

How to Prevent Nosocomial Infection for Emergency and Confine Operations during COVID-19 Pandemic? Experience from China

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Abstract

Novel coronavirus, emerging in Wuhan City of China since December 2019 [1], has spread to more than 200 countries worldwide with serious epidemic situation so far [2]. The World Health Organization (WHO) has named this virus as 2019-novel coronavirus (2019-ncov) and the pneumonia caused by 2019-ncov as Corona Virus Disease 2019 (COVID-19) [3]. The characteristics of COVID-19 are diverse modes of transmission, strong transmission force with high speed and difficulty to be prevented and treated, which has been a great threat to the safety of human life [4]. The hospital is a pivotal place in the prevention and control of COVID-19. During the COVID-19 pandemic, there are many patients who need emergency surgeries or confine operations. In order to save these patients' lives, the operations must be performed in time, however, nosocomial infection must be avoided simultaneously. In this study, the management flowcharts of emergency surgery and confine operation were developed, and protective measures were strictly implemented to ensure the safety of patients and medical staffs and avoid the occurrence of nosocomial infection.

Keywords: Nosocomial Infection; Corona Virus Disease 2019 (COVID-19); 2019-Novel Coronavirus (2019-ncov)

The management flowchart of emergency operations

Emergency operations refer to the patients with serious condition, who need operations immediately to save their organs and lives. The management flowchart of emergency operations was shown in figure 1.

