

Using Plan-Do-Check-Act Circulation to Improve the Management of Panic Value in the Hospital

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The concept “panic value” (or critical value) was first brought up by American scholar Lundberg^[1] in 1972. It refers to the results of auxiliary examinations that are widely deviating from normal or anticipated results. The occurrence of these abnormal results shows that patients could be in a dangerous situation that their lives might be threatened. If clinicians are able to get the information in time and provide the patients with effective interventions or treatments promptly, lives could be saved. Otherwise, there could be serious consequences and the best opportunities for rescuing the patients might be missing.^[2] The management of panic value is an important component of medical quality management, as the National Health and Family Planning Commission has clearly defined in the “patient safety goals” for several consecutive years.^[3] In countries such as America, Australia as well as Germany, the management of panic value has also been greatly emphasized and was been included in various hospital assessments. For example, in the yearly assessment of medical quality held by Joint Commission International (Joint Commission on Accreditation of Healthcare Organizations) of America, the management of panic value was an important part for evaluation.

WHAT IS PLAN-DO-CHECK-ACT CIRCULATION AND HOW TO APPLY IT TO THE MANAGEMENT OF PANIC VALUE IN THE HOSPITAL?

The idea “Plan-Do-Check-Act (PDCA) circulation” was presented by Dr. Edwards Deming, an American expert of quality management in the 1950’s.^[4] It divided the process of management into 4 parts, which contains PDCA. PDCA circulation is extensively used in the quality management of the various field, it is the process of finding and solving problems and is applicable for the continuous

improvement of the management of medical quality.^[5] In the 1990’s, the concept of PDCA circulation is introduced to the field of medical quality management by American experts and was since widely used in many aspects of medical quality control. This paper will elaborate on the using of PDCA circulation to continuously improve the management of panic value in a Class III Grade I hospital in detail.

In light of the PDCA circulation theory, the hospital divided the process of the management of panic value into 4 parts: PDCA, and carried out the specific work according to the objectives by continuous circulations to improve the management.

PLAN

According to the requirements of the Administrative Department and clinical needs, through detailed research, demonstration and preliminary design,^[6] the hospital established the group of panic values management, drafted rules and regulations as well as work programs and the specific implementation measures for panic value management, and carried out training and education program for staffs to ensure the work moving on smoothly.

Establishment of the group of panic value management

The hospital established the group of panic value management as the working unit under the medical quality management

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committee of the hospital. The leader of the group is the medical director of the hospital, the members of the group consist experts in fields of laboratory, clinical, imaging as well as management. The group is in charge of drafting regulations and designing programs for panic value management, and carrying out the training and education projects for hospital staffs on panic value management.^[7] The group also presides over the process to ensure that the work was carried out smoothly.

Establishing management system and reporting procedures

According to the requirements for the management of panic value in combine with the specific situation of the hospital, the group of panic value management of established the management system and reporting procedures of panic value as a valid basis to develop concrete work of management.^[8] The system requires the results of panic value be immediately reported to the clinical as soon as it is confirmed by telephone, clinical staffs who receive the call should record the information carefully as required and take diagnosis and treatment measures timely for the patients.^[9]

Setting up items and scopes for panic value reporting

According to the 2009–2010 “patient safety goals” published by the National Health and Family Planning Commission, the items as well as the scopes of panic value reporting can be defined according to the specific need of the hospital, while should at least include calcium, serum potassium, blood sugar, blood, leukocyte count, platelet count, and thrombotic time. After repeated discussions and researches by experts of clinical, laboratory and management, the hospital finally setting up the items and scopes for panic value reporting.^[10] In addition to quantitative clinical laboratory items, nonquantitative items such as ultrasound inspection, imaging examination as well as a pathological diagnosis were also brought into the panic value management system.

Carrying out personnel training to strengthen quality control

To ensure the effective implementation of the management system, the group of panic value management of the hospital carried out a series of professional training for staffs of relevant departments to help them get familiar with the process and the contents of panic value reporting quickly. In addition, to guarantee the authenticity and reliability of the results reported, the hospital require relevant departments take serious quality control before each test, strictly examine and analyze the results after the test, while carefully implementing each item of requirement for quality control to make sure that the results are effective and valid that are reported correctly and timely.^[11]

Do

According to the plan, the hospital officially put the management system and reporting procedures of panic value into practice in November 2011, requiring staffs of relevant departments carry out the reporting, receiving and disposing measures according to the management procedures.

