

Health Care Provision in Post-COVID-19 Period: Experiences from Tongji Hospital, Wuhan, China

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Abstract

COVID-19 is a highly infectious respiratory disease caused by a new coronavirus known as SARS-CoV-2 and rapidly extended globally. Health systems are facing unprecedented challenges. During the epidemic, routine medical activities had even been deferred and only emergency services were provided. With control of epidemic situation in China, institutions in Wuhan are scheduled to recover to pre-epidemic status, especially for health system. The backlog of routine medical needs during the epidemic has become an urgent problem in post-epidemic period. However, existing of asymptomatic patients, possibility of recurrence, small-scale outbreak and COVID-19 situation all over the world could hamper recovery procedures. There is a probability of aggregation in hospital and a risk of cross infection in medical activities for patients and medical staff. This paper aims to provide a comprehensive overview of the procedure in hospital recovery in post-epidemic period based on the experiences of Tongji Hospital, which may benefit the health care resumption process all over the world.

Keywords: COVID-19; Health Care; Infection Control; Recovery Experience; Post-Epidemic

Introduction

The novel coronavirus (SARS-CoV-2) that causes coronavirus disease 2019 (COVID-19) has now spread around the world [1]. On March 11, 2020, WHO has declared COVID-19 as pandemic disease and by Jan 27, 2021, COVID-19 has spread to more than 200 countries and regions worldwide with more than 100 million cases and approximately 2.16 million deaths. There is no doubt that local and global health systems are facing unprecedented challenges, and there is an urgent need for preparedness and proactive strategy to enhance screening, treatment and prevention of the infections. During the pandemic, the routine medical activities even came to a standstill. On May 2, 2020, the level of public health emergency response in Hubei Province was adjusted from the first level to the second level, indicating that China's epidemic prevention and control policy has achieved significant success. The backlog of routine medical needs during the epidemic has become an urgent problem in transition and post-epidemic period.

Epidemiological studies have pointed out that COVID-19 has hidden onset, strong infectivity, high risk of nosocomial infection and relative confined space transmission. Most COVID-19 patients are fairly mild cases. Common symptoms of COVID-19 patients are fever, cough, shortness of breath, muscle pain, abdominal pain, fatigue, and abnormal chest CT. It also includes some few common symptoms such as headache, nausea, diarrhea, vomiting, dizziness, etc. [2] The typical transmission routes of COVID-19

include direct transmission and contact transmission. Direct transmission includes sneeze, cough, and inhalation of small airborne particles and contact transmission includes contact with the oral, eye, and nasal mucosa [3,4]. Until now, SARS-CoV-2 has not been detected in the vaginal secretion of women with severe COVID-19 infection [5]. Moreover, given the paucity of the existing studies in epidemic, the evidence of vertical transmission is still insufficient [6].

Recently, some researchers [7,8] reported that the epidemiological characteristics of asymptomatic carrier could transmit COVID-19, and 30% - 60% of new coronavirus infected people have no symptoms or mild symptoms. Noticeably, their potential of spreading the virus is non negligible, and these recessives infections may cause a new round of outbreaks, which would bring other disorders to clinical differential diagnosis in post-epidemic. Even after patient recovery, recurrence during the convalescence period was reported [9]. Moreover, there were a series of small-scale outbreak reported in post-epidemic period. Some experts even proposed the concept of “epidemic may exist for a long time” [10]. Therefore, how to complete the transition from epidemic to post-epidemic period is especially critical for the recovery of the medical institutions. However, there are still few studies on the strategies and experiences of post-COVID-19 rehabilitation.

