

Research and Practice on the Quality Control of Medical Equipment Combined with the Overall Maintenance Service of Medical Equipment

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Abstract: *Purpose* In the face of the problems in medical equipment quality control, such as manpower shortage, lack of standardization, insufficient quality control equipment and weak information means, the implementation methods of medical equipment quality control are improved effectively by reorganizing the key points of quality control and introducing the overall maintenance service of medical equipment. *Methods* On the basis of researching and determining the quality control objects of medical equipment, formulating the work content of medical equipment quality control and supporting special quality control record sheets, formulating the work plan of medical equipment quality control, and adjusting the quality control content in time according to the actual clinical needs, our hospital has passed and the overall maintenance company of medical equipment cooperates closely and obtains the support of manpower, quality control equipment and information management tools to ensure that the quality control of medical equipment is in place. *Result* Through the standardization of medical equipment quality control, the efficiency of medical equipment quality control has been significantly improved, and the operation quality failure rate of quality control objects has decreased year by year, and we can find the hidden trouble of medical equipment operation quality and solve it accordingly. In addition, compared with hospital engineers, there is a certain gap in the medical equipment quality control ability of maintenance engineers in medical equipment overall maintenance service companies. At the same time, there are still some shortcomings in the coverage of quality control work. *Conclusion* Overall medical equipment maintenance service is conducive to the implementation of medical equipment quality control, and quality control is effective in improving the operation quality of medical equipment, and can guarantee the safety of medical service, but there is still a large space for improvement.

Keywords: Medical Equipment, Quality Control, Repair and Maintenance

1. Introduction

With the deepening of the concept of professional management of the whole life cycle of medical equipment, regulations and policies related to the quality control of medical equipment and industry norms have been promulgated and implemented, for example, *Measures for quality supervision and administration of the use of medical devices* (Order No. 18 of the State Food and Drug Administration) clearly requires that medical device users shall inspect, test,

calibrate and record medical devices that need regular inspection, inspection and calibration in accordance with the requirements of product manuals, and timely analyze and evaluate medical devices to ensure that they are in good condition; point 12 of qualitative indicators in the *Performance Appraisal Operation Manual of National Grade III Public Hospitals* requires that necessary testing and quality control equipment should be configured, preventive maintenance should be carried out on equipment on a regular basis, especially first-aid and life support equipment, and the

equipment in use should be in good condition, recorded and marked, and problems should be dealt with in time [1, 2]. To achieve the above management requirements, our hospital has begun to carry out quality control work of medical equipment since 2016. However, the quality control of medical equipment in our hospital is not ideal because of obvious cost and valueless benefit of quality control work of medical equipment, the imperfect construction of medical engineers, and lack of standardized management of hospital medical equipment work operation, etc., as a result, to our hospital, there is still a large space for improvement. In this context, through recombining the key points and improving the methods of quality control work, and on the basis of *Guiding Opinions of The General Office of the State Council on Promoting the Healthy Development of the Pharmaceutical Industry* (State Affairs and Development No. 11, 2016), our hospital introduced overall medical equipment maintenance service in 2018 by public bidding, we tried to use the engineering team of third-party medical equipment professional maintenance companies [3], the configuration base of quality control equipment and the medical equipment management platform to comprehensively improve the quality control of medical equipment with the idea of "first breakthrough in key points, and then widespread deployment".

2. Difficulties in the Quality Control of Medical Equipment in Our Hospital in the Past

2.1. Lack of Personnel

In 2016, our hospital introduced Fluke's multi-parameter vital signs simulator, defibrillation analyzer, airflow analyzer, electrical safety analyzer, and infusion equipment analyzer, and arranged for some medical engineers to participate in quality control equipment use training and equipment quality control special training course held by Nanfang Hospital. The course planned to change the current situations of medical equipment operation and maintenance management in our hospital, which were "maintenance-based, supplemented by inspection and maintenance" [4]. However, because the equipment department of our hospital was also responsible for the operation and maintenance management of electromechanical equipment such as medical gas system and purification system in addition to the management of medical equipment, the configuration of medical engineers was relatively limited. Medical engineers increase quality control work on the premise of maintaining the quality of maintenance, inspection, maintenance, installation, etc., and could only carry out quality control work by sampling testing, resulting in unsatisfactory quantity and quality of quality control work.

