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## Practice Forum

## Medical waste management practice during the 2019-2020 novel coronavirus pandemic: Experience in a general hospital

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## Key Words:

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Disposal

It is currently a critical period for the prevention and control of the COVID-19 pandemic. Since the medical waste disposal could be an important way to control the source of infection, standardization, and strict implementation of the management of COVID-19 related medical waste should be with careful consideration to reduce the risk of epidemic within hospitals. This study illustrates the practice of medical waste disposal responding to the 2019-2020 novel coronavirus pandemic.

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A novel coronavirus disease (COVID-19) was discovered in Wuhan, China in December 2019. As of May 21, 2020, COVID-19 has spread to 188 countries and regions. There have been more than 5 million confirmed cases worldwide, and more than 300,000 deaths have been reported to WHO.<sup>1</sup> The spread of COVID-19 may be increased by the inadequate waste management.<sup>2</sup> With the rapid rise in the number of confirmed cases, the amount of COVID-19 related medical waste also increased significantly. The daily COVID-19 related medical waste in China is about 468.9 tons according to the press conference for the joint prevention and control mechanism of China's State Council.<sup>3</sup> Ensuring that COVID-19 related medical waste is timely, orderly, efficiently, and harmlessly disposed has also become an important part of the battle against the pandemic. This study illustrates the practice of medical waste disposal responding to the 2019-2020 novel coronavirus pandemic.

## INFECTION CONTROL SPECIAL TEAM AND MEDICAL WASTE MANAGEMENT FRAME

A special multisectoral team of infection prevention and control was established to discuss the problems that might encounter and counter

measures. Team members include the nosocomial infection control expert, director of infectious disease department, respiratory disease department, nursing department, logistic department, and administrative leader. Each department has a clear distribution of labor to coordinate and improve the management of medical waste (Fig 1).

## MANAGEMENT OF COVID-19 RELATED MEDICAL WASTE

*Classified packaging and pretreatment*

The waste from protective facial masks has greatly increased the possibility of carrying pathogens. Therefore, some medical waste buckets with distinct mark were placed in the public areas of the hospital to collect the abandoned masks. They were packaged in double-layer medical waste bags and disposed as general medical waste by a specific staff (Fig 2).

Medical waste and domestic waste from fever clinics, observation wards, isolation wards, special examination rooms, and medical laboratories especially the nucleic acid testing laboratories should be treated as COVID-19 related medical waste, and a label printed with "COVID-19 infection" should be affixed. Infectious waste and pathological waste should be packaged with double-layered medical waste bags, and the surface of bags should be sterilized by spraying chlorine-containing disinfectant prior to putting them into the medical waste bucket which has a cover. The injury waste is packed into the sharps box to avoid damage to the packaging. After packaging with another double-layered medical waste bag, the chlorine containing disinfectant is sprayed again for disinfection. Then, the injury waste is placed into the medical waste bucket. Specimens or preservation solutions containing pathogens from the laboratory should be sealed

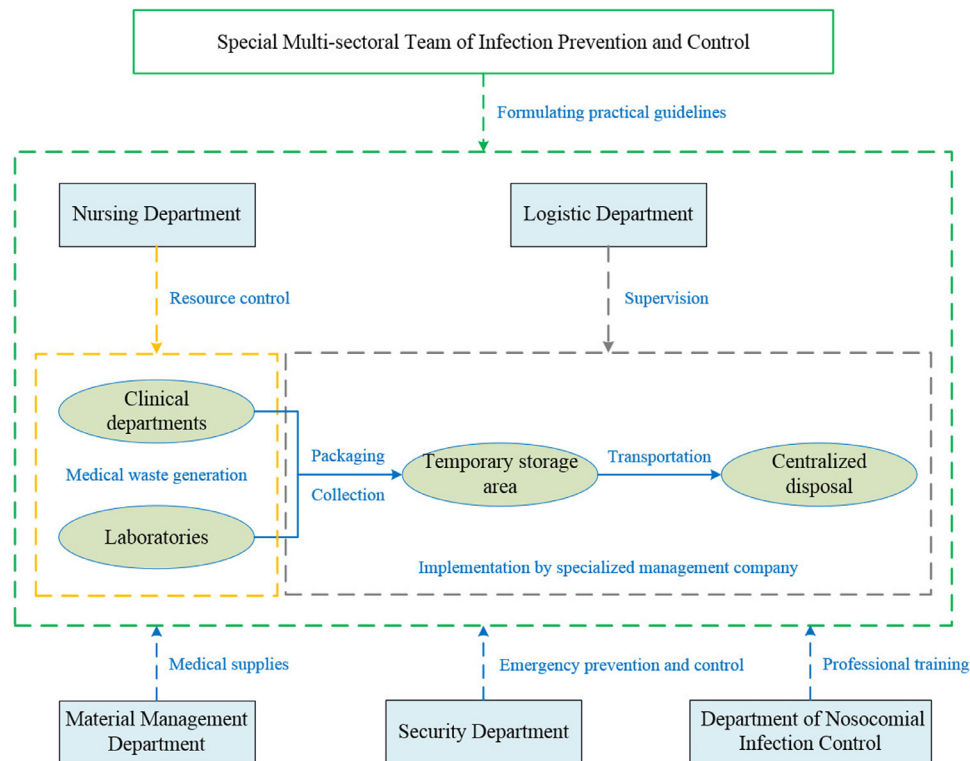
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**Figure 1.** Medical waste management frame in authors' unit.

