

Process and Specification for Collecting Nasal and Throat Swab Specimens from Hospitalized Patients with Novel Coronavirus Infection in the Department of Infectious Diseases

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Abstract. The rapid spread of the novel coronavirus around the world has caused a large number of cases of novel coronavirus pneumonia that are rare in human history. The detection of the novel coronavirus is the key link to preventing and controlling the epidemic of the novel coronavirus, so the establishment of nasal and throat swab specimen collection process, mastery of the relevant rules and regulations for the collection of novel coronavirus pneumonia, standardization of nasal and throat swab specimen collection operating procedures, and standardized patient management are the keys to controlling the spread of coronavirus pneumonia. Literatures about novel coronavirus 2019 were searched by the Web of Science database. A total of 556 English literatures were collected. Using VOSviewer software to extract keywords, and conducting the cluster analysis and knowledge mapping. This study describes in detail the basic methods, standard procedures and basic steps for collecting nasal and throat swab specimens from patients infected with novel coronavirus infection, as well as the precautions and common problems of throat swab specimen collection in novel coronavirus infection samples. Finally, the main ways and prospects for the prevention of respiratory infectious diseases are proposed. This study is of great significance for the prevention and control of the rapid spread of novel coronavirus pneumonia.

Keywords: coronavirus infection; nasal and throat swabs; specimen collection; process; specification.

1. Introduction

Corona Virus Disease 2019 (COVID-19) is pneumonia caused by infection with the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) [1]. A case of pneumonia of unknown cause appeared in Wuhan in December 2019. Subsequently, several patients with pneumonia of unknown cause appeared in Wuhan. In January 2020, the pathogen was preliminarily judged to be the new coronavirus [2], and since then, the novel coronavirus pneumonia has ravaged the world, seriously affecting social stability and posing a major threat to people's lives and bodies [3-4]. The new coronavirus can be transmitted through droplets, contact and fecal oral, and the population is generally susceptible to infection, and the elderly and people with underlying medical conditions are more seriously ill after infection [5]. The number of infections has risen rapidly and continuously, the spread of novel coronavirus in China and other countries has caused the emergence of tens of thousands of cases of novel coronavirus pneumonia [6-7]. It is included in the category b infectious diseases stipulated in the law of China on the Prevention and Control of Infectious Diseases as an acute respiratory infectious disease, and the prevention and control management of category a infectious disease is implemented. The current gold standard for confirmed novel coronavirus infection is the Real-time fluorescence RT-PCR of respiratory or blood samples is positive for novel coronavirus nucleic acid [8-9]; Viral genetic sequencing from respiratory or blood specimens that is highly homologous to known novel coronaviruses.

The quality of respiratory specimens is the key to the diagnosis of novel coronavirus infection, and the virus is highly contagious and there are many unknowns [10-11], such as irregular collection, the process of collecting specimens is a good infection condition, which can easily lead

to cross-infection of patients and infection of medical staff [12]. Therefore, specimen collection from patients suspected of being infected with the novel coronavirus infection must be completed only after a professionally trained medical staff has passed the assessment [13]. When detecting the novel coronavirus nucleic acid, it is necessary to collect nasal and throat swab specimens, which is one of the important tasks [14]. To ensure that many links from the collection object of nasal and throat swab specimens to the method of collecting specimens, collection personnel and materials, environmental preparation and precautions to the submission and separation of nasal and throat swab specimens strictly meet the requirements [15-16], it is necessary to establish the nasal and throat swab specimen collection process, master the relevant rules and regulations of new crown pneumonia collection, standardize the operation procedures for nasal and throat swab specimen collection, which is one of the keys to achieving early diagnosis, standardizing patient management and controlling the spread of the disease.