2.2. Lack of Standardized Management

Although formulating relevant system about management of medical equipment quality control, because of the reasons as the medical equipment management system of our hospital

was not configured and lack of long-term supervision on the quality of medical engineers' quality control work. As a result, medical engineers not only carried out quality control work with the attitude of "doing it when you have time", but also the content of quality control work and the supporting quality control record sheet were outdated versions provided by Fluke, which couldn't be timely updated according to the latest national regulations. And the scope of quality control was also mainly based on meeting the evaluation standards of graded hospitals and the performance evaluation indicators of public hospitals, and the quality control files were not electronically managed. According to statistics, a total of about 600 sets of ECG monitors, defibrillators, ventilators and other equipment have been quality-controlled from October 2016 to September 2018. At present, only more than 30 quality control records have been retained.

3. Improvement Measures for Quality Control of Medical Equipment

In order to improve the efficiency of medical equipment quality control work, our hospital integrated quality control into user needs in the process of introducing overall medical equipment maintenance service in Oct 2018. In the satisfaction evaluation of the project implementation stage, the quality control work was listed as one of the evaluation indicators, and clear requirements were put forward for the quality control work of medical equipment. On this basis, our hospital adopted the work idea of "hospital overall planning and company implementation", and cooperated with the overall maintenance service company of medical equipment to work together to do a good job in the quality control of medical equipment [5].

3.1. Hospital Section

Under the background of planning to introduce the overall maintenance service of medical equipment, based on the premise that the medical engineers of our hospital have rich experience in the quality control of medical equipment, and have a more in-depth understanding of the quality control of medical equipment after strengthening professional study, our hospital mainly improves the quality control of medical equipment from the following aspects:

3.1.1. Developing and Determining the Quality Control Objects of Medical Equipment

The medical engineers of our hospital fully studied the Measures for the Supervision and Administration of the Use of Medical Devices, The Metrology Law of the People's Republic of China, the United States Vermont University's Clinical Medical Equipment Risk Assessment Methods, Health Industry Standards - Medical Device Safety Management (WS/T 654-2019) and other relevant laws and regulations and industry norms, and carefully studied the differences between mandatory verification, calibration/verification and independent quality control (see

Table 1 for details). They combined the human resources allocation and quality control of the overall medical equipment maintenance service company and technical situation, and then "defibrillator, ECG monitor, ventilator, microinjection pump, micro-infusion pump, infant incubator" were selected as the quality control objects [6-10].

Table 1. Classification and difference between "mandatory verification, calibration/verification and independent quality control".

Category	Including in Category	Detection Party	Management Differences
Mandatory check	According to the <i>Announcement of the State Administration for Market Regulation on Issuing the Catalogue of Measuring Instruments for Compulsory Administration</i> (2019 No. 48)	Legal metrological verification agency	The government pays as a whole, and the hospital reports and implements free compulsory inspection, but there are few inspection items and the inspection cycle is fixed.
Calibration/ Verification	Other measuring instruments not included in the <i>Catalogue of Measuring Instruments Subject to Compulsory Management</i>	Statutory metrological verification agency or qualified testing agency	It can be carried out on demand, and the fee is charged according to the number of inspections or inspection content, and the fee is generally higher. If a qualified testing agency is responsible, it is basically the same as "calibration/verification"; if the hospital conducts its own development, the testing items, testing cycle, testing record form, etc. can be completely customized as needed, but it is necessary to purchase quality control equipment and invest in corresponding manpower.
Independent quality control	Customized according to the operation quality requirements of hospital medical equipment (for example, our hospital uses the overall maintenance service company of medical equipment to carry out quality control of medical equipment)	Qualified testing institutions or hospitals	

