

ized patients are exposed to each other for frequent but short "doses" of time.

But through it all, gallows humor has been the glue that has kept—and will keep—the unit together.

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# Psychiatrists' Accuracy in Predicting Violent Behavior on an Inpatient Unit

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*Courts and legislators continue to assume psychiatrists are able to predict dangerousness, but research has shown they have no special ability to do so. In this study, two psychiatrists examined 47 new inpatient admissions to a short-term psychiatric treatment unit and predicted whether they would commit battery or demonstrate threatening or suicidal behavior within seven days. The psychiatrists were not accurate in predicting battery or suicidal behavior but had some efficacy in*

*predicting threatening behaviors. The presence of assaultive or threatening behavior on admission, hallucinations on mental status examination, and a discharge diagnosis of mania were useful for predicting battery. A discharge diagnosis of mania was useful for predicting threatening behavior. The use of likelihood ratios to conceptualize predictive data is described.*

The prediction by psychiatrists of future dangerous behavior is an enigma. Recent research demonstrates that psychiatrists' accuracy in predicting violent behavior rarely exceeds results obtained by chance alone (1). Nevertheless,

courts and legislatures have continued to involve psychiatrists in civil and criminal procedures in which their primary role is to predict an individual's future dangerousness. Psychiatrists have been found guilty of malpractice for failing to predict accurately whether their patients would behave dangerously and for failing to warn the patients' victims (2).

A monograph by John Monahan (3) provided what is perhaps the most thorough review of the state of the art in clinical predictions of future violent behavior. Monahan noted that when predicting violent behavior, "clinicians appear prone to several types of systematic errors, including vagueness as to what is being predicted, reliance upon erroneous predictor items, and a failure to take into account information regarding the environment in which the individual is to function."

He further stated that existing research on clinical prediction has "tested something other than prediction, such as bureaucratic inertia, that the predictions were seriously out of date by the time they

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were tested, and that much violence may have occurred but escaped detection." Mulvey and Lidz (4) suggested that prospective research should be the next step in efforts to understand the process of clinical predictions of dangerousness.

Consistent with those observations, the study described here used a prospective design to assess the accuracy with which clinicians on an inpatient psychiatric unit predicted which patients would demonstrate violent, threatening, or suicidal behavior during their stay. The study also considered whether demographic and other patient factors might independently predict the patients' use of violence.

### Existing research

Studies by Werner and associates (5,6) have attempted to address some of the deficiencies in current research. Psychiatrists were asked to forecast whether patients at an inpatient acute psychiatric unit would engage in assaultive acts during the first seven days after their admission. To make their predictions, the psychiatrists were given the results of 18 scales of the Brief Psychiatric Rating Scale (BPRS) administered to the patients at the time of their admission and told whether commission of a violent act had been a factor in the admissions. Nursing staff recorded all assaultive acts committed by the patients throughout the seven-day period.

No significant correlation was found between the patients' actual violence and psychiatrists' predictions of violence. Consistent with Monahan's hypothesis, Werner and associates also found a significant discrepancy between the scale items the psychiatrists relied on to make their predictions and the scale items that had been shown to be associated with violent behavior.

Lion (7) reviewed clinical indicators of violent behavior in psychiatric patients. He concluded that violent behavior on psychiatric

units is often caused by a variety of divergent factors, including the patient's diagnosis, the staff's attitudes toward the patient, and the presence of "organic factors."

Hoping to identify variables that would be useful in predicting violent behavior, Yesavage (8) studied factors associated with danger-

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### **The variables that correlated best with assaultive behavior were low serum neuroleptic levels, degree of "schizophrenic symptoms," and violence prior to admission.**

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ous behavior over a three-year period in an inpatient population of schizophrenics. As in the study by Werner and associates, nursing staff recorded all instances of assaultive behavior by patients over a seven-day period. The variables that correlated best with assaultive behavior were low serum neuroleptic levels, degree of "schizophrenic symptoms" (derived from a principal component analysis of the BPRS), and violence prior to admission. Unfortunately, reliance on those variables alone to predict future dangerousness would result in many false positive predictions.