2. Materials and Methods

The process of collecting nasal and throat swab specimens from samples of novel coronavirus infection is very important. Sample collection should be carried out in fever clinics or isolation wards for suspected cluster cases, confirmed patients for re-examination, fever outpatients and others who need to diagnose or differential diagnosis of novel coronavirus infection. We insert a plastic rod swab with a polypropylene fiber head into the nasal palate of the inner nasal passage of the person being collected, stay for 15~30 s, rotate 3~5 times, and slowly turn and exit. We put the plastic rod swab of the polypropylene fiber head into sterile normal saline to moisten, cross the base of the tongue to the pharyngeal isthmus with the assistance of a tongue depressor, wipe the bilateral pharyngeal tonsils and posterior pharyngeal wall at least 3 times, and avoid touching the tongue and oral mucosa when taking out. After specimen collection, the swab head is immersed in a tube containing 2~3 ml of virus preservation solution, the tail is discarded, the tube cap is screwed tight, and the sampling tube indicates the patient's name, sample type, sampling time, number, and other basic information.

Specimen collectors must be trained by the Hospital Infection Control Department and the Nursing Department's Skills Training Expert Group before taking up their posts. Specimen collectors are equipped with protective equipment in accordance with tertiary protection [8], including protective clothing, disposable work caps, medical protective masks (N95), goggles, face shields, double gloves and shoe covers. It is necessary to be equipped with facilities to prevent the spread and infection of pathogenic microorganisms, such as garbage cans for handling organisms, disinfectants and equipment for handling emergency accidents, and certain ventilation conditions. Determine whether throat swab sampling is required according to medical advice, isolate suspected or confirmed cases of new coronary pneumonia immediately, and conduct medical observation of other people who have been in contact.

Bibliometric analysis method was used in this study. Many literatures about novel coronavirus 2019 were searched by the Web of Science database. A total of 556 English literatures were collected. Using VOSviewer software to extract keywords, and conducting the cluster analysis and Knowledge mapping.

3. Results

3.1 Bibliometric Analysis

A total of 556 English studies were included. The top five keywords were COVID-19 (171 times), children (72 times), streptococcus-pneumoniae (55 times), disease (50 times) and diagnosis (50 times). Cluster analysis was performed on keywords with a frequency of more than 25 times (Figure 1), and 246 keywords were clustered into five categories, indicating that there are five main research hotspots in the collection of specimens of COVID-19 in English. The first cluster included

According to the regulations, it is put into a special refrigerator and immediately sent to the regional prevention and control center for further testing by special personnel and special vehicles. All above process are shown as Figure 2.

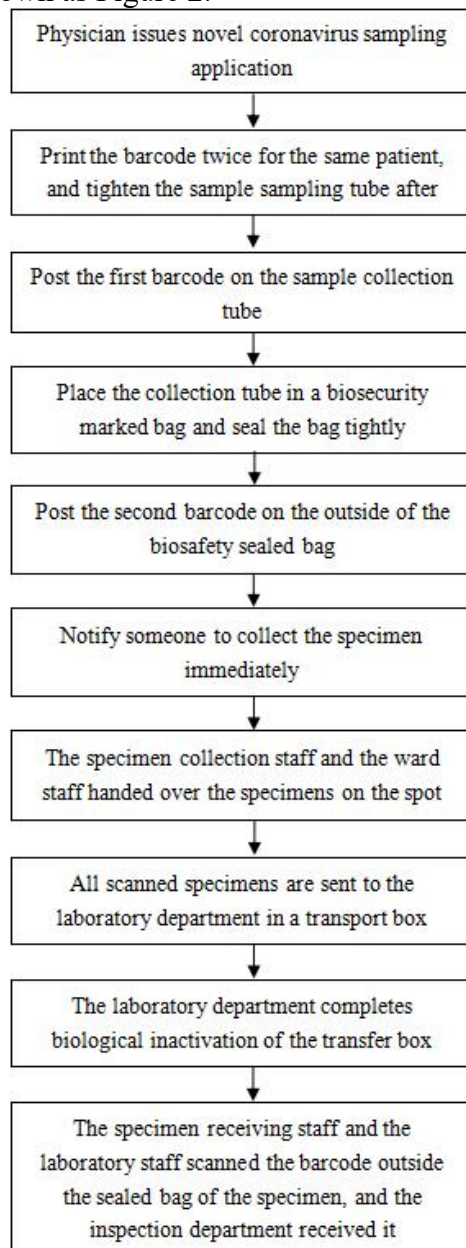


Fig. 2 Flow chart of specimen collection and inspection of novel coronavirus

3.3 Attention Matters for Collecting Specimens

The collection personnel must undergo strict training by professionals and pass the assessment before they can take up their posts.

