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Methods for Establishing Critical Value Standards for Psychiatric Patients and Their Clinical Application Effects

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Abstract: *Objective:* To explore the method of formulating critical value (CLV) standards for psychiatric patients and analyze the effect of its clinical application. *Methods:* Research time: January 2024 to December 2025, the research subjects were 62 psychiatric patients admitted to the psychiatric department of our hospital. According to the different criteria for determining the critical value of the test, they were divided into a research group and a control group, with 31 cases in each group. The research group used the specially formulated critical value standards for psychiatric patients to carry out inspection management, while the control group used conventional clinical inspection risk assessment methods for management. Explore the application effects of the 2 groups. *Results:* A total of 31 cases of critical value testing occurred in the study group, and 30 cases were correctly identified; a total of 31 cases of critical value testing occurred in the control group, and 23 cases were correctly identified, with a comparison $P < 0.05$. The incidence of adverse events in the study group was lower (3.23% vs 19.35%), with a comparison $P < 0.05$. The test report turnaround time and hospitalization time of the study group were shorter than those of the control group, $P < 0.05$. *Conclusion:* Combining the clinical characteristics of patients with mental illness, the critical value standard developed through the three-step method of literature review, expert consultation, and clinical verification can effectively improve the accuracy of critical value identification, shorten the turnaround time of test reports, avoid the occurrence of adverse events, and thus improve the prognosis of patients.

Keywords: Mental illness; Testing critical value; Formulating methods; Clinical application

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1. Introduction

The critical test value refers to the test result that indicates that the patient may be in a life-critical state. Once a critical value occurs, corresponding clinical intervention measures must be taken immediately, the patient's condition may worsen, and even life safety may be endangered [1]. Due to the influence of the disease itself, mentally ill patients have characteristics such as poor ability to complain, mental symptoms masking physical discomfort, a narrow drug treatment window, high risk of poisoning, and difficulty in identifying physical comorbidities, making it significantly more difficult to identify and handle patients' critical values than ordinary patients [2]. Currently, there is no unified clinical standard for critical value testing for psychiatric patients. Most medical institutions still use the critical value testing standards for

ordinary patients, or use conventional risk assessment methods to carry out testing and management. Problems such as missed critical value determination, misjudgment, or untimely treatment may occur, which increases the risk of clinical diagnosis and treatment of patients [3]. To this end, this study analyzes the application effect of the critical value standard, which is summarized as follows.

2. Materials and methods

2.1. General information

(1) Research time

January 2024 to December 2025, the research subjects were 62 psychiatric patients admitted to the psychiatric department of our hospital. According to the different criteria for determining the critical value of the test, they were divided into a research group and a control group, with 31 cases in each group. There were 17 males and 14 females in the study group; the age range was 21 to 64 years old, with an average age of (38.25 ± 10.12) years old; the disease duration was 1.5 to 12.0 years, with an average disease duration of (5.68 ± 2.34) years; the disease types included 19 cases of schizophrenia, 7 cases of bipolar disorder, 3 cases of paranoid psychosis, and 2 cases of other types; 23 patients were taking antipsychotic drugs for a long time, and 8 patients had basic diseases such as mild hypertension and diabetes. There were 16 males and 15 females in the control group; they were 20 to 65 years old, with an average age of (37.98 ± 10.35) years old; the disease duration was 1.2 to 12.5 years, with an average disease duration of (5.52 ± 2.41) years; the disease types included 18 cases of schizophrenia, 8 cases of bipolar disorder, 4 cases of paranoid psychosis, and 1 case of other types; 22 patients were taking antipsychotic drugs for a long time, and 9 patients had basic diseases such as mild hypertension and diabetes. Comparison of baseline data between the 2 groups $P > 0.05$.

(2) Inclusion criteria

(a) Clearly diagnosed with mental illness according to DSM-5 diagnostic criteria;

(b) Stable mental symptoms, no severe mania, depression or impulsive aggressive behavior;

(c) Regular routine blood tests, biochemistry, blood drug concentration and other tests;

(d) Voluntarily participate in this study;

(e) Able to cooperate in completing tests and follow-up work.

(3) Exclusion criteria

(a) Serious blood system diseases, immune system diseases or infectious diseases;

(b) Associated with mental retardation, organic mental disorder, alcohol or drug dependence, etc.;

(c) Use of anticoagulants, hormones, immunosuppressants and other drugs that may affect test results in the past month;

(d) Failure to cooperate with test operations, follow-up or incomplete clinical data.