and packaged firstly. Then, they should be subjected to high-pressure steam sterilization at 121°C for 110 minutes before placing them into the medical waste bucket.

#### Temporary storage

A separate temporary storage area was built for COVID-19 related medical waste with a significant warning mark. Medical waste buckets from fever clinics, observation wards, isolation wards, and nucleic acid testing laboratories were put into this area to avoid mixing them with other waste from common wards. The temporary storage time for COVID-19 related medical waste in the hospital should not exceed 24 hours.

#### Collection and transportation

COVID-19 related medical waste disposal should be arranged by specifically trained staff and special vehicles which should be different from general medical waste. A specific handover book is used for maintaining detail records of time and quantity between internal and external transporters. The route of transportation should avoid crowd as much as possible, and the time should avoid the morning and evening rush hour. The storage room and vehicles should be disinfected immediately after loading and unloading.

#### Centralized disposal

COVID-19 related medical waste is preferentially treated by high-temperature incineration. Although the gases disposed during the incineration process will cause air pollution, previous study shows that incineration is the most common and effective way to kill infectious pathogens, and it is applicable to various infectious medical waste.<sup>4</sup> For areas without incineration capabilities, medical waste

can also be processed with sanitary landfill after steaming and boiling at a high temperature.

#### Disposal practice

So far, a total of 24 patients had been confirmed in our hospital with no death. The average daily output of medical waste in our hospital was 2.1 tons, and the COVID-19 related medical waste is about 150 kg. Under the overall management, the disposal time of COVID-19 related medical waste was reduced by nearly 2 hours, and the distance of the transportation was reduced by approximately 1,000 meters compared with ordinary situation. No COVID-19 related hospital infection occurred during the period.

#### DISCUSSION

It is currently a critical period for the prevention and control of the COVID-19 pandemic. The patients infected with SARS-CoV-2 that manifest as fever and cough are important source of infection, some recent studies have suggested that COVID-19 may be spread by asymptomatic carriers.<sup>5</sup> The virus is thought to spread mainly from person-to-person through respiratory droplets and close contact, and the aerosol may be a potential transmission channel. Studies have shown that SARS-CoV-2 can survive on plastic and metal objects for up to 2–3 days, and there was extensive environmental contamination by confirmed patient.<sup>6</sup> Thus, the management of medical waste could be an important way to control the source of infection.

As far as we know, some hospitals separated an area from the original storage room of general medical waste to temporarily store the COVID-19 related medical waste. There may be potential risks for mixing the waste because of very close interval and a relatively longer transportation distance. Some other hospitals installed the on-site waste disposal equipment for rapid disposal of COVID-19 related medical waste which was quick and convenient. But the spending