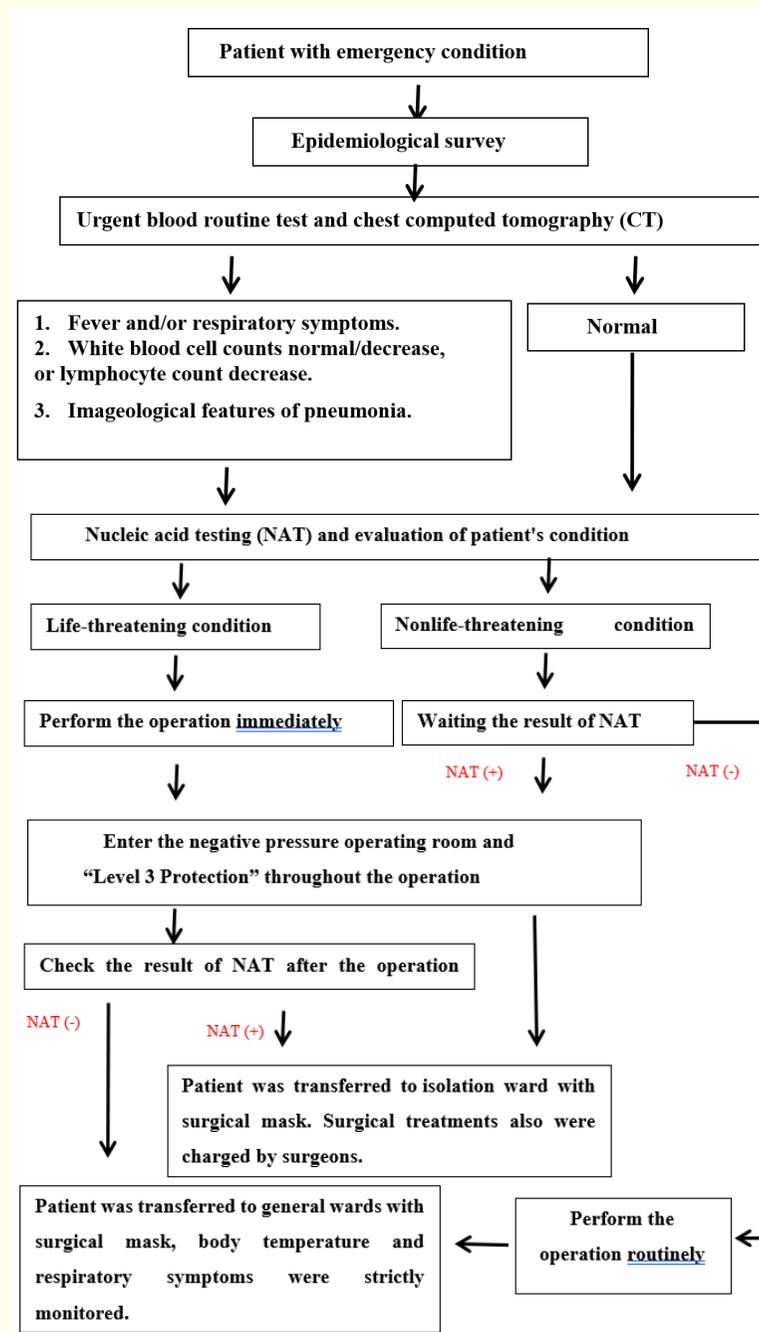


Figure 1: The management flowchart of emergency operations.

The management flowchart of confine operations

Confine operations refer to the operation time can be chosen, but can't delayed too long, for example, malignant tumour radical resection. The management flowchart of confine operations was shown in figure 2.