Tongji hospital, Huazhong University of Science and Technology is an academic and comprehensive medical center in Wuhan, Hubei Province. It has become the designated hospital with treated the largest number of severe COVID-19 patients. Confronting the outbreak and the ever-changing situation, periodic strategies were rapidly established including administrative team establishment, infrastructure modifications and special arrangement for clinic patients, hospitalizations and surgeries. Doctors worked here published a series of guidelines for management of medical service, surgery in epidemic [11,12]. In this epidemic transition period, Tongji Hospital also implement a series of strategies and achieve considerable improvement in the recovery of clinical departments with no COVID-19 infection (Figure1). Based on the experiences of safely returning to pre-epidemic medical situation and clinical characteristics, diagnosis and treatment of diseases and COVID-19, we would like to share our experiences and lessons in preparing and managements of health care provision in post-epidemic period. It should be useful for the recovery of medical departments and institutions.

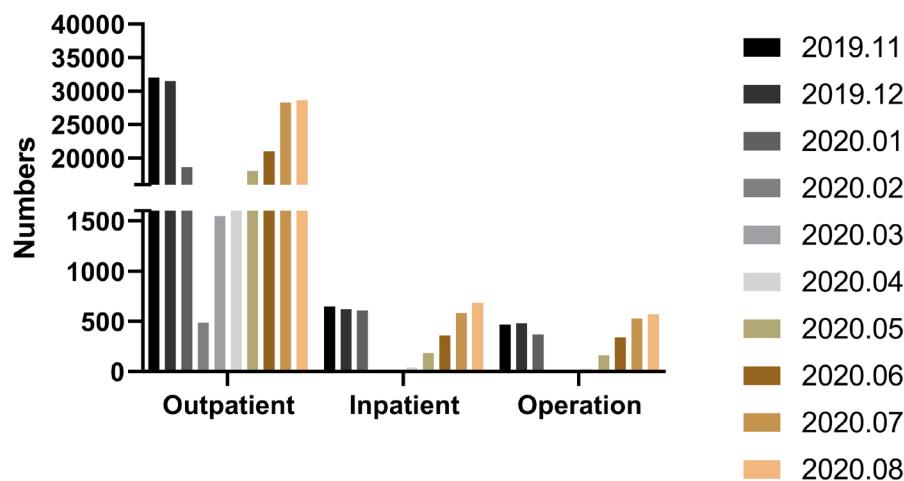


Figure 1: Changes in the number of outpatients, inpatient and operation in Tongji Hospital
The data showed that the number of outpatients, inpatient and operation decreased significantly in COVID-19 outbreak (February to April), when the epidemic was under control, these indicators gradually returned to the level of the same period before the epidemic

The impact of the COVID-19 on medical services

In pandemic, all efforts of health care system were focusing on controlling and treating COVID-19 [13]. This has led to a rearrangement of the hospital, such as suspension of elective operation, delay visiting of chronic diseases [14]. Accompanied by the improve of epidemic situation, it is necessary to gradually return to regular activities. In epidemic transition period, existing of asymptomatic carrier, recurrence of the cured patients, small-scale outbreak and imported cases all challenge the recovery of the whole country. At this stage, a careful assessment of COVID-19 status should be considered to be the first priority in in routine medical activities. All staff returning to work should be screened with a negative COVID-19 status. Every patient should complete the COVID-19 screening while they need clinical operation.

All medical staff need to be familiar with the epidemiology and clinical manifestations of COVID-19 and follow the guideline of New Diagnosis and Treatment Scheme for Novel Coronavirus Infected Pneumonia [15] issued by the National Health Commission of the People's Republic of China. It is recommended that all staff should learn about the patients' epidemiological history and review of the results in recent 2 weeks such as throat swab test, antibody and chest computed tomographic (CT).

Besides, it has reported that during the outbreak of COVID-19 in China, more than half of the respondents rated the psychological impact as moderate-to-severe, and about one-third reported moderate-to-severe anxiety [16]. In transition period, some patients were also afraid to go to the hospital, which delayed the diagnosis and treatment of the disease to some extent. Some patients could not understand the COVID-19 screening schedule in routine medical activities because of the cost.