3.1.2. Formulation of Quality Control Work Content and Record Sheet for Medical Equipment

On the basis of clear quality control objects, through in-depth cooperation with engineers from Panyu District Quality and Technical Supervision and Inspection Institute, the medical engineers of our hospital jointly studied the *Technical Specifications for Quality Control and Measurement Management of Sanitary Equipment*, *Guidelines for Quality Control of Medical Device Management in Medical Institutions*, *Medical Device Safety Management* (WS/T 654-2019) and other industry standards and *Safety Management of Multi-parameter Monitors* (WS/T 659-2019), *Safety Management of Ventilators* (WS/T 655-2019), *Medical Infusion Pumps and Medical Syringe Pumps Safety Management* (WS/T 657-2019), *Infant Incubator Safety Management* (WS/T 658-2019) and other equipment-specific industry standards, and then combined with the quality control equipment configuration of hospitals

and overall maintenance service companies, respectively developed the quality control content of each quality control object. For example, the ECG monitor takes 9 dimensions of "appearance and daily management, power-on inspection, heart rate, respiratory rhythm, blood oxygen saturation, blood pressure, sound and light alarm, electrical safety of the power supply, and electrical safety of the application" as the quality control objects; the ventilator takes 8 dimensions of "appearance of the instrument, power-on inspection, tidal volume, forced ventilation frequency, inspired oxygen concentration, inspiratory pressure level, positive end-expiratory pressure, safety alarm function" as the quality control objects; the micro-injection pump carries out "qualitative inspection and qualitative inspection, among which the qualitative inspection includes flow inspection, blockage alarm inspection, alarm system inspection", etc., and formulates a special quality control record sheet according to the quality control content [11].

Table 2. Medical equipment annual quality control work plan.

Months	Objects	Frequency	Range
January	Microinjection pump, micro-infusion pump	/	8.3% of the whole hospital
February	Microinjection pump, micro-infusion pump defibrillators	1 st time	8.3% of the whole hospital Whole hospital
March	Microinjection pump, micro-infusion pump ventilator	1 st time	8.3% of the whole hospital Whole hospital
April	Microinjection pump, micro-infusion pump ECG monitor	1 st time (mandatory check instead of the 2nd)	8.3% of the whole hospital Whole hospital
May	Microinjection pump, micro-infusion pump defibrillators	2 nd time	8.3% of the whole hospital Whole hospital
June	Microinjection pump, micro-infusion pump	/	Guaranteed to reach 50% of the whole hospital
July	Microinjection pump, micro-infusion pump baby incubator	/	8.3% of the whole hospital Whole hospital
August	Microinjection pump, micro-infusion pump defibrillators	3 rd time	8.3% of the whole hospital Whole hospital
September	Microinjection pump, micro-infusion pump ventilator	2 nd time	8.3% of the whole hospital Whole hospital
October	Microinjection pump, micro-infusion pump	/	8.3% of the whole hospital
November	Microinjection pump, micro-infusion pump defibrillators	4 th time	8.3% of the whole hospital Whole hospital
December	Microinjection pump, micro-infusion pump	/	Guaranteed to reach 100% of the whole hospital

3.1.3. Formulation of a Work Plan for Quality Control of Medical Equipment

There was partial overlap between quality control and mandatory check objects and content of our hospital. As a result, to avoid duplication of work, and on the basis of making full use of human resources, so as to effectively improve the operation safety and accuracy of the quality control objects, and indeed find hidden problems and solve them in advance, at the same time, combining with "ECG monitor, defibrillator (ECG part)" in the mandatory verification cycle in October every year and the requirements for the quality control testing cycle of medical equipment formulated according to *the Clinical Medical Equipment Risk Assessment Method of Vermont University in the United States*, such as 4 times/year for defibrillator, 2 times/year for ventilator, and considering the long testing time of a single microinjection pump and micro-infusion pump [12], our hospital has formulated a quality control work plan for medical equipment throughout whole hospital (see Table 2 for details), requiring the overall maintenance service company for medical equipment to carry out quality control testing of medical equipment according to the content of quality control work and fill in the quality control record form according to the facts strictly.

3.1.4. According to Clinical Feedback, Timely Adjust the Content of Quality Control Work

According to the practical implementation of medical equipment quality control work, our hospital noticed that there was discrepancy between specific needs for operational quality in clinical use and quality control technical parameters, quality control work content and record sheets, which were formulated with reference to the national calibration standard [13-14]. In view of this, after the communication with clinical medical staff about qualitative testing content of quality control objects and understanding about clinical daily technical parameters, our hospital made timely partial adjustments of quality control work to make medical equipment quality control work more suitable for practical clinical needs. Take the quality control work of ventilator and ECG monitor in our hospital as an example.

