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Optimizing response in surgical systems during and after COVID-19 pandemic: Lessons from China and the UK – Perspective

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1. Background

Coronavirus (COVID-19) that was first detected in China presented in the beginning with a series of pneumonia cases. This virus has now been detected in more than 100 locations internationally [1]. Most recently, the focus of the attention has moved away from Mainland China and the World Health Organization (WHO) has recognised Europe as the new epicenter of the outbreak [2]. We are seeing the tragedy in Italy and Spain and fast spreading in the US, creating havoc around the world. Healthcare workers including doctors, nurses, and anesthesiologists, and health care support workers are on the front line of caring for patients with confirmed or possible infection with COVID-19, and have a high risk of exposure to this virus because of shortages of personal protective equipment (PPE) in many countries [3]. It has been challenging to protect health-care workers from exposure and the effectiveness of PPE for health-care workers who take care of patients infected with the COVID-19 is unclear [4]. Reports from China and Italy alarm us that we need to improve safety in all possible aspects during clinical care [5,6]. As of 17 February 2020, six health-care workers have died from the COVID-19 in China and more than 1700 have been infected. Similarly at least 15 deaths are reported amongst the health-

care professionals in the UK. The surgical system faces many difficult questions, in this sense; the experiences from China and the UK may represent an opportunity for the other countries to plan for adequate measures in surgical system.

1.1. Develop triage strategies in the surgical system

The triage strategy to keep surgical staff out of clinic and decrease exposure when they are not needed is a key protocol. China has learned important lessons from the Severe Acute Respiratory Syndrome (SARS) in 2003. One effective measure in China was the establishment of fever clinics for confirmed and suspected patients [7]. Isolated wards and buildings (when possible) need to be set up to place newly admitted confirmed and suspected patients. In this early phase of the coronavirus pandemic, propagation of nosocomial infections lead to increased out-patients visits occurred in multiple clinics of Wuhan city. Against this background, national triage strategies to screen for COVID-19 were developed. Normally, fever clinic is not mandatory for patients with any acute respiratory symptoms or fever in China. During the epidemic, in order to minimize unnecessary clinics and hospitals patient visits, fever clinics are set up by repurposing existing ones in dedicated

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Flow chart for emergency outpatients during COVID-19 epidemic