Transition of medical activities and personal protective equipment from epidemic to post-epidemic

Since the beginning of the COVID-19 epidemic, infection control policies, protocols and standard operation procedures (protection, screening and telephone consultation) must be established to minimize the risk of infection. During the pandemic outbreak, additional preventive measures should be taken to keep protection at a high level. All medical staffs should utilize personal protective equipment (PPE) including fit-tested disposable N95 respirator, goggles, face shield, gowns, double-layered gloves, and protective footwear to achieve maximum droplet/contact isolation precautions (Class III protection). Medical staff should complete personal hand hygiene before and after contact with patients [17].

In epidemic transition period of China, the situation of COVID-19 has been gradually brought under control. However, the existing of asymptomatic patients and SARS-CoV-2 positive after recovery make the medical situation more complicated [18]. Medical staffs should still utilize advanced personal protective equipment (PPE), whenever not only close encounter with suspected or confirmed COVID-19 patients but also was on call in emergency room [19]. The protection level should be adjusted according to the exposure risk of medical activities. In daily outpatient department and buffer ward, all medical staff should correctly perform clinical tasks, wear gloves, hats, gown and disposable surgical masks (Class II protection). In clean ward, all medical staff should wear gloves, hats, and disposable surgical masks correctly (Class I protection).

Patient management and prevention of infection in transition period of epidemic

In transition period, the routine medical procedures will gradually recover. The treatment processes in this period are as follows.

Emergency considerations

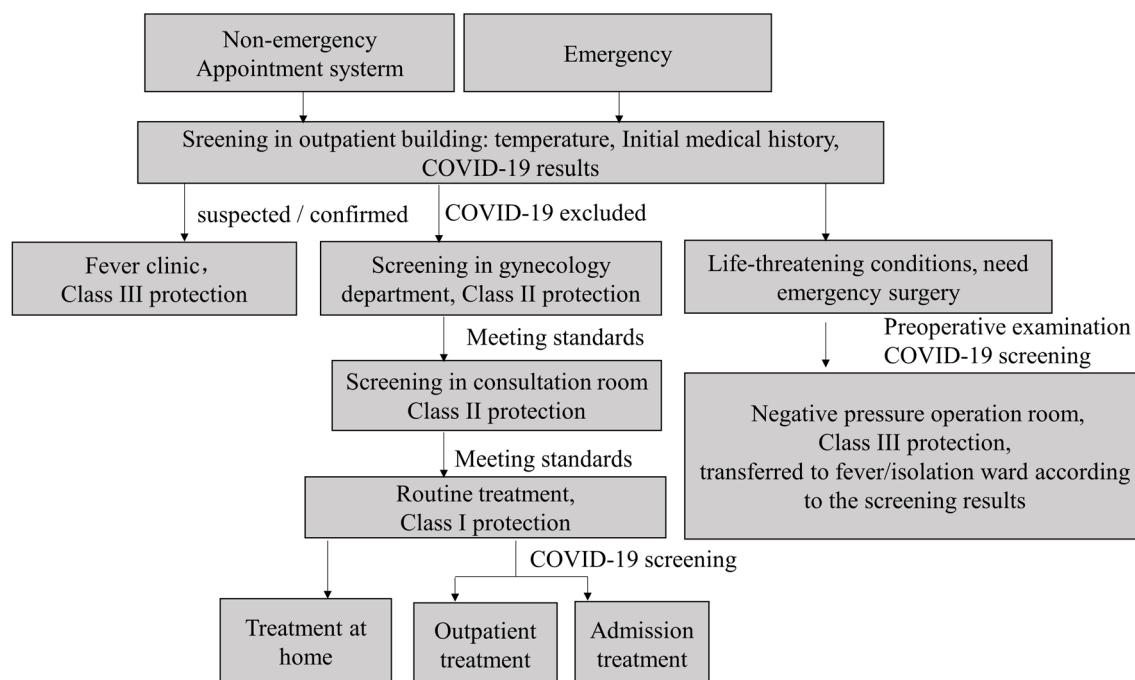


Figure 2: Flowchart of the out-patient management

Flowchart showing the patients screening and categorization procedure during the post-epidemic period of COVID-19 in out-patient department