First, referring to the JFJ 1234-2018 Ventilator Calibration Specification, and optimizing the Invasive

Ventilator Quality Control Test Record Form. JFJ 1234-2018 Ventilator Calibration Specification points out that the minimum set value of tidal volume calibration for adult ventilator is 400ml, and the minimum set value for tidal volume calibration for infant ventilator is 50ml. In clinical applications, the tidal volume of the neonatal ventilator is usually set at about 15ml, while the tidal volume may be set at 7ml when used for the treatment of premature infants. Therefore, we adjusted the Invasive Ventilator Quality Control Inspection Record Form to 3 versions of "Adult, Child, Neonatal". Among them, the neonatal version has been communicated with the medical staff of the neonatology department, and combined with the minimum measurement value requirements of the technical parameters of the quality control equipment, the tidal volume quality control value of the invasive ventilator is adjusted to a total of 4 values of "10ml, 20ml, 30ml, 50ml". Second, referring to the JJG 1163-2019 Verification Regulations for Multi-parameter Monitors, optimizing the Multi-parameter Monitor Quality Control Test Record Form. However, in the clinical quality control work, we found that the cuff of the ECG monitor in the neonatology department was a neonatal type, and the non-invasive blood pressure cannot be detected above 200/150 (166). After communicating with the medical staff of the neonatal department, it was determined that the non-invasive blood pressure measurement result of the neonate would not exceed 200mmHg. Therefore, the non-invasive blood pressure quality control value of the neonatal ECG monitor was adjusted to a maximum of 150/100 (116). In addition, the air tightness settings for detection were adjusted to 200mmHg for neonates, 245mmHg for children, and 285mmHg for adults.

3.2. Overall Maintenance Service Company Section

The company, which provides our hospital with overall medical equipment maintenance service, is one of the largest medical device third-party maintenance companies. It is currently listed, and its service targets cover more than 100 hospitals. As a result, it plays a great role in the quality control of medical equipment in terms of manpower, quality control equipment and information management tools [15].

Table 3. Quality control equipment list.

Belonging to	Names	Brand	Model	Quantity
Hospital	Multiparameter vital signs simulator		Prosim8	1
	Infusion Equipment Analyzer		IDA5	1
	Electrical Safety Analyzer	Fluke	ESA615	1
	Defibrillator Analyzer		Impulse 7000DP	1
	Airflow Analyzer		VT MOBILE	1
Medical Equipment Overall Maintenance Service Company	Multiparameter vital signs simulator		Prosim8	1
	Infusion Equipment Analyzer		IDA-1S	1
	Electrical Safety Analyzer	Fluke	ESA615	1
	Defibrillator Analyzer		Impulse 7000DP	1
	Baby Incubator		INCU II	1
	Airflow Analyzer		VT900	1

3.2.1. Providing Sufficient Manpower and Supporting Quality Control Equipment

To make improvement about lacking of quality control manpower [16], our hospital required that resident engineers cannot be less than 12 after introducing the medical equipment maintenance service company, and at the same time, the original 4 engineers of our hospital are included in the unified management of the maintenance service company. In terms of quality control equipment, it is required that on the basis of the existing quality control equipment in the hospital, combined with the demand for the type of quality control equipment of the quality control object and the demand for the quantity of quality control equipment for the implementation of the quality control work plan, it should be supplemented to form the quality control equipment shown in Table 3. The equipment list has improved the type and quantity of quality control equipment.

3.2.2. Application of Medical Equipment Management Platform

Medical equipment overall maintenance company provides our hospital with medical equipment management service [17], including medical equipment quality control module, by using information means of medical equipment management platform. First of all, engineers enter the equipment that needs quality control into the software to form a quality control list after formulating plans of medical equipment quality control work. Second, engineers can “sweep” the asset label pasted on the device body in the mobile phone applet to enter the device information and

easily record the quality control inspection results. And then, detailed record of quality control work can be archived into homologous equipment files as profile of its life cycle by photographing or scanning [18-19]. Finally, quality control work reports will be formed monthly and pushed to management staff to check quality control work situation, specific content, and problems found in quality control and solutions, etc. [20].