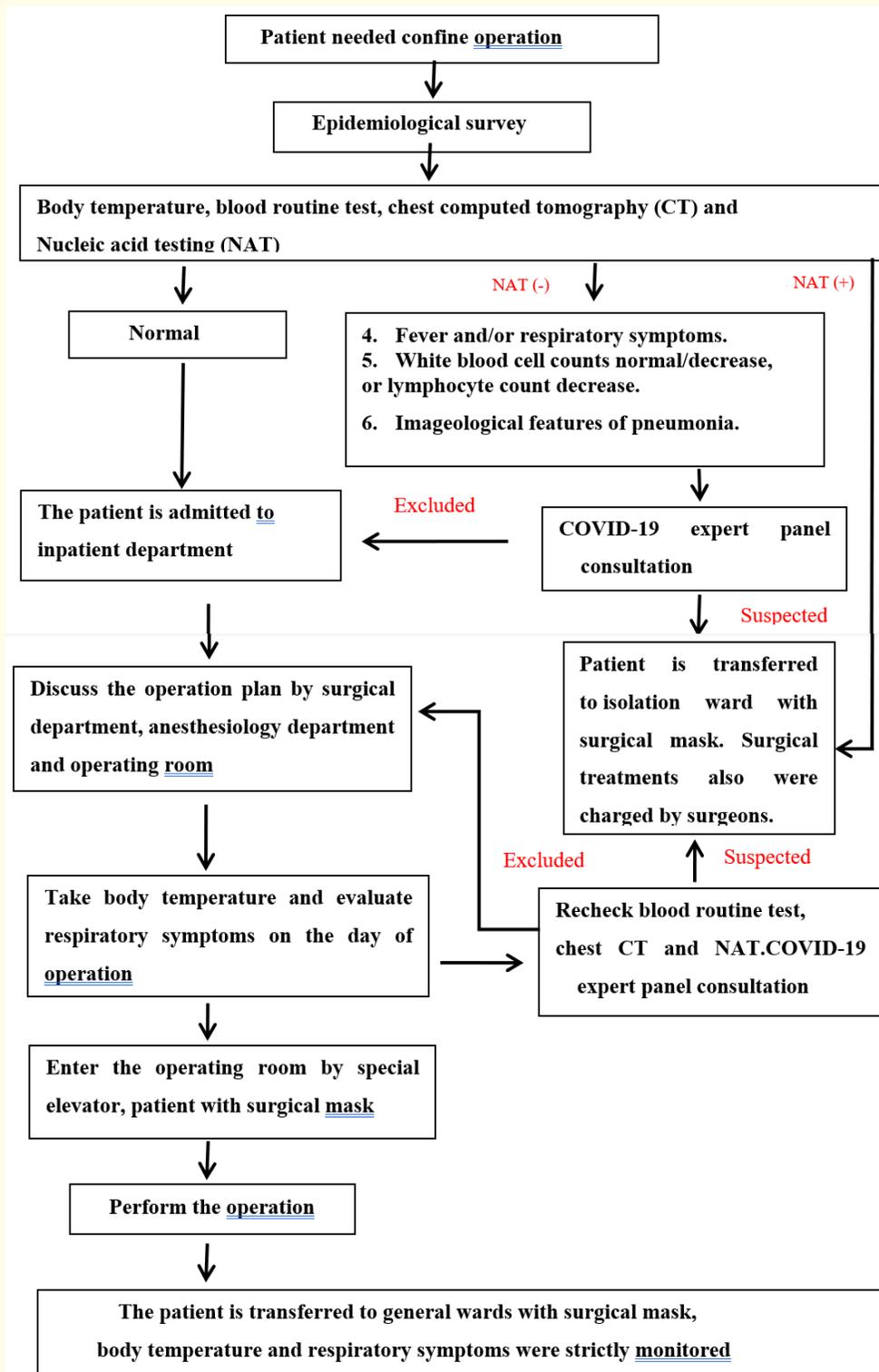


Figure 2: The management flowchart of confine operations.

Protective measures in operation for suspected or confirmed COVID-19 patients

Preoperative protection

The operations are arranged to be performed in independent negative pressure operating rooms [5,6]. The “COVID-19” mark was hung on the operating room door. The operation was strictly prohibited to be visited. Disposable dressings are prepared for the operations. Two circulating nurses are arranged in the indoor and outdoor areas respectively. The indoor circulating nurse obey and complete the duties of circulating nurse and are not permitted to leave the operating room during the operation. The outdoor circulating nurse stay outside of the buffer room and is responsible for taking special items needed for the operation, such as high-value consumables, blood products, etc. Once these items are placed in the buffer room, the outdoor circulating nurse should leave immediately. After the door of the buffer room is closed, the indoor circulating nurse can enter the buffer room to take needed items. The laminar flow of operating room is switched to “negative pressure” and the absolute value of negative pressure should be greater than 5 Pa 30 minutes before the operation. The filter net of air outlet is sprayed with 2000 mg/L chlorine-containing disinfectant and the filter net was soaked with 5000 mg/L chlorine-containing disinfectant for 1 hour after the operation or renewal the filter net. Special surgical transfer beds which are better if using negative pressure kind, are used to transfer patients by special path to the negative pressure operating room. Special surgical transfer beds were marked with “COVID-19” and sterilized with 5000 mg/L chlorine-containing disinfectant. Patients should wear surgical masks throughout the transfer process [7]. Medical staff and workers should wear surgical masks, protective clothing, protective face shield, protective glasses, gloves, shoe covers [8]. In order to maintain the indoor negative pressure, patients and medical staffs can enter the negative pressure operating room only when the first moving door of the buffer room is completely closed.

Intraoperative protection

Medical staffs must strictly implement three-level protective measures. Anesthesiologists and circulating nurses should wear disposable protective clothing, protective shoes, surgical masks, protective glasses, protective face shield, double gloves. Surgeons and instrument nurses should wear disposable protective clothing, protective shoes, protective glasses [9]. After scrubbing hands, surgeons and instrument nurses wear sterile surgical gown and gloves. During the general anesthesia, disposable filters should be placed between the endotracheal tube and the ventilator circuit to prevent the contamination to the respiratory circuit [10]. Due to the protective equipment, the accuracy and sensitivity of medical staffs’ visual, auditory and tactile ability are greatly reduced, which have impaction on the accuracy of operative manipulation and increase the risk of occupational exposure. Therefore, the following measures should be taken for occupational protection: ① Making a clear identification for every medical staff to facilitate effective communication; ② Reducing the manipulation speed, such as venipuncture, transfer instruments, etc. so as to avoid contamination caused by spattering blood and body fluids, as well as needle injury. ③ Using non-contact methods to transfer sharp instruments.

