SHORT COMMUNICATION

Nursing Management Strategies to Improve the Qualified Rate of Clinical Microbial Specimens

Hongmei Chen [1], Hui Cong [2]

[1] Vip Ward, Affiliated Hospital of Nantong University, Nantong, China
[2] Department of Laboratory Medicine, Affiliated Hospital of Nantong University, Nantong, China

SUMMARY

Background: The purpose of clinical microbiology testing is to provide important information for clinical diagnosis and treatment. The correct collection, processing, and transportation of specimens are the key to the success of clinical microbiological examination.
Methods: Retrospective analysis was done on the composition and causes of unqualified microbial samples submitted by clinical departments from 2019 to 2020 at the Affiliated Hospital of Nantong University. The solutions were proposed from the perspective of nursing management.
Results: In 2019, the hospital received 64,244 clinical microbial specimens. The unqualified rate of samples was 8.96%, of which the unqualified sputum accounted for 84.74%. After strengthening the communication with the medical laboratory, increasing publicity and training, and improving the information system and other auxiliary monitoring functions, the unqualified rate of clinical microbial specimens was reduced to 6.05% in 2020.
Conclusions: Continuously improving the theoretical and practical abilities of nurses can reduce the unqualified rate of samples.

Correspondence:
Hui Cong
Department of Laboratory Medicine
Affiliated Hospital of Nantong University
20 Xisi Road
Nantong 226001
China
Email: huicjs@163.com

INTRODUCTION

The purpose of clinical microbiology testing is to isolate, culture, and identify the specimens collected from the human body, so as to provide important information for clinical diagnosis and treatment. The correct collection, processing and transportation of specimens are the key to the success of clinical microbiological examination, in which nursing staff play an important role [1,2]. This study analyzed a total of 125,414 microbial specimens submitted by clinical departments at the Affiliated Hospital of Nantong University from 2019 to 2020. The composition and causes of unqualified specimens were analyzed, and countermeasures were put forward from the perspective of nursing management, in order to improve the quality of submitted specimens, reduce the rate

of unqualified specimens, improving correct clinical diagnosis and timely treatment of patients.

MATERIALS AND METHODS

Sample source
A total of 64,244 microbial specimens were submitted by the Affiliated Hospital of Nantong University from January to December 2019, and a total of 61,170 microbial specimens were submitted in the whole year of 2020.

The study was approved by the Ethics Committee of the Affiliated Hospital of Nantong University (2022-K057-01). Because we only retrospectively accessed a de-identified database for purposes of analysis, informed consent was not required by the Ethics Committee of the Affiliated Hospital of Nantong University.

Screening criteria
Unqualified specimen judgment criteria: 1) The test barcode was not attached, and the specimen type was inconsistent with the specimen type formulated by the barcode. 2) In terms of specimens submitted for examination: 1) Specimens were placed in unsuitable containers or open containers, containers with cracks, and unsuitable media for bacterial/anaerobic culture, such as sputum, midstream urine, wound secretion, throat swab, vaginal secretion, oral and nasal secretion, feces, bronchial lavage fluid, and open specimens. 2) The specimens were mixed with fixative or preservative or other foreign interference, such as sputum culture specimens mixed with rice residue and vegetable leaves; Saliva or direct smear WBC < 25/HP and epithelial > 25/HP; 3) Routine bacteriological examination of specimens over 2 hours or at 4°C for more than 24 hours or suspected cold sensitive Neisseria gonorrhoeae, Neisseria meningitidis, Haemophilus influenzae infection specimens refrigerated transport. 4) Specimens not suitable for bacterial culture due to other reasons.

Statistical analysis
SPSS 13.0 was used for statistical analysis. The unqualified rate of microbial specimens was tested by χ^2 test. p-values less than 0.05 were considered to be statistically significant.

RESULTS

Unqualified rate of specimens
A total of 64,244 microbial specimens were submitted to our hospital in 2019. According to the above screening criteria, the number of unqualified specimens was 5,759, and the unqualified rate was 8.96%. A total of 61,170 microbial specimens were submitted to our hospital in 2020, and 3,703 were judged to be unqualified, with an unqualified rate of 6.05%.

Classification of unqualified reasons
In this study, the causes of unqualified specimens were classified into the following categories: saliva and sputum, specimen contamination, specimen type inconsistency, specimen volume inconsistency, incorrect container use, unclear bar code, repeated bar code, withdrawal of medical advice, etc. Among the 5,759 unqualified specimens in 2019, unqualified sputum accounted for 84.74% (4,880/5,759), followed by contaminated specimens accounted for 14.27% (822/5,759). The specific reasons for the unqualified classification and constituent ratio are shown in Table 1. Among the 3,703 unqualified specimens in 2020, unqualified sputum accounted for 80.10% (2,866/3,703) followed by contaminated specimens (19.44%, 421/3,703), and the specific reasons for unqualified classification and constituent ratio are shown in Table 2.

Composition of unqualified specimens
The types of specimens sent to the microbiology laboratory include sputum, urine, blood, secretions, pleural fluid, ascites, and others. In 2019, the highest failure rate was 32.19% for sputum samples, and the lowest failure rate was 0.06% for pleural effusion samples (Table 3). In 2020, the unqualified rate of sputum samples dropped to 22.90%, and the unqualified rate of pleural effusion and ascites samples remained the lowest at 0.05% (Table 3).