4. Improvement of Quality Control of Medical Equipment

Since September 2018, our hospital has cooperated with the overall medical equipment maintenance service company to carry out the quality control of medical equipment. As of December 2021, it has been able to carry out quality control work according to the annual plan listed in Table 2. The main quality control conditions are as follows:

4.1. The Trend of Qualified Rate of Some Quality Control Equipment in Our Hospital

By analyzing the qualitative and quantitative test results of 645 defibrillators, 1043 ECG monitors, and 594 ventilators from 2018 to 2021, it can be found that under the working mode of “periodic quality control and timely solve the problems found in quality control”, the operation quality of medical equipment can indeed be improved, and the unqualified rate of quality control testing shows a downward trend year by year. Please refer to Figure 1 and Figure 2.

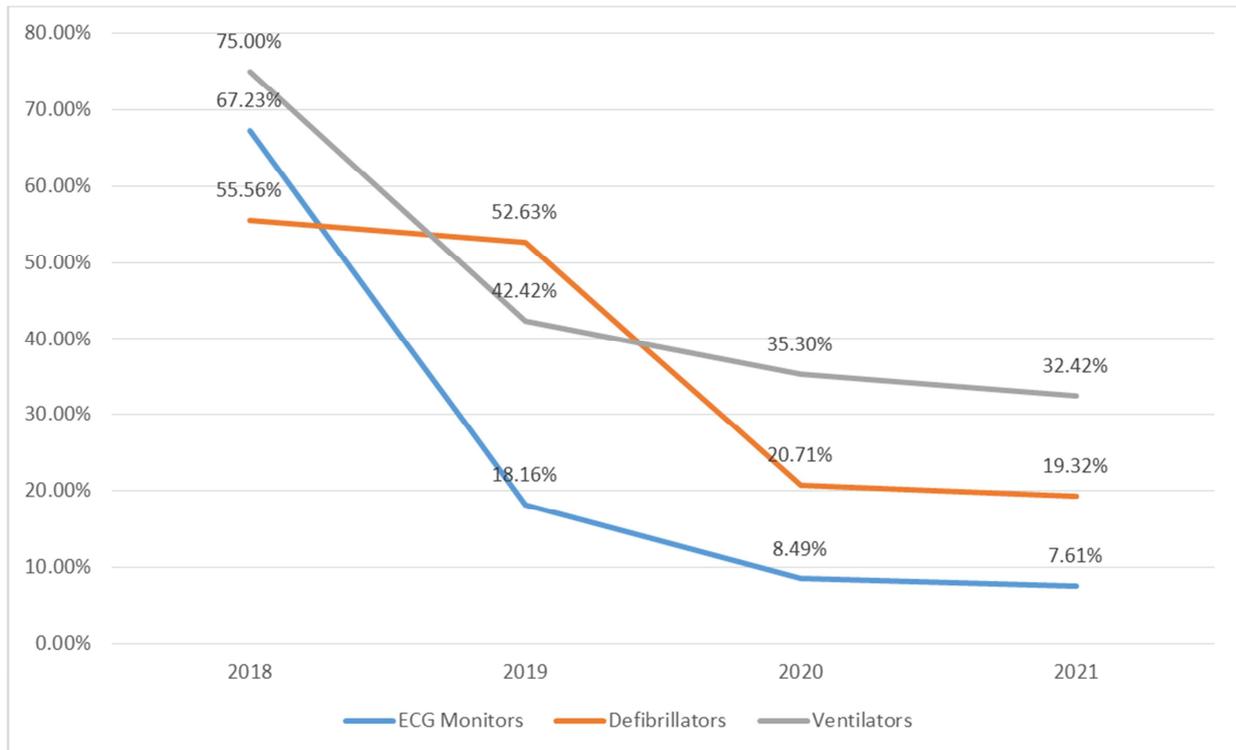


Figure 1. Percentage of unqualified quality control in three-year qualitative testing of ECG Monitors, Defibrillators, and Ventilators.