Meanwhile, to ensure that the results are traceable, both of the reporting and receiving departments are required to record the information.^[12]

CHECK

A year after the panic value management system implemented, the group of panic value management of the hospital carried out a comprehensive inspection of the general situation, and found out problems as follows: First of all, some of the staffs are unfamiliar with the contents and procedures of panic value reporting and fail to answer the questions related to panic value management correctly in the inspection; secondly, some departments failed to report panic value results in time as required, or even neglected reporting; third, the records of panic value in reporting as well as receiving departments lack standardization and the phenomenon of omission happens constantly, making the results hard to trace back; last but not least, some Clinical Departments are unaware of the importance of panic value results and thus failed to take appropriate measures timely, which all add to hidden dangers and risks. These pressing problems need to be solved immediately.

Act

Aiming at the problems found in the inspection, the group of panic value management held meetings to discuss current defects existed in the management process and decided that there are two key factors in the above problems: Timeliness and unity.^[13] Since medical works are busy and complex while conditions of patients may change rapidly, the original way of reporting only by telephone has multiple transfer links and requires a long time, and is likely to produce false reports or omissions, thus cannot fully meet the demands for current hospital management.^[14] Besides, the group of panic value management held a symposium on panic value management, convened doctors, nurses as well as other technical staffs of relevant department in order to listen to the advices as well as suggestions of the clinical front line on panic value management. Through multiple investigations and researches, the hospital has taken a series of measures to improve the current situation.

Introducing information system management to ensure the effective implementation of panic value reporting

Through communicating and coordinating between different information systems developers, the hospital set up panic value reporting intervals of each item in the laboratory information system, when the test results appears to be a panic value, the system will automatically judge it and prompt a yellow sign for staffs in the Laboratory Department to recognize. When the results are confirmed valid, it will be transferred in real-time to the health information system and a prompt message will pop up for clinical doctors and nurses to notice. In order to deal with the panic value results properly and timely, when logging into the medical record system, doctors must first complete the disposing records of panic value for patients that they are in charge of, otherwise

they would be unable to carry out other operations in the system. By combining the compulsory reminding function of the information system with telephone reporting as the double insurance mechanism, the improvement in panic value management is moving on much more effectively and smoothly.^[15]

Allocating unified panic value recording books in the hospital

The hospital printed a bunch of panic value recording books and distributed to each Clinical Department to solve the problem of nonstandard recording of panic value by formulating standard recording format. The recording contents include the inspection and reporting date, the patients' basic information as well as the items and results of the panic value, the name of receiver and so on to make sure the results are traceable.

Retraining of staff

In order to help staffs get familiar with the contents and procedures of panic value reporting along with the new management measures that the hospital recently was taken, the hospital organize an intensive training program for staffs of relevant departments to ensure these management measures can be put into effect as soon as possible.

Revising the contents and scopes of panic value according to clinical needs

The group of panic value management of the hospital revised part of the contents and scopes of panic value [Table 1] during the symposium according to clinical needs in combined with new revised edition of "reference interval of common clinical biochemical tests" (Industry Standard: WS/T 404-2012) by the National Health and Family Planning Commission, to ensure that panic value better meet the need of clinical demands and ensure medical safety.^[16]

PRELIMINARY PRACTICE AND EFFECTS BY ADOPTING PLAN-DO-CHECK-ACT CIRCULATION TO IMPROVE THE MANAGEMENT OF PANIC VALUE

Through the continuous improvement over the year, the group of panic value management of the hospital carried out

Table 1: Some of the changes in contents and scopes of panic value

| Contents | Units | Reference interval | Original scopes | Current scopes |
|-----------------|--------|--------------------|-----------------|---|
| Glucose | mmol/L | 3.9–6.1 | >22.2 or <2.2 | >22 or <2.8 |
| Troponin I | ng/ml | 0–0.04 | ≥0.2 | ≥0.1 (first time) |
| Hemoglobin | g/L | 110–160 | >200 or <50 | >200 or <60 |
| PT and activity | s | 8.8–13.4 | >17 | Nonorally taking anticoagulant patients PT >20 s, orally taking anticoagulant patients INR >4 |
| Fibrinogen | g/L | 2–4 | – | <1.00 |

PT: Prothrombin time; INR: International normalized ratio.

another comprehensive inspection on panic value at the end of 2013. Compare and analyze data of the two inspections and the results are as follows.

