.[47] Perhaps one reason for our failure to uncover a link between substance abuse and inpatient violence was the quality of the information about substance abuse available at admission. Because patients arrived at the hospital via several different routes (e.g. emergency departments, jails), blood screening may not have been conducted before a patient's arrival at the hospital. Even if screening had been performed, toxicology results were often not transported with patients or available within the first 24 hours of admission to the hospital. In addition, most of the information gathered at admission is based on patient self-report, and an argument could be made that patients with antisocial tendencies who ultimately become violent are the very patients who would lie at admission about abusing substances. At the very least, the current findings attest to the need to gather more solid evidence of substance abuse and suggest that self-reported information may not be reliable at admission.

In this study, we used a retrospective, case-control method of sampling, and therefore patients who were violent during a hospital stay were not randomly selected. Patients were also not identified on the basis of commitment status (voluntary versus involuntary) or method of transfer to the hospital (e.g., police, transfer from another facility), and it is possible that patient commitment status predicted violence risk, or that patients received treatment that reduced their violence risk before admission to the hospital. In addition, although patient compliance with treatment before hospitalization was assessed at the time of admission, we did not measure treatment noncompliance during hospitalization, and failure to take prescribed medication may have contributed to increased inpatient violence risk.

Another possible limitation is that we relied on psychiatrist ratings of the information available to them at admission; however, we should clarify that this information was not gathered from progress notes but instead from a standardized, user-friendly, four-page form that cued clinicians to gather all of the information described in the Method section. It is possible that some patients' preadmission violence affected psychiatrists' ratings of risk factors, but our data showed no evidence of such bias. In addition, none of the violence risk factors identified by this study can be said to be causally related to inpatient violence, and these factors may simply be markers for other variables that are causally related to violence. For example, a clinician's estimation of below-average intelligence on admission may actually be a surrogate marker for prior brain injury or a primary psychotic disorder that is etiologically related to a patient's assaultive behavior.

The patients at the southern, state psychiatric hospital who were included in this study may not represent patients admitted to acute care psychiatric hospitals in other parts of the United States. For example, a large proportion of the nonviolent patients in our sample had psychiatric histories (as did virtually all of the violent patients), and it is possible that a high number of false positives were based on this one factor alone. However, it is important to be clear that we did not purport to create an actuarial risk assessment tool. Instead, our goal was to determine whether any of the information readily available at admission to a state psychiatric facility could be used to discriminate between patients who ultimately engage in inpatient violence and those who do not. Although a relatively simple screening tool based on the violence risk factors identified in this study could be developed and used at admission to identify those patients at high risk of violence in the hospital, further research will be necessary to validate any screening tools developed from the data presented here and to determine if such tools are successful in reducing inpatient violence. Ultimately, risk assessment is useful only if interventions to prevent the targeted behavior are available, appropriately applied, and effective. Accurate identification of

risk factors is the first step in the prevention process.

The findings from the current study may be used to help clinicians utilize readily available information at admission to guide decision-making about a patient's risk of violence; as more factors are endorsed, the clinician should become increasingly concerned about the patient's potential for engaging in violence as an inpatient. Use of the empirically derived factors found by this study can enhance a clinician's evaluation of patient violence risk and thereby assist inpatient staff to determine the level of monitoring that may be needed for a given patient. Early detection of patients who are likely to engage in violent behavior would allow frontline staff to initiate preventive safety measures, reduce the use of more restrictive interventions that often result when patients are violent, and free staff to provide more therapeutic interventions. Ultimately, the identification of potentially violent patients at the time of admission could prevent assaultive behavior and greatly reduce the number of injuries sustained by hospital staff and patients.

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