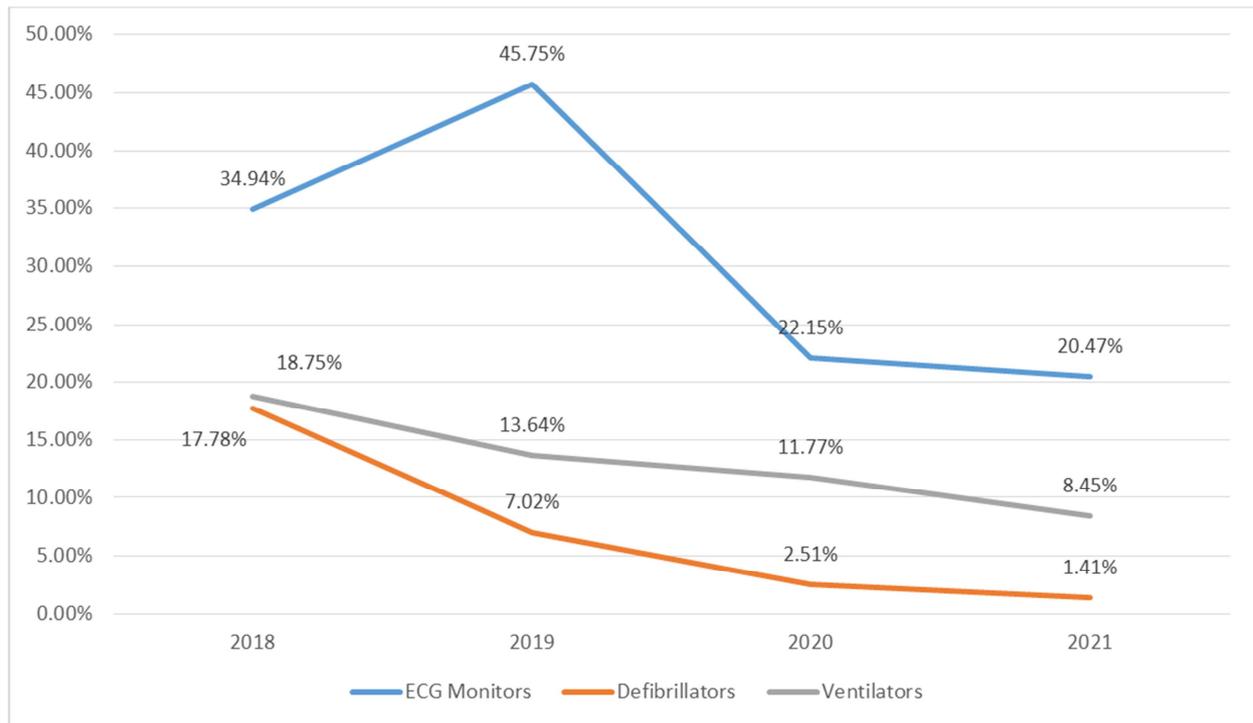


Figure 2. Percentage of unqualified quality control in three-year quantitative testing of ECG Monitors, Defibrillators, and Ventilators.

4.2. Analysis of Unqualified Quality Control of Ventilator and ECG Monitor in Our Hospital from 2019 to 2021

In view of the fact that the brand of invasive ventilators in our hospital is relatively unified, 83% of the ventilators are Dräger, of which nearly 50% of the ventilators have a service life of more than 8 years. In the quantitative test, it was found that the unqualified situation of ventilator was mostly concentrated in knob operation or main switch malfunction, accounting for 5.89% of the total number of ventilators in the hospital. In addition, the output deviation of oxygen concentration is too large, accounting for 2.94% of the total number of ventilators in the hospital. Since the tidal volume of Dräger Savina series ventilator is controlled by the detachable and sterilized exhalation valve and flow sensor, most of the excessive deviations in the output of tidal volume are caused by inaccurate installation or loss of the exhalation valve and flow sensor. Therefore, according to the quality control test of ventilators in our hospital, the performance indicators of Dräger ventilators are relatively stable in most cases where the service life exceeds 8 years. Accessories that need to be replaced due to aging failure are also accepted. The overall performance of the Dräger ventilator is stable and the quality of operation is guaranteed.