All emergency of life-threatening conditions needs a special procedure. An emergency and multi-disciplinary cooperation system will be started and it is necessary to report to the leader of the department, anesthesia department, operating room and ICU isolation ward immediately. As far as possible, multidisciplinary meetings should be held with an objective that not to delay the treatment of patients who need it [20]. All emergency operation should be performed in a designated negative pressure environment. Moreover, it is essential to keep pressure difference between the operating room below -4.7 Pa. Numbers of medical staff participating operation should be reduced as much as possible. All personnel involved in the operation should keep advanced level of PPE (Class III), be familiar with the use of protective equipment and the emergency procedure (Figure 2).

Outpatient Service

Base on the influence of COVID-19, the conventional medical mode has changed. Conventional medical activity is in the face-to-face mode, while an internet mode developed due to the COVID-19 pandemic.

(1) Internet consultation

Some chronic diseases need longtime-management. Internet mode is a good choice for them to reduce the risk of cross infection, which includes video consultation and graphic consultation. Doctors could make individualized evaluation and provide treatment plan according to the complaints and examination results. Patients could get advices and prescription online and drugs by mailing.

(2) Hierarchical triage procedure of outpatient department

Categorizing treatment according to the urgency of the required treatment and the risk and benefit associated with each treatment. It is recommended to use advanced personal protective equipment in emergency department. For those non-emergency patients, the outpatient appointment consultation system is strongly advised. Patients could visit in time according to the appointment. At present, the outpatient department adopts the “Hierarchical pre-examination and triage” system, including the pre-examination in outpatient building, department and consultation room. If suspected/confirmed cases are found, they will be reported immediately and transferred to fever clinic by specialized staff. For the patients who need minor operation in clinic or urgent surgery in operating room, it is necessary to be screened for COVID-19 such as throat swab test, antibody and chest CT. Therefore, patients in need of treatment should be categorized according to the probability of infection of COVID-19 (Figure 2).

Admission Consideration

There are many kinds of diseases that need hospitalization, including diseases need special drug treatment as well as those need surgical therapy. It is recommended that all surgery patients must complete preoperative COVID-19 screening despite being asymptomatic.