Data selection

Panic value reporting rate, rate of reporting in time, percentage of qualified records

Through extracting the panic value data of all the patients from the backstage of information system in November, 2011 (before the continuous improvement) and November, 2013 (after the continuous improvement) along with the records of the reporting and receiving departments. The panic value reporting rate was counted by records of both the reporting and receiving departments existed as the criterion; the rate of reporting in time was counted by within half an hour as recorded; the percentage of qualified records was counted by records that meet all the requirements of the hospital as the criterion.^[17]

Rate of disposing in time

Retracing the disposal records of the selected cases of panic value results in the medical records system, the records that are written within 2 h are counted as qualified, records that are written exceeding 2 h or even no records are treated as unqualified.^[18]

Statistical analysis

Statistical analyses were input by Excel and performed using SPSS Statistical software (version 16.0, SPSS Inc., Chicago, IL, USA), data of rates were evaluated by Chi-square test, $P < 0.05$ was considered statistically significant.

Results of data analysis

A total of 124 panic value cases occurred in November 2011 in the hospital, while 168 cases occurred in November 2013, the detailed statistics are shown in Table 2.

The results show that the under the $\alpha = 0.05$ statistical test level, the percentage of reporting rate as well as the rate of reporting, recording and disposing in time has significantly risen in 2013 than in 2011.

OUTLOOK OF THE ADOPTION OF PLAN-DO-CHECK-ACT CIRCULATION IN THE FIELD OF MEDICAL QUALITY CONTROL

The adoption of PDCA circulation has significantly improved the management of panic value in the hospital as the data showed above.^[19] While even as for now, there are still potentials for promotion. For instance, patients are hard to tract when panic value results came out, especially for outpatient or that the doctors in charge fail to log into the information system in time. These would all lead to the delay of receiving and disposing of the results. Thus, the group of panic value management of the hospital plans to further optimize the procedures on panic value reporting through sending mobile messages or other telecommunication software such as WeChat to the doctors as well as patients to ensure they get the information immediately for the panic value to be reported and disposed in time.^[20]

Table 2: Statistics of panic value in November 2011 and November 2013

| Indicators | November 2011 | November 2013 | Total | χ^2 | P |
|-------------------------------|----------------|----------------|----------------|----------|-------|
| Reporting rate (%) | 81.5 (101/124) | 96.4 (162/168) | 90.1 (263/292) | 178.94 | <0.05 |
| Rate of reporting in time (%) | 54.0 (67/124) | 86.3 (145/168) | 72.6 (212/292) | 37.37 | <0.05 |
| Rate of recording in time (%) | 74.2 (92/124) | 90.5 (152/168) | 83.6 (244/292) | 13.76 | <0.05 |
| Rate of disposing in time (%) | 45.2 (56/124) | 81.0 (136/168) | 65.6 (192/292) | 42.05 | <0.05 |

$\nu=1; \chi^2_{(0.05,1)}=3.84$.

In addition, some doctors have different opinions for the intervals of panic value subjects in clinical practice. In departments mainly treating patients of chronic diseases, if the intervals of panic value subjects are relatively narrow, the department will receive reports frequently and increases the workload of clinical staffs.^[21] On the contrary, doctors in the Emergency Department prefer the opposite, since wider intervals may lead to the ignorance of hidden problems and thus missed the best opportunity for treatment. To solve the problem, the group of panic value management held another symposium and decided that the intervals of panic value subjects may vary according to the specific situation of each department. The group also plans to enhance the information system by adding above functions to meet clinical demands.

The hospital has put these problems into the next phase of PDCA cycle as the key subjects for continuous improvement.

Through PDCA circulation, the management of panic value in the hospital has shown great improvement. Besides, the experience shows that PDCA circulation is not merely the process of simple and parallel repetition, it is a spiral of upgrading changes to continuously improve the current situation.^[22] The hospital will apply the PDCA circulation concept as a the tool for probing problems, analyzing reasons as well as making changes to improve the medical quality in different fields.

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Conflicts of interest

There are no conflicts of interest.

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