The ECG monitors in our hospital are mainly concentrated in three major brands, of which the Philips is mainly used in the operating room, accounting for about 5%. About 38% of the NIHON KOHDEN were purchased before 2014, and about 60% of the Mindray were purchased after 2014. According to statistics, 85% of the unqualified quantitative quality control tests are BSM-73 ECG monitors of the

NIHON KOHDEN. The main problem is that the machine cannot be inflated normally when measuring blood pressure, the heart rate interference is serious, and the blood pressure cannot be measured, all of which are caused by the failure of the multi-function module board. The second is the touch panel failure, which cannot be touched in the lower right corner of the problem. After checking the maintenance records of the NIHON KOHDEN ECG monitor, it is found that the failure rate of the multi-function module and touch panel has increased significantly after the NIHON KOHDEN ECG monitor has been used for 6 years. For example, between August 2019 and December 2021, it has failed and replaced the multi-function module board or touch screen over 10 times. After comprehensive evaluations, our hospital clearly agreed that after the service life of the NIHON KOHDEN ECG monitor reaches 8 years, it will apply for scrapping if there is a fault with high maintenance cost, and at the same time disassemble and retain the fittings in which they are intact for backup.

4.3. Analysis of Quality Control Efficiency of Maintenance Engineers and Engineers of Our Hospital

After statistics and analysis of quality control work data, it was found that the company's maintenance engineers were low in terms of quality control efficiency. Our engineers tested a total of 375 ECG monitors, 204 micro-infusion pumps, and 512 defibrillators from April 2019 to December 2021. The company's maintenance engineers tested a total of 668 ECG monitors, 817 micro-infusion pumps and 133 defibrillators. In view of the difference in the total number of quality controls of the two types of engineers, we refer to the calculation method of the statistical Sharpe ratio. We set the

denominator to 50 and set the sharp ratio by dividing the total number of problems found by the two types of engineers by the total number of their respective quality controls. The resulting analysis shows that the quality control effect of the engineers of our institute is significantly better than that of the company's maintenance engineers.

5. Deficiencies in the Quality Control of Medical Equipment

5.1. There Is a Lot of Room for Improvement in the Quality Control Work Ability of Maintenance Engineers

Under the repeated emphasis of our hospital, although the overall maintenance service company of medical equipment

has recognized the importance of quality control of medical equipment, it has also actively cooperated with the quality control work. However, based on its previous focus of work on "repair, inspection and maintenance", the current maintenance company has not set up an independent quality control working group. Therefore, the medical equipment overall maintenance service company lacks professional medical equipment quality control staff. Moreover, although the recruited engineers have certain medical equipment maintenance capabilities, they have a limited understanding of the functions of the existing medical equipment in the hospital, and it is difficult to form an effective quality control combat effectiveness in a short period of time. Overall, the performance of weak quality control ability. The main problems are listed in Table 4 below.

Table 4. The main problems of quality control ability of maintenance engineers.

Problem category	reason	outcome
Unfamiliar with the principles of some medical equipment	The engineers of the maintenance company have no work experience in comprehensive tertiary hospitals, and their previous work experience is basically a single brand or category of medical equipment maintenance.	Lack of theoretical foundation, do not understand the significance of various parameters and cannot carry out medical equipment quality control work
Unfamiliar with medical equipment operation methods	The engineers of the maintenance company have limited contact areas in the past and they are not familiar with the medical equipment they have not been exposed to but are used in the hospital, and do not participate in the procedures and operation training of the hospital's newly purchased medical equipment.	Without the ability to operate according to procedures and without understanding the "setting, maintenance mode" and other entry methods, it is impossible to carry out the quality control of medical equipment.
Do not understand the management requirements of the top three hospitals in Guangzhou, medical device measurement specifications, etc.	The engineers of the maintenance company have no work experience in the top three hospitals in Guangzhou and lack the awareness to learn the relevant laws and regulations of the industry.	Lack of correct understanding of the importance of medical equipment quality control work, subjective initiative and meticulousness of work, etc. it is difficult to meet the requirements of the hospital.
Conceal or delay the problems found in the process of quality control of medical equipment	The problems found in the quality control test should be noted in the case and submitted to the hospital for archiving, resulting in the maintenance company needing to rectify and incur corresponding manpower and costs.	The problems found in quality control testing may exist for a long time until the hospital staff finds itself or the medical equipment fails, resulting in small hidden dangers in quality control often developing into major failures.