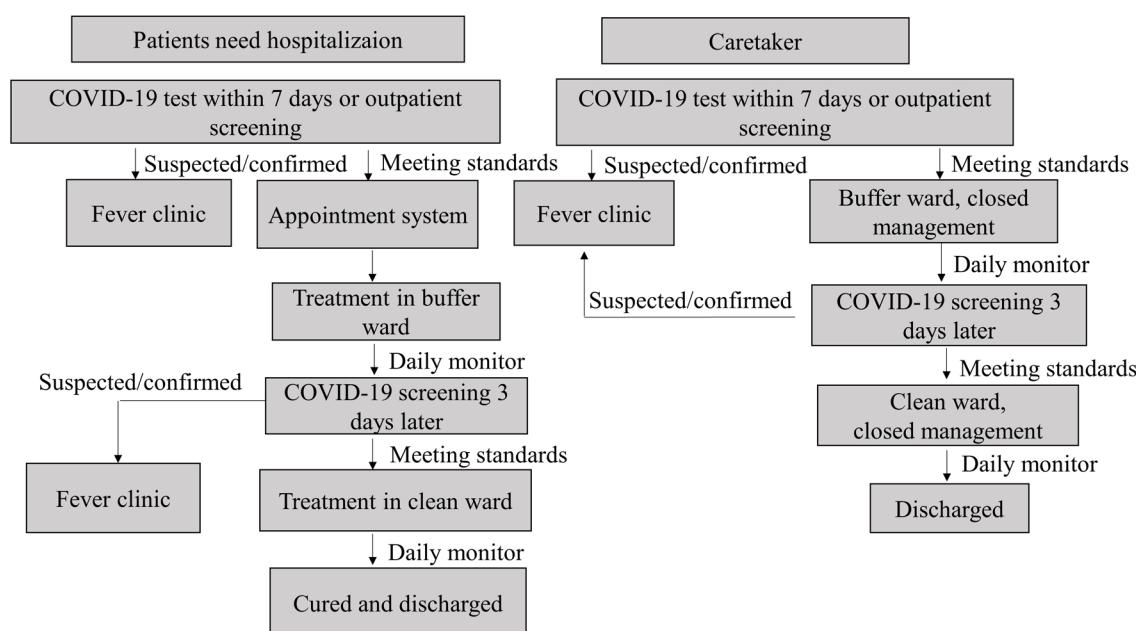


Figure 3: Flowchart of the inpatient management

Figure 3. Flowchart of the inpatient management
Flowchart showing the inpatient screening and categorization procedure during the post-epidemic period of COVID-19

All suspected/confirmed patients or symptomatic patients with diseases need elective surgery should be transferred to the COVID-19 designated hospitals and it is recommended that all elective surgeries to be postponed. For non-COVID-19 patients with diseases need elective operation, hospitalization appointment system is recommended. During the hospitalization period, patients can be allowed to have one caretaker. Once the patients and caretakers complete the COVID-19 screening and meet standards, they can make appointment for admission. In order to implement the hierarchical management of inpatients, buffer ward and common ward are set up in the ward, and closed management is carried out. After admission, patient and caretaker enter the buffer ward, complete the specialized examination, receive daily monitoring. 3 days later, when finished the COVID-19 screening again, they will be transferred to the common ward once meeting the standards. The specific process is as follows (Figure 3).

Preoperative Considerations

Categorizing operation according to the urgency of the required treatment and the possible risk associated. All emergency operation should be performed in a designated negative pressure environment and medical staff involved should keep advanced level of PPE (Class III). For elective operation, once patients had been isolated in ward for 3 days and screened negative for COVID-19 twice, it is recommended to adjust the protection level to Class II.

Surgeons and other medical staff should be aware of the exposure risk of blood and body secretions at the time of surgery. Aerosol generating procedures (AGPs) are associated with an increased infection risk to medical staff during the operation [21]. Aerosol included in various types of clinical operations, such as the use of laparoscopy and energy devices, intubation, extubation and so on [22]. The methods of surgery vary greatly, which include open surgery, minimally invasive surgery, etc. The choice between laparoscopy and laparotomy as a surgical approach needs to be paid more attention. The core group composed of experts will make a thoughtful decision according to medical history and epidemic. In order to reduce the adverse effects of laparoscopic surgery on lung function, open surgery should be considered priority on emergency surgery for suspected/confirmed patients. Laparoscopic surgery should be performed by the most experienced surgeon to ensure that all knowledge of safe laparoscopic procedures is followed and procedures are performed in the shortest time. When using electrocautery or other energy equipment during surgery, it is especially important to adjust to the lowest effective power possible to reduce surgical smoke and utilize smoking evacuator [23]. The specific classification standards of surgical protection are as follows (Table 1).

Operating room	Evaluation criteria	Personal protection level
Negative pressure operating room	1. Emergency operation 2. Ward isolation ≤ 3 days 3. COVID-19 screening results are incomplete or abnormal: nucleic acid/antibody/CT	Class III (fit-tested disposable N95 respirator, double-layered gloves, goggles, face shield, hats, gowns, footwear)
General operating room	1. Elective surgery 2. Ward isolation > 3 days 3. COVID-19 screening results are normal: nucleic acid/antibody/CT 4. Patients in clean ward	Class II (fit-tested disposable surgical masks, gloves, hats, gown,)

Table 1: Recommendations on surgical protection during post-epidemic period

Psychological and behavioral counseling during the epidemic transition period

The COVID-19 pandemic has alarming implications for individual and collective health and emotional and social functioning [24,25]. In addition to providing medical care, health care providers have an important role in monitoring psychosocial needs and delivering psychosocial support to their patients, health care providers, and the public-activities that should be integrated into the general health care. During routine medical activities, we need to pay more attention to public psychological stress. National screening, green-code verification, keeping social distance and hand hygiene, wearing masks can benefit relieving everyone's nervousness. However, different psychological interventions could be formulated according to the psychological characteristics.