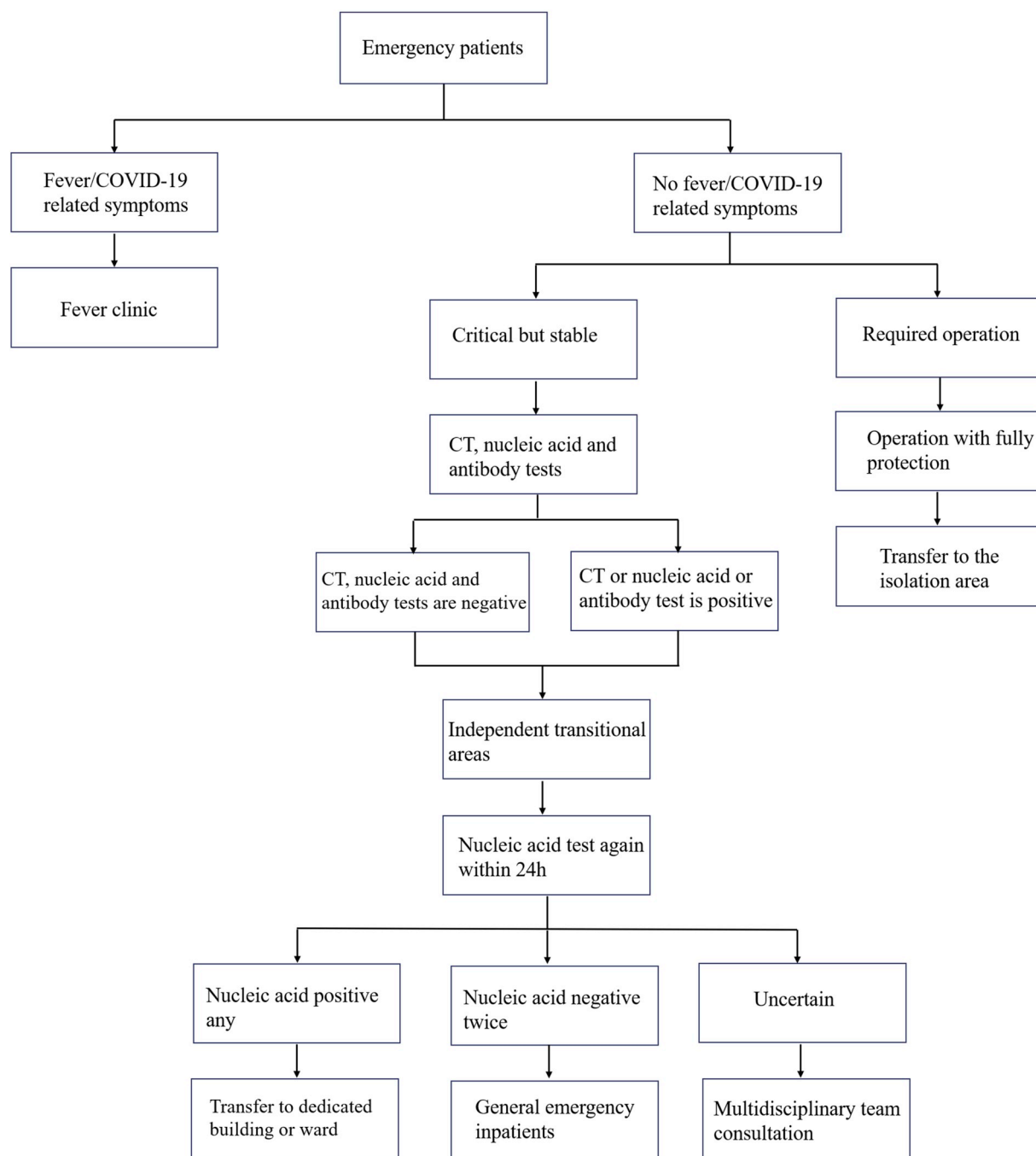


Fig. 1. Flow chart for emergency outpatients during COVID-19 epidemic.

hospitals. Good public access is essential. Medical staff needs high levels of protection and must be well trained in the use of PPE. Use of a fever clinic potentially limits the risk of health-care workers exposure to the virus because tasked expertise is concentrated. The diverting function of a triage strategy makes more health-care workers available to maintain workforce capabilities. Home care isolation can relieve the burden on health-care workers in response to the large volume of suspected patients arriving at clinics, but we do not generally recommend this because of the physical and mental health risks for patients.

1.2. Limit outpatient visits

Hospitals should cancel or reduce unnecessary outpatient visits in order to reduce COVID-19 transmission, shifting as much care as possible to virtual consultation. Patients with suspicious symptoms should be separated from the rest of the patient population in fever clinics. Social distancing is important in clinics, keeping the distance between chairs in the waiting-room and the distance between doctors and patients six feet apart. It is essential to provide surgical facemasks to all patients especially during the examinations. Cleaners should utilize regular droplet precautions (surgical mask, gloves, and gown) and disinfect all surfaces after each consultation. Mandatory use of separate

team in every clinic and ward can avoid health-care-related transmission and maintain workforce capabilities by avoiding the necessary laboratory testing and fourteen-day self-quarantine required for those exposed to an infected person or with any respiratory symptoms. We recommend that front-line health care workers in the isolation areas should be provided with isolated accommodation. When their duty rotation finishes, they should be tested for COVID-19 and self-quarantine before going back to their communities even if the results is negative.

1.3. Screen asymptomatic patients before admission

American College of Surgeons (ACS) guidelines recommends that surgeons should delay elective operations and consider nonoperative management whenever clinically appropriate [8]. One asymptomatic patient undergoing neurosurgery in a hospital in Wuhan infected 14 health care workers [9]. At that time, no health care workers did not realize that this patient was infected by coronavirus and did not take appropriate protective measures during the OR and wards. Asymptomatic patients can spread COVID-19 with high efficiency. Therefore, reasonable measures, including tests and isolation should be taken by surgeons to avoid asymptomatic transmission during aerosol-generating surgical procedures.

The availability of tests is still limited and many tests have high false negatives results. In China, nucleic acids test (PCR), antibodies test and chest CT scan are required to be completed in one day before admission. Nucleic acids test, which is largely affected by sampling procedure, has the highest false negative rates (sensitivity rate 30–50%). The novel coronavirus-specific IgM antibody can be tested positive in 3–5 days post-infection. Due to the limited laboratory testing capabilities, the diagnosis in many clinics cannot be based solely on laboratory testing, therefore a combination with chest CT (sensitivity rate nearly 60%) is proven to be effective during the early stage of the outbreak in Wuhan. If all tests are negative, the patient can be placed in a transitional ward waiting for another nucleic acid test in 24 h. If the patient with negative results again then they will be transferred to the general ward. Any suspected positive patients should be placed in a dedicated building or ward. Patients with uncertain results after all tests should be observed and quarantined for 14 days before elective surgery.