5.2. The Coverage of Quality Control Work Is Limited

According to the requirements of our hospital's *Medical Equipment Risk Assessment and Management System*, the scope of medical equipment quality control should include at least hospital-defined emergency life support medical equipment, namely: ECG monitor, ECG machine, Defibrillator, Ventilator, Anesthesia machine, Gastric lavage machine, Sputum suction machine, Blood oxygen saturation meter, Micro injection pump, Micro infusion pump, and continue to expand according to industry requirements. Due to the limited types of quality control equipment configuration, the quality control work of medical equipment in our hospital currently only expands the quality control work of infant incubators. Therefore, it can be known that the quality control work has not yet achieved full coverage of emergency life support medical equipment. There is still a certain distance from the requirements of institutional management in the hospital. Therefore, it is necessary to further broaden the coverage of quality control work, and strive to include at least the scope of quality control objects

such as Anesthesia machines, Hemodialysis machines, Cardiopulmonary Resuscitation, Intra-Aortic Balloon Pump System, High frequency electrosurgical equipment.

6. Discussion

With the introduction of the overall maintenance service of medical equipment and the support of the company for manpower, quality control equipment and management platform, the quality control of medical equipment in our hospital has been improved, and the safety and effectiveness of medical services have been effectively guaranteed [21-22]. However, limited to various factors, there is still room for continuous improvement in the quality control of medical equipment in our hospital:

- (1) Set up a quality control working group with hospital engineers as the core. Due to quality control skills, work responsibility, maintenance costs and other reasons, the engineers of the overall medical equipment maintenance service company help the hospital to broaden the scope of quality control work, but its quality control efficiency

is indeed insufficient, so it is recommended to set up a quality control working group with hospital engineers as the core, designate special personnel to coordinate the quality control work, and responsible for formulating work plans, carrying out quality control testing, supervising the quality control quality of maintenance engineers, etc.

- (2) Increase investment in quality control equipment and personnel training. We should continue in-depth communication with the overall maintenance service company of medical equipment, publicize the quality control of medical equipment, and strive to increase "quality control" as one of the focuses on the basis of the initial strategic focus of "repair, inspection, and maintenance". At the same time, we should take the initiative to connect with relevant institutions such as local quality supervision agencies, third-party testing agencies, and quality control equipment companies. We should also strengthen the standardized training of the skills of the quality control staff, so that the staff can effectively find and solve the operation quality problems in the quality control process.
- (3) Strengthen the combination of medical treatment and industry, and scientifically optimize the content of quality control. Compared with manufacturer engineers, or enterprise quality control engineers, clinical medical engineers work and serve in the clinic and have a better understanding of the risks of medical equipment in clinical applications. Through clinical practice and exploration, as well as continuous exchanges and discussions with professional engineers, such as manufacturer engineers, enterprise quality control engineers, and metrology engineer of quality supervision institute, they adjust, optimize and formulate scientific, feasible and clinical requirements of medical equipment quality control testing content, combined with the actual needs of clinical medical personnel for the operating parameters and quality of medical equipment in diagnosis and treatment.
- (4) Obtain relevant qualifications for quality control and prepare for the establishment of regional quality control centers. In the implementation of quality control work, we should fully summarize the practical experience, at the same time, a hospital plans to strive to declare a domestically recognized and internationally recognized CNAS laboratory according to the technical team building, quality control equipment configuration, quality control specifications, etc., and take this as an opportunity to prepare for the establishment of a regional quality control center with our hospital as the main body and radiation Panyu District medical institutions, thereby improving the quality of medical equipment operation in the whole region.

7. Conclusion

The overall maintenance service of medical equipment can

quickly provide support for manpower and some quality control equipment, so that the quality control of medical equipment can be carried out as soon as possible, and the unqualified rate of medical equipment quality control has decreased year by year. However, due to the overall weak quality control ability of maintenance engineers and the limited coverage of quality control work, there is still a lot of room for improvement, which needs to be explored and practiced by the majority of medical and engineering colleagues.

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