Menzies and associates (9) developed a scheme for rating patients' future dangerous behavior based on personality and situational factors, behavioral facilitators and inhibitors, social and cultural context, and confidence in the prediction. To test the instrument's validity, two nonclinicians were asked to use the rating scheme to predict dangerous behavior among 210 patients at a forensic evaluation facility after observing the patients during standard clinical interviews.

Two years later the records of five regional psychiatric hospitals and a national penal registry were reviewed for evidence of violent behavior by the patients since the

evaluation. Pearson product-moment analyses comparing the results of the instrument and the patients' actual dangerous behavior in the follow-up period found a modest correlation of .34. Even if predictions had been rendered only in situations in which the patients posed an extreme danger or clearly posed no danger at all, the ratio of accurate predictions to false-positives would have been only 1.6 to 1.0, indicating the scheme had poor predictive validity.

A major shortcoming of the study was its reliance on hospital records and criminal registries to reflect outcome, as they would not indicate incidents of unreported violence.

### Description of the study

The study was conducted on the acute psychiatric unit of the Francis Scott Key Medical Center in Baltimore, a university-affiliated teaching service. The 20-bed unit treats a predominantly blue-collar, lower-middle-class catchment area, although patients from throughout Maryland are also admitted. All admissions are voluntary.

Patients admitted to the unit over an eight-week period from November through December 1985 were entered into the study. Within 24 hours of the patient's admission, the intern or attending physician assigned to the patient, and sometimes both, interviewed the patient, collected historical and demographic data, and performed a mental status examination. Immediately after the interview, one or both of the physicians predicted whether the patient would engage in battery or threatening or suicidal behavior in the next seven days. The physicians were instructed to base their prediction on clinical judgment.

Demographic information collected during the interview consisted of the patient's age, sex, race, and educational level. Historical information collected comprised history of violent behavior against others, suicide attempts or self-mutilation, nonassaultive crimi-

nal activity, illicit drug or alcohol abuse, and living in a violent subculture. It was noted whether assaultive, threatening, or suicidal behavior was a precipitant of the current admission. Mental state factors recorded included the presence of hallucinations, delusions, formal thought disorder, impaired consciousness, and immediate risk of violent behavior.

Nurses on each eight-hour shift monitored the patients 24 hours a day for seven days and recorded the presence or absence of battery and threatening or suicidal behavior using the "violent-incident instrument." They also made a brief description of each violent event. The nurses were not told the treating clinicians' predictions about the patients. Patients discharged after less than seven days were not included in the final data analyses.

Both the nursing staff and the clinicians were provided operationalized definitions of battery, threatening behavior, and suicidal behavior. The definitions were based on a classification scheme for incidents of institutional violence developed by Dietz and Rada (10). Battery was defined as making an assaultive impact using a part of the body, a weapon, or an object. Threatening behavior was defined as threatening another through words or with a part of the body or a weapon. Suicidal behavior was defined as a suicide attempt or threat or self-mutilation.

As a check of the validity of the violent-incident instrument, one of the investigators compared each patient's progress notes with the instrument. Discrepancies in reports of battery or threatening or suicidal behavior were resolved by speaking to the nurse who completed the instrument.

At the time of the patients' release, their discharge diagnoses were recorded and categorized as schizophrenia, bipolar disorder (manic or mixed), depression (major depression; bipolar disorder, depressed; or dysthymic disorder), adjustment disorder, other psy-

chotic disorders (including organic delusional syndromes and delirium), or other nonpsychotic disorders (including personality disorders and substance use disorders).

The Fisher's exact test was used to compare the psychiatrists' predictions with the patients' actual outcomes in each category of behavior. A separate Fisher's test was conducted for each of the patient characteristics to determine whether any were associated with violent outcome.

For each of the patient characteristics for which the correlation was found to be significant, sensitivity—percentage of true positives identified—and specificity—percentage of true negatives excluded—were computed. Likelihood ratios, indicating the odds that a measured variable would be expected in a patient who will become violent, as opposed to one who will not, were calculated for the same variables. Finally, positive predictive values, the proportion of patients with a given variable who are violent, were computed for the same variables.