2.2. Method

2.2.1. Method for formulating the standards for testing critical values

Combined with the clinical characteristics of patients with mental illness, a three-step method of literature review, expert consultation, and clinical verification was used to develop the standard for critical value testing.

(1) Literature review: Systematic search of databases such as PubMed, China National Knowledge Infrastructure, and Wanfang to collect relevant research, clinical guidelines, and testing management specifications on critical value testing for mental patients at home and abroad. Focus on sorting out the critical value limits, formulation basis, and clinical application experience of common test items for patients with mental illness to provide theoretical support for the formulation of standards.

(2) Expert consultation: Invite 2 chief physicians of the psychiatry department, 1 deputy chief physician of the laboratory department, and 1 clinical pharmacist to form an expert group. All experts have more than 10 years of relevant clinical or laboratory work experience and are familiar with the characteristics of diagnosis and treatment of mental patients

and the management process of critical laboratory test values. Based on the results of the literature review, the expert group conducted a demonstration on the critical value limits of common test items for patients with mental illness, focusing on the impact of antipsychotic drugs on test results, the masking characteristics of physical symptoms of patients with mental illness and other factors, and proposed revisions. After three rounds of consultation, a consensus was reached and a draft standard for testing critical values was formed.

(3) Clinical verification: Select 10 patients with mental illness to conduct a pre-test, use the draft standard to carry out critical value identification and treatment, record the critical value identification situation, treatment effects and existing problems, and fine-tune the critical value boundaries in the draft standard based on clinical intervention feedback, optimize the identification process, and finally determine the critical value standard that meets the clinical characteristics of patients with mental illness, and clarify the upper and lower limits of critical values, identification processes and treatment principles for each test item.

2.2.2. Research group

The above-mentioned critical value standards for testing of mentally ill patients are used to carry out inspection management. The inspectors strictly follow the critical value limits in the standard to screen the patient's blood routine, biochemistry, blood drug concentration and other test results. Once a critical value is found, the specimen quality and testing process are immediately checked. After confirmation, the test results are notified via phone and system message within 5 minutes. Psychiatric medical staff also record the results of the critical value, the time of discovery, notification time and the recipient; after receiving the notification, the medical staff will evaluate the patient within 10 minutes and take targeted intervention measures. Within 30 minutes, the intervention measures and the patient's condition changes will be recorded in the course of the disease, and the test results will be followed up and reviewed until the critical value returns to normal.

2.2.3. Control group

Conventional clinical testing risk assessment methods are used for management. Testing personnel make manual judgments on obviously abnormal test results in accordance with the testing standards for ordinary patients. After abnormal results are discovered, medical staff are notified, and the risk assessment of the patient is conducted based on clinical experience, and corresponding intervention measures are taken. Both groups of patients received continuous intervention for 4 weeks.

2.3. Observation indicators

(1) Test the accuracy of critical value identification: The test personnel will fill in the critical value identification record form to record the patient's test results, whether it is a critical value, identification results and other information.

(2) Adverse event incidence rate: filled in by medical staff to record the time, type, cause and treatment results of adverse events.

(3) Test report turnaround time: filled in by the tester, recording the patient test specimen collection time, test start time, report issuance time, and calculating the turnaround time.

At the same time, the time from the issuance of test results to the time when medical staff takes intervention measures is recorded in detail; the patient's prognosis is assessed using the Brief Psychiatric Rating Scale (BPRS), with a total score of 18 to 126 points. 18 to 35 points are a good prognosis, with mild mental symptoms and can lead a normal life; 36 to 70 points are a moderate prognosis, with obvious mental symptoms and require further intervention; 71 to 126 points are a poor prognosis, severe mental symptoms, and inability to take care of themselves.

2.4. Statistical methods

The SPSS 26.0 software was used to process the data involved in the study. Measurement data were expressed as "mean ± standard deviation (SD)" and tested by "t"; count data were expressed as "[n/(%)]" and tested by "χ^2". $P < 0.05$ indicated

that the difference was significant.

3. Results

3.1. Comparison of test critical value identification accuracy

A total of 31 cases of critical value testing occurred in the study group, and 30 cases were correctly identified; a total of 31 cases of critical value testing occurred in the control group, and 23 cases were correctly identified, with a comparison $P < 0.05$ (**Table 1**).

Table 1. Comparison of critical value identification accuracy rates between two groups [n (%)]

Group	n	Actual critical value examples	Correctly identify instances	Recognition accuracy (%)
Research group	31	31	30	96.77
Control group	31	31	23	74.19
χ^2	——	——	——	6.369
P	——	——	——	0.012

3.2. Comparison of adverse event incidence rates

The incidence of adverse events in the study group was lower (3.23% vs 19.35%), with a comparison $P < 0.05$ (**Table 2**).