There should be three negative pressure suction devices during the operation. The first one was used for anesthesia sputum’s suction to minimize the diffusion of respiratory secretions to the air. The second one is used to suck the blood and washing fluid intraoperatively. The last one was used to suck a large number of aerosols produced by high frequency electro tome, for this kind of aerosol is easy to suspend in the air for a long time which do great harm.

Postoperative protection

After the operation, the surgical staffs remove the disposable surgical gowns, outer gloves, shoe covers and throw them into the double layer medical garbage bag in the negative pressure operation room, then after walk into the buffer room to wash hands, take off disposable protective clothing, protective shoes, protective glasses, gloves, etc. and put them into the double layer medical garbage bag. The protective glasses are put into the 10000 mg/L chlorine-containing disinfectant, soaked for 30 minutes and then rinsed by clean water.

All the intraoperative instruments are sprayed the moisturizer after the operation and placed in a double layer medical garbage bag. The medical garbage bag was sprayed with 5000 mg/L chlorine-containing disinfectant and placed into another medical garbage bag with "COVID-19" label [11,12]. These medical garbage bags are collected by the disinfection center immediately and conducted further disinfection and sterilization management. 5000 mg/L chlorine-containing disinfectant was used to wipe the surface of instrument tables, equipment, operation table, floor, switches, doors, wall, etc. then using clean water to wipe after 30 minutes [13]. The surface of special surgical transfer beds was also sterilized with 5000 mg/L chlorine-containing disinfectant and the mattresses are disassembled and sterilized with ultraviolet light for 30 minutes. The pathological specimens are fixed with 10% formalin in the negative pressure operation room. The pathological specimen bags are sealed and placed in a double layer medical garbage bag. The medical garbage bag was sprayed with 5000 mg/L chlorine-containing disinfectant and placed into another medical garbage bag with "COVID-19" label. The pathological specimens are sent to pathology department by special medical worker immediately.

The laminar flow is closed after the operation, and the air was sterilized by 3% hydrogen peroxide spray according to the criteria of 20 ml/m³ and restarted after 2 hours. The negative pressure operation room can be reused only when the continuous monitoring results of the object surface and air samples are qualified for 3 days.

Conclusion

The outbreak of COVID-19 is a worldwide disaster. The prevention of nosocomial infection in operating room play a vital role in the control of nosocomial transmission. Scientific procedures and effective disinfection measures can save patients' lives and protect medical staffs avoiding nosocomial cross infection. Therefore, we summarize and establish these flowcharts and strategies, which may provide some hints for medical staffs and hospital administrators in the management of emergency and confine operations during COVID-19 pandemic. However, the experience summarized in this paper has some shortcomings due to the pressing time, different medical management characteristics, the changing epidemic situations, etc. also look forward to further improvement in the future.

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Appendix

COVID-19 epidemiological questionnaire

Name: Gender: Male/Female ID number: Tel:

1. Have you had any fever in the past 14 days? Yes No
2. Have you had any respiratory symptom in the past 14 days? Yes No
3. Have you had any breathing difficulty in the past 14 days? Yes No
4. Have you been to epidemic areas in the past 14 days? Yes No
5. Have you ever left this locality for another place in the past 14 days? Yes No

6. Have you come back to this locality from other places in the past 14 days? Yes No
7. Have you had any contact with confirmed COVID-19 cases in the past 14 days? Yes No
8. Have you had any contact with suspected COVID 19 cases in the past 14 days? Yes No
9. Have you had any contact with any person from epidemic areas in the past 14 days? Yes No
10. Have you had any contact with patients with fever in the past 14 days? Yes No
11. Have you had any contact with patients with cough in the past 14 days? Yes No
12. Have you taken any public transportation in the past 14 days? Was there anyone with fever and cough? Yes No
13. Is there any family member or surrounding people with fever or cough? Yes No
14. Is there any family member or surrounding people who has been diagnosed confirmed/suspected COVID-19 case? Yes No
15. Signature: Date:

Authors Contribution

Both Heng Zhang and Hui Cai have the same contribution to the article.

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