## Results

Of the 54 patients admitted during the course of the study, 47 remained hospitalized for seven days and were included in the final data analyses. Patients' ages ranged from 14 to 74 years, with a mean  $\pm$  SD age of  $33 \pm 6$ . A total of 57 percent were male, and 72 percent were white. All of the nonwhite patients were black. Patients had had from two to 16 years of education, with a mean  $\pm$  SD of  $10 \pm 2.6$ .

At discharge, schizophrenia was the diagnosis of 17 percent of patients, depression of 21 percent, bipolar disorder (manic or mixed) of 23 percent, adjustment disorder of 17 percent, other psychotic disorders of 9 percent, and other nonpsychotic disorders of 13 percent.

Predictions were made by both the attending physician and the intern for 29 patients, or 62 percent, and by only one of the doctors for the remaining 18 patients. Both the intern and the attending physician predicted that none of the 29 patients would commit battery. Interrater reliability for the predictions of threatening and suicidal behaviors was also high, as indicated by kappa values of .72 for threatening behavior and .90 for suicidal behavior.

During the study period, nine incidents of battery were reported involving seven patients (15 percent). Fifty incidents of threatening behavior were reported involving a total of 17 patients (36 percent). Nine incidents of suicidal behavior were reported involving seven patients (15 percent). A total of 21 patients (45 percent) accounted for all incidents of violence perpetrated by the study population.

Table 1 presents the result of the Fisher's exact test comparing the physicians' predictions of violent behavior with actual outcomes for the 47 patients. Predictions and outcome were not correlated for battery and suicidal behaviors but were correlated at a moderately significant level ( $p < .02$ ) for

**Table 1**  
Comparison of psychiatrists' predictions about the behavior of 47 psychiatric inpatients and their actual behavior

Prediction	Actual behavior					
	Battery		Threatening <sup>1</sup>		Suicidal	
	Yes	No	Yes	No	Yes	No
Yes	1	1	7	3	1	6
No	6	39	10	27	3	37

<sup>1</sup>  $p < .02$ , Fisher's exact test

**Table 2**  
Patient variables correlated significantly with violent behaviors in a sample of 47 psychiatric inpatients

Behavior, variable	p <sup>1</sup>	Sensitivity <sup>2</sup>	Specificity <sup>3</sup>	Likelihood ratio <sup>4</sup>	Positive predictive value <sup>5</sup>
<b>Battery</b>					
Admission precipitated by assault	.008	.43	.98	17.1	.75
Admission precipitated by threatening behavior	.018	.42	.95	8.6	.60
Hallucinations	.002	.71	.90	7.1	.56
Delusions	.002	.86	.80	4.2	.42
Formal thought disorder	.035	.43	.93	5.7	.50
Bipolar disorder, manic or mixed state	.001	.86	.88	6.9	.55
<b>Threatening behavior</b>					
Bipolar disorder, manic or mixed state	.007	.47	.90	4.7	.73
<b>Suicidal behavior</b>					
Personality or substance use disorder	.035	.42	.93	5.7	.50

<sup>1</sup> Fisher's exact test

<sup>2</sup> Percentage of true positives identified

<sup>3</sup> Percentage of true negatives excluded

<sup>4</sup> Odds that a measured variable would be expected in a patient who will become violent

<sup>5</sup> Proportion of patients with the patient variable who are violent

threatening behaviors. In an effort to minimize false negative findings and maximize sensitivity, a prediction by either of the two physicians that the patient would be violent was counted among the positive predictions.

Table 2 lists patient variables that were correlated significantly with violent outcome. Data are presented on the sensitivity, specificity, likelihood ratio, and positive predictive value of the characteristics, each indicating to what degree the variables act as predictors of violent behavior.

## Discussion

We explored the effectiveness of psychiatrists in predicting violent behavior among patients by measuring their assessment at the time of admission against the patients' actual behavior during the following week. We found the doctors had no ability to predict battery and suicidal behavior but had some ability to accurately predict threatening behavior.