Specimen collection, preservation, and transportation should pay attention to the principle of aseptic operation to prevent specimens from being contaminated, and standard prevention should be done. Ensure the qualification and validity of collected specimens and the safety of sending them for detecting.

When collecting specimens, the collector needs to maintain a close distance from the patient. During the operation, most patients will be intolerable, cough, nausea, vomiting due to pharyngeal discomfort, and the droplets splashed by patients and their vomit will pose a huge risk of virus exposure to medical staff, so medical staff must wear face shields, surgical gloves, and membrane gloves before collection.

When collecting specimens, the direction and distance of the patient's seat can be adjusted appropriately, and the patient's face can be instructed to face diagonally rather than directly facing the medical staff.

Eye-to-heart contact is required during communication to ensure the safety of patients and medical staff themselves and the people around them.

3.4 Temperature Condition

The preservation of throat swab specimens of new coronavirus infection samples after collection must strictly grasp the temperature and time of storage. And the temperature in the specimen box during the process of sending them to the detection is kept at about 4 °C to ensure that qualified specimens are sent to the CDC so that the success rate and preservation rate of specimen collection reaches 100% of timely testing.

4. Discussion

In the future, the task of preventing respiratory infectious diseases has a long way to go, so the training of medical staff to strengthen the collection of throat swab specimens cannot be interrupted, and the quality of throat swab specimen collection should be improved, and at the same time, international cooperation and exchanges should be continuously strengthened, and drill training and assessment should be enhanced [17]. Historically, respiratory infectious diseases have brought too painful lessons to the world, such as SARS, H1N1 influenza, H7N9 influenza, African Ebola virus, COVID-19, so the global joint response to the epidemic of respiratory infectious diseases has become inevitable.

Strengthen the treatment and nursing of respiratory infectious diseases, carry out systematic care and education from disease health education, specialized disease nursing guidelines, and basic nursing implementation to psychological nursing intervention, daily life, and personal hygiene. Strengthen the implementation of disinfection and isolation measures and the standardization of various diagnosis and treatment technical operations, prevent cross-infection, establish an integrated medical and nursing ward rounds mechanism, and provide patients with high-level, high-quality integrated nursing [18]. At the same time, medical staff should follow up forward-looking knowledge promptly, improve professional quality, and complete each operation technique in accordance with regulations and standard procedures. With the rapid development of the information age, the nursing concept should be updated in time, and China's nursing industry should take the path of innovative nursing development.

Conclusion

The impacts of various prevention and control measures on the spread of COVID-19 was discussed, and the results showed that the most effective prevention and control measures are, in order, reducing person-to-person contact, strengthening the tracing and isolation of close contacts, and increasing testing and treatment capacity to enable infected people to be isolated and treated as soon as possible. According to the "Novel Coronavirus Pneumonia Prevention and Control Plan", each suspected case of novel coronavirus pneumonia and cluster case must collect acute respiratory specimens for nucleic acid testing.

The new coronavirus nucleic acid detection takes a long time, about 4~6 h to get the result, and there are clear requirements for the quality of the specimen. The accuracy of sampling site was 100% and the one-time success rate of swab insertion was more than 95% in the examination results of nasopharyngeal swab specimen collection and operation skills. According to the common problems in the clinical collection of nasopharyngeal swabs, the questionnaire was designed to record the patient's discomfort, and the results showed that the incidence of pain was 12.6%, the

incidence of cough was 3.1%, the incidence of sneezing was 7.3%, and the incidence of nosebleeds was 1.2%.

The Department of Infectious Diseases should enhance the availability of hospital throat swab specimen collection, expand the scope to improve the quality of specimen collection, expand the scope of training for medical staff in various departments, carry out hospital-wide monitoring and collection, unify the collection process and normative standards, improve the respiratory tract infectious monitoring system in the hospital.

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