1.4. Emergency surgery

Emergency surgery should be considered as a priority for admission [10]. All healthcare facilities should develop plans for emergency surgery and referral plans for patients who do not need emergency care during COVID-19 epidemic. The plan must ensure emergency patients with respiratory symptoms being triaged to fever clinic (Fig. 1). A more efficient and rapid emergency surgical procedure by experienced staffs can potentially minimize the risk of exposure and resources exhaustion. Designated operating areas must be allocated to confirmed COVID-19 patients or patients who require urgent operation.

1.5. Decrease exposure of health care staffs in OR

Optimized intraoperative management is imperative to mitigate perioperative transmission. Restrictive reception of staffs is an initial step to minimal unnecessary exposure [11]. The number of staff (5–6 persons) in the dedicated operating theatre should be minimized strictly. Surgeons should not be in the OR when perform intubation which is considered as an aerosol generating procedure. Video laryngoscope can avoid close contact of anesthetist with patient. Before the end of the operation, it is recommended to clean the airway and oral secretions under deep anesthesia, and remove the tracheal tube before the patient is awake [12]. The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) and European Association of Endoscopic Surgery (EAES) recently released their Recommendations Regarding

Surgical Response to COVID-19 Crisis. They highlighted the risk of virus release during laparoscopy with pneumoperitoneum and strongly suggested the use of devices to filter released carbon dioxide for aerosolized particles [13]. Smoke evacuation systems with appropriate filters may reduce the risk of exposure, and using electrosurgical equipment at the lowest effective power as possible, but the complete elimination of surgical smoke is practically unrealistic. From the experiences we gained in China, open surgery is preferred with a surgical team wearing full-body PPE. Laparoscopic surgery can be gradually performed for elective surgery in well controlled area after the pre-operative screening. Because of the shortage of PPE, it is sometimes impossible to provide full-body PPE for all staff at all operations. For facilities with comprehensive screening and isolation conditions, normal levels of protection can be used including disposable surgical cap, N95 mask, work uniform, disposable medical protective uniform, disposable latex gloves and goggles.

1.6. Personal protection equipment (PPE) management

Because of the massive outbreak of COVID-19 worldwide, many health care facilities are facing shortages of PPEs and having to identify alternative ways for standard practices [14]. In China, the lowest standard of PPE that the government recommended for the staffs in general clinic or ward is surgical masks [15]. For fever clinic or other high-risk area, N95 respirators and goggles are required. The Centers for Disease Control and Prevention (CDC) of US has released a series of recommendations to optimize the application of PPE especially N95 respirators. The ideal way to prevent airborne transmission is to use a combination of hierarchy controls strategies, including elimination, substitution, engineering controls, administrative controls and PPE [16]. Before engaging in any work of caring patients with confirmed or suspected COVID-19, the staff must undergo strict training and be certified by the facility to ensure that they know how to put on and remove PPE correctly. To minimize the unnecessary change PPE, staff should reduce the frequency of moving in and out of the isolation wards.

1.7. Cancer surgery

Health care facilities in China have been forced to postpone or cancel cancer surgeries so they can allocate resources on care of COVID-19. However, forced delays of surgeries might increase the risk of cancer progression. Alternative treatment approaches (neoadjuvant chemotherapy) for patients who can't receive timely surgery should be considered. In order to limit the number of patients and the risk of transmission, chemotherapy drugs administered through infusion can be changed to orally administered drugs if available [17]. Cancer patients should be closely followed-up, once any perforated, obstructed, or actively bleeding occur, emergency surgery should be performed. All decisions to offer or defer surgery will be based on clinical judgement and the actual situation of the hospital.

1.8. Late stage of the epidemic

After three months of the start of epidemic, there have been few new COVID-19 cases in mainland China, and China has entered into the late stage of the epidemic. All health care facilities have gradually started to provide health care services. Because the spread of the virus in the community has not been completely blocked, the facilities still need to limit the number of patients coming to the clinic through the administrative controls. For example, promoting the use of telemedicine can help triage patients to the appropriate clinics. Health care workers should obtain a complete travel history and contact history of the patients before admission. For patients who need non-urgent or emergency surgery, nucleic acids test, antibodies test and chest CT scan are all necessary in high-risk area such as Wuhan. Nucleic acids test and

antibodies test are not mandatory for patients in low-risk area, however chest CT scan is mandatory in most hospitals even in low-risk area.

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None.

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