In this study, however, as in any study of the effectiveness of

a predictive test in a clinical setting, the prevalence of the disorder, symptom, or in this case, behavior under study must be taken into consideration. Statistical and clinical literature have documented the difficulty of predicting events with a low prevalence, or low pretest probability. Prevalence can vary widely among patient populations, depending on the distribution of patients of different sex, race, age, diagnostic category, or any other classification. This variation greatly affects the power and utility of a clinical predictive test in any setting.

The likelihood ratio is independent of prevalence. If the clinician has calculated the likelihood ratio for a given demographic factor and knows the prevalence of violent behavior in general in the population being treated, he or she can derive the positive predictive value for a patient with that particular characteristic. To do so, the clinician would multiply the likelihood ratio by the pretest odds, which are derived directly from the prevalence, to yield the posttest odds,

which can be converted directly to the positive predictive value.

Such an approach uses a modification of Bayes' theorem. Sackett and associates (11) discussed this approach more fully in the context of laboratory testing and clinical outcome.

Data about an individual patient are most likely to improve the accuracy of a prediction when the prevalence, or pretest probability, of the behavior being predicted hovers around 50 percent (11). With prevalence in that range, the data will have a greater chance of providing new information and will clarify prediction decisions. In the population described here, the prevalence of battery and suicidal behaviors was low, and so it was not surprising that clinical prediction for these behaviors was not statistically significant.

On the other hand, clinical prediction of threatening behavior, with a prevalence rate of 36 percent, was statistically significant ( $p < .02$ ), yielding a likelihood ratio of 4.1. This value indicates that clinical judgment alone is a fairly powerful predictor of threatening behavior.

Because of the low prevalence of violence among voluntarily admitted psychiatric inpatients, even some factors with a relatively high likelihood ratio, those shown in Table 2, were associated with posttest probabilities (shown in the last column) of only around 50 percent. The presence of these factors therefore did not aid in distinguishing patients who were violent from those who were not.

Assaultive or threatening behavior on admission, the presence of hallucinations, and a discharge diagnosis of bipolar disorder, manic or mixed state, were associated with posttest probabilities of more than 50 percent for battery. A diagnosis of bipolar disorder, manic or mixed state, also yielded a higher than 50 percent posttest probability for threatening behavior. These variables, then, did help

to distinguish dangerous from non-dangerous patients.

The likelihood of accurately predicting violent behavior among psychiatric patients is low because the prevalence of battery, threatening behavior, and suicidal behavior among the general psychiatric population is low. Predicting violence among patients involuntarily committed because of violent behavior may yield higher posttest probabilities than found in this study of voluntarily admitted patients. Two studies have shown psychiatrists to be highly able to predict violent behaviors in involuntary psychiatric populations (12,13).

Our study attempted to correct some of the methodological flaws in existing research by adopting a prospective design, assessing the reliability of the clinicians' predictions, operationalizing definitions of violent behavior, limiting the time frame of the prediction to seven days, and following the patients in a controlled setting. However, the study has several limitations, and its results should be extrapolated only to similar patient populations in which the prevalence of violent behavior is comparable. The small number of patients studied limited the power of the statistical analysis. Categories that were found not to be statistically significant predictors of violent behavior may in fact have been found to be significant in a larger patient sample.

To help in the prediction process, further research examining the prevalence of violent behaviors in different populations is necessary. However, studies of effectiveness in predicting violent behavior in clinical settings are likely to remain problematic, since clinical assessment can predict only potential, not actual, behaviors.

For example, when violent behavior is anticipated, appropriate clinical management steps are usually taken to avert the actual behavior. If the patient's actual behavior is the standard against which the prediction is compared, preventing the violent behavior may indicate a clinical success but would

be measured as a false positive for the research study. The result is to suggest weaker predictive power in spite of the apparent correctness of the prediction.

A more adequate study would require a completely uncontrolled clinical environment, in which no special precautions were taken to prevent violence and in which treatment considerations were not influenced by the clinical assessment of potential violence. Ethical factors would argue against using such a research design.

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