Medical activities in post-epidemic period

Once the epidemic situation improved obviously, we will gradually implement the regular epidemic and control measures and hasten health care recovery. During this period, the routine medical activities were carried out in schedule to pre-epidemic mode, but health care providers still need to keep vigilance on COVID-19. Everyone working or visiting hospital should wear mask and keep hand hygiene. The routine outpatient and inpatient procedures gradually returned to normal. Fever clinics will keep for a long time, and isolation space will be set up in the ward and operating room for urgent cases with unclear COVID-19 status. The prevention and control strategy can be adjusted flexibly according to the alteration of the epidemic situation.

Discussion

The COVID-19 pandemic has rapidly and drastically changed the treatment model of health care. Regardless of geographic location, COVID-19 will have an impact on all practitioners; however, the degree will vary depending on the prevalence of COVID-19 and local resources available [26]. Based on this background, we must carefully weigh the risk of patients undergoing treatment and the disease emergency in the context of COVID-19. Traveling to hospital and treatment process also increase exposure risk and transmission of COVID-19. During the epidemic, routine medical activities has almost stalled, and only emergency medical services have been retained. With the improvement of the epidemic situation and the gradual development of resumption of work, the routine medical activities such as health care needs to be gradually restored to meet the medical needs of the majority of patients. Aggregation in hospital increase the risk of infection for patients and medical staff. Besides, many routine medical examination procedures may have the potential to be exposed to body secretions, medical staff are among the highest risk categories for transmission and contraction of the coronavirus. Due to the possibility of COVID-19 recurrence, existing of asymptomatic patients and outbreak all over the world, a guideline for health care recovery is especially important in the epidemic transition period. This can help in reducing and preventing new outbreaks. This article described our efforts in responding, organizing and managing in department to prevent any possibility of transmission and infection in post-epidemic period.

Until now, with the efforts of both government and hospitals, the COVID-19 epidemic in Wuhan has been well controlled, and the whole society has entered the reconstruction period. We would anticipate that if the agreed strategy will be a gradual return to normal activities, health care would be one of the first to begin. In the process of resumption of hospital and department in post-epidemic, Tongji Hospital had encountered many challenges. Based on the advices of hospital infection control department, every department implements the outpatient appointment triage, inpatient appointment, and operation protection classification. For the emergency situation, the emergency strategy will be started. In processes like diagnosis, treatment, physical examination and clinical operation, medical staff should take corresponding personal protection. When meeting suspected/confirmed cases or emergency situation, advanced PPE (Class III) is necessary; Class II of protection is recommended for routine outpatient department and buffer wards; Class I of protection is recommended for medical staff in clean areas.

All medical activities need to meet the medical needs of patients with disease while ensuring the safety of patients and staff. Careful assessment of the COVID-19 infection in outpatients, hospitalized patients, caretakers at each stage is essential to ensure a low risk of transmission. In addition, hospitals and department need relevant procedures and strategy to arrange examinations and escort patients. Moreover, the personal protection mode need adjust according to the changes of the epidemic situation. All medical institutions all over the world can make corresponding adjustment and improvement according to the medical conditions and specific epidemic situation and finally maintain regular epidemic prevention and control.

Conclusion

The experiences formulated in this work are general guidelines and the final procedure will be provided according to the judgement of practitioners. Every hospital and department could be imaginative and creative with the existing guidelines. For instance, if the case is out of the category, there will be an alternative way for practitioner to judge and evaluate the situation. Therefore, categorization of diagnosis and treatment should always be considered by the practitioner. It is hoped that the guidelines proposed in this work will help in the recovery of health care around the world during the transition period of COVID-19 pandemic, and provide a solid base for further health care guidelines development. As experiences accumulates, we believe that the guideline will evolve as well.

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