Table 2. Comparison of the incidence of adverse events between the two groups [n (%)]

Group	n	Electrolyte imbalance	Hypoglycemia	Drug poisoning	Worsening of the condition	Incidence rate (%)
Research group	31	1（3.23）	0	0	0	1（3.23）
Control group	31	2（6.45）	2（6.45）	1（3.23）	1（3.23）	6（19.35）
χ^2	——	——	——	——	——	4.026
P	——	——	——	——	——	0.045

3.3. Comparison of inspection report turnaround time, nursing intervention timeliness and BPRS score

The test report turnaround time and hospitalization time of the study group were shorter than those of the control group, $P < 0.05$ (**Table 3**).

Table 3. Comparison of test report turnaround time, nursing intervention timeliness and BPRS score (mean ± SD) between the two groups

Group	n	Inspection report turnaround time (min)	Nursing intervention time (min)	BPRS score (points)
Research group	31	28.56 ± 4.32	18.56 ± 4.23	35.67 ± 5.89
Control group	31	45.23 ± 5.16	32.74 ± 5.61	48.92 ± 6.78
t	-	13.792	11.237	8.214
P	-	0.000	0.000	0.000

4. Discussions

In the clinical diagnosis and treatment of mentally ill patients, test results are an important basis for judging the patient's

physical condition and adjusting treatment plans, and the timely identification and handling of critical test values are directly related to the patient's life safety [4]. Due to the special clinical characteristics of patients with mental illness, ordinary standards for testing critical values are difficult to adapt to the needs of clinical diagnosis and treatment. Conventional risk assessment methods lack standardized processes, which may lead to untimely identification of critical values and irregular handling, thereby increasing the risk of clinical adverse events for patients. Therefore, formulating targeted critical value standards for testing of mentally ill patients is of great significance to optimizing testing management and ensuring patient safety [5].

This study adopted a three-step method of literature review, expert consultation, and clinical verification to formulate the critical value standard. The literature review provided solid theoretical support for the formulation of the standard and ensured the scientific nature of the critical value standard. Expert consultation combined with the opinions of psychiatry, laboratory medicine, clinical pharmacy and other disciplines, focusing on the impact of antipsychotic drugs on test results, avoiding the limitations of ordinary standards. Clinical verification passed pre-tests to further optimize the details of the standard to ensure that the critical value standard can adapt to actual clinical needs and improve operability of the critical value standard. Clinical application results show that the research team's critical value identification accuracy rate is 96.77%, indicating that the critical value standard can clarify the boundaries of critical values, standardize the identification process, and reduce missed judgments and misjudgments, thereby helping inspectors to quickly and accurately identify critical values [6].

The incidence rate of adverse events in the study group was 3.23%, and the turnaround time of inspection reports was significantly shortened. The key is that the critical value standard clarifies the notification time limit and intervention time limit after the critical value is discovered, and establishes a closed-loop management process of "inspection-notification-intervention-review". Inspection personnel and medical staff cooperate with each other to quickly deal with critical values, promptly correct the patient's physical abnormalities, and avoid further deterioration of the condition. At the same time, the critical value standard also clarifies the handling principles of each test item, provides clear clinical guidance for medical staff, and reduces the blindness of intervention [7].

The nursing intervention time of the study group was shortened and the BPRS score was reduced, indicating that by testing the critical value standard, the critical value can be quickly identified, the direction of intervention can be clarified, and the medical staff can take effective intervention measures in a short time, to obtain the best treatment opportunity for the patient, improve the patient's mental symptoms, alleviate physical discomfort, and thereby improve the patient's prognosis quality [8].

The study also has certain limitations. The sample size of the study was small, including only 62 patients, and the study period was short. It was not possible to observe and test the application effect of the critical value standard for a long time; the study only selected patients from a single hospital, and the generalizability of the results may be affected. Follow-up studies can expand the sample size, extend the research period, and include patients from multiple centers to further verify the scientificity and practicality of the critical value test standards. At the same time, the critical value threshold can be optimized based on the individual differences of patients to achieve individualized test management.

5. Conclusion

In summary, combined with the clinical characteristics of patients with mental illness, the critical value standard for testing developed through the three-step method of literature review, expert consultation, and clinical verification can effectively improve the accuracy of identifying critical values for testing, shorten the turnaround time of test reports, avoid the occurrence of adverse events, and thus improve the prognosis of patients.

Disclosure statement

The author declares no conflict of interest.

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