DISCUSSION

Among the indicators reflecting the level of diagnosis and treatment and service quality of a hospital, the accuracy and timeliness of the analysis results of the laboratory medicine department are one of the key points, which rely on the cooperation of clinical doctors, nurses, laboratory personnel and patients to achieve the quality control of the whole process of laboratory medicine. Quality control before analysis is the weakest link, which has many influencing factors and involves a wide range of personnel [3]. It has been noted in the literature that a significant proportion of preanalytical errors are associated with clinical nursing work [4]. Therefore, whether the nurses can standardize the collection of specimens, submit specimens in time, and do a good job in the promotion and education of patients is an important link in doing a good job in pre-analysis quality assurance. In this study, the unqualified sputum accounted for 84.74% of the 5,759 unqualified samples in 2019. Most of the body fluid specimens such as sputum were collected by the patients themselves. Perhaps the medical staff did not explain clearly to the patients before specimen collection, or the patients and their families had limited education levels and did not fully understand it, and perhaps the medical staff lacked relevant knowledge, which caused the patients to collect sputum specimens at will. Aseptic procedures were not strictly followed or body fluid samples were not collected from appropriate parts. In addition, the delivery of specimens by nursing

Table 1. Classification and constituent ratio of unqualified microbiological specimens.

Reasons for unqualified specimens	Unqualified samples (n)	%
Saliva sputum	4,880	84.74
Protected specimen brush	822	14.27
Specimen type discrepancy	21	0.36
Specimen volume discrepancy	11	0.19
Container usage error	12	0.21
Bar code not clear	2	0.03
Bar code duplication	5	0.09
Doctor's orders have been discontinued	6	0.10

Table 2. Classification and constituent ratio of unqualified microbiological specimens in 2020.

Reasons for unqualified specimens	Unqualified samples (n)	%
Saliva sputum	2,866	80.10
Protected specimen brush	421	19.44
Specimen type discrepancy	5	0.14
Specimen volume discrepancy	2	0.05
Container usage error	3	0.08
Bar code not clear	1	0.03
Bar code duplication	2	0.05
Doctor's orders have been discontinued	4	0.11

assistants and the implementation of barcode printing procedures by nursing staff also led to specimen contamination or the false increase in the time of submitting some specimens after collection.

Strengthen the communication with the medical laboratory department
Pre-analytical quality control is the first step and key link in the quality management of the medical laboratory, which is particularly important in the field of microbial laboratory, because it affects the subsequent analysis of test results and the judgment of disease diagnosis and treatment. In order to ensure that the collected clinical specimens can meet the requirements of microbiological detection, medical laboratory staff often communicate with clinical doctors and nurses. As nursing workers, they should actively cooperate and inform the process of specimen retention, and assist the medical laboratory staff to judge the results. We found that through tele-phone communication between the medical laboratory staff and the nursing staff, the network notification of unqualified specimens, and informing the nursing staff of the reasons for unqualified specimens, the clinical recognition was obtained and the recurrence of the same type of errors was avoided.

Increase publicity and training
Nursing workers must undergo systematic training and education to enhance clinical practice skills, improve professional quality, standardize behavior and operation, so as to promote the improvement of medical quality. In addition to the training and assessment of newly recruited nurses by inviting medical laboratory experts, we also strengthened the promotion of the clinical specimen Collection Manual written by the medical laboratory department, and conducted face-to-face discussions with the staff of the medical laboratory department, analyzed the unqualified specimens that may be caused by nursing staff in each department, and carried out continuous improvement. Through the above measures, the unqualified rate of samples was reduced to 6.05% in 2020.

Improve the auxiliary monitoring function such as information system
The information system plays an important role in nursing management and greatly improves the efficiency of management [5]. In addition to manual monitoring, we also communicate and cooperate with the information department and the medical laboratory department. We set up the overdue alarm function in the nursing workstation to reduce the time difference between bar code execution and specimen collection, so as to truly reflect the time of specimen collection and submission. Improve the function of hospital information system, so that unqualified specimens can also be reflected in HIS (hospital information system). It is suggested that the accuracy of specimen submission should be included in the performance evaluation index of clinical departments, so as to strengthen the attention of clinical nurses to specimen retention and submission.

While the results of this study indicate the importance of training for the eligibility of microbiological specimens, there are limitations. One limitation is that this study is a single-center study and is not representative of all hospitals, because data from other hospitals are not accurately available. Another limitation is the limitation of specimen inclusion, which does not include all clinical specimens, such as blood routine test specimens.

In summary, effective and correct sample collection is essential for the results of clinical microbiology testing, which requires the participation of clinical doctors, medical laboratory personnel, and patients. By strengthening the training of medical staff and guiding and helping patients to correctly obtain specimens, the unqualified rate of microbiological test specimens can be significantly reduced. Comparing the statistical results of our hospital in 2019 and 2020, it can be seen that the unqualified rate of specimens decreased by 1.19%. Therefore, it is neces-

Table 3. Classification and constituent ratio of unqualified microbiological specimens from 2019 to 2020.

Specimen type	2019			2020			χ^2	p-value
	Number of specimens	Unqualified samples (n)	Reject ratio (%)	Number of specimens	Unqualified samples (n)	Reject ratio (%)		
Sputum	15,160	4,880	32.19	12,952	2,966	22.90	299.603	< 0.001
Urine	7,294	694	9.51	7,581	279	3.68	206.992	< 0.001
Blood	14,380	144	1.00	25,165	428	1.7	31.399	< 0.001
Secreta	3,029	31	1.02	3,230	21	0.65	2.644	0.125
Chest and abdominal fluids and other sterile body fluids	6,964	4	0.06	6,312	3	0.05	0.062	0.000
Others	1,460	6	0.41	5,930	6	0.10	6.935	0.018

sary to pay attention to the role of nursing staff in clinical specimen collection in the future, continuously strengthen training, improve the theoretical and practical ability of nursing staff, and reduce the unqualified rate of specimens.

Declaration of Interest:
The authors report no competing financial interests.

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