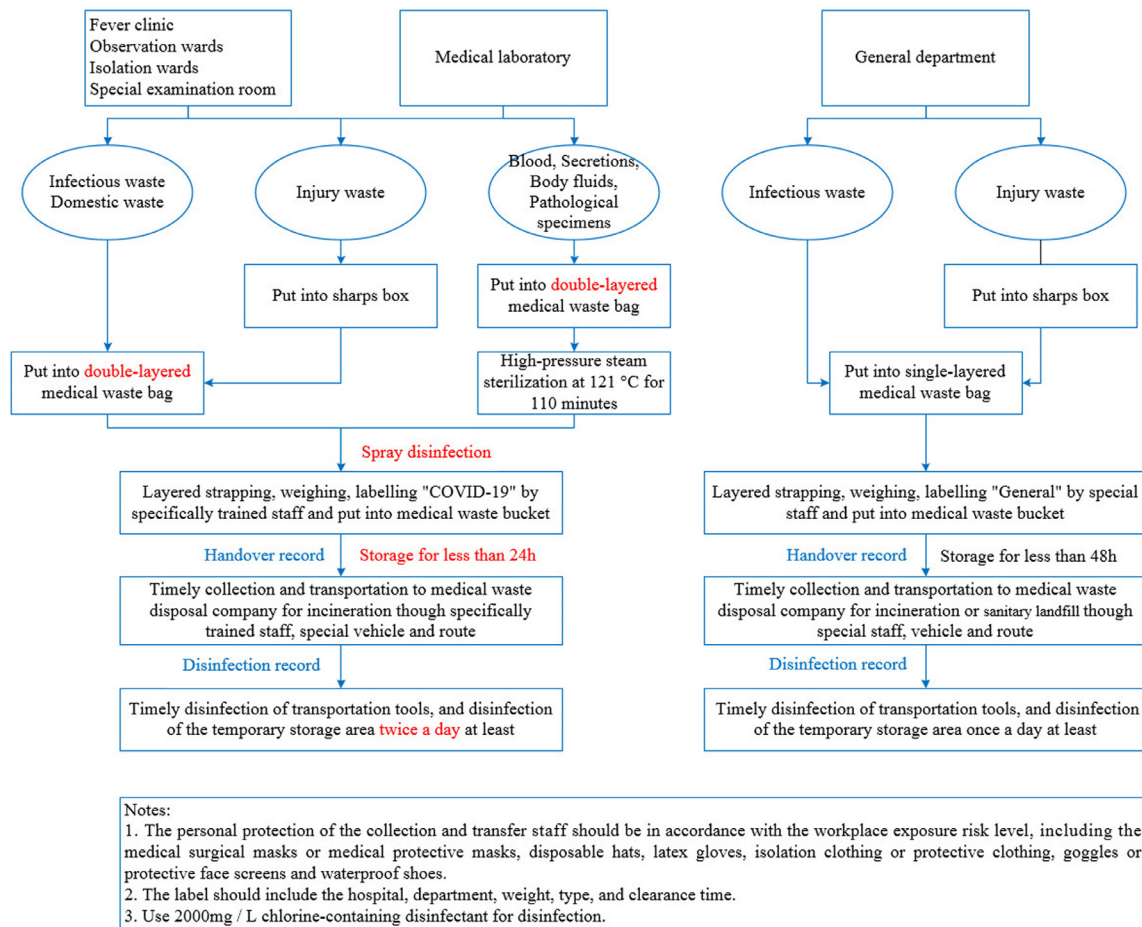


Figure 2. Medical waste disposal process in authors' unit.

was huge and the residue may pollute the surrounding environment if not processed in time. Thus, it was not applicable for the hospitals and institutions in medium- and low-risk areas or in the less developed countries.

The management of medical waste involves many departments and a large number of individuals which required of interdepartmental collaboration. During the initial epidemic period, a special multi-sectoral team and subsequent management frame was established in our hospital. This frame united and coordinated the COVID-19 related training, supervision, safety management, material supply, and medical waste disposal. The management practice was adjusted timely with the outbreak of the epidemic, and the key point was to strictly distinguish the waste and reduce the storage time. Thus, a separate temporary storage area for COVID-19 related medical waste was built. It was near the fever clinics and observation ward area in the hospital to isolate them from general waste. The medical waste disposal company was required to collect them directly from the temporary storage area without any unnecessary intersection and contact. The time and route of COVID-19 related medical waste collection and transportation was different from the general waste in order to reduce the risk of leakage and damage during the transfer process in the hospital and to improve the transfer efficiency.

The general ward will inevitably accept some patients presenting with fever or similar chest imaging characteristics as COVID-19. These patients were examined and distinguished carefully by an expert group in the hospital and were admitted to the temporary isolation ward of related department after COVID-19 was excluded. The management of medical waste generated by these patients was the

same as general medical waste. To better control the epidemic and minimize the risk of virus transmission, the sanitary landfill, which was the original medical waste disposal method of the hospital, was replaced with a high-temperature incineration in our hospital. The in-hospital storage time was changed from no more than 48 hours to no more than 24 hours. But for epidemic regions with high risk, such as Wuhan city of Hubei Province, the management of medical waste should be given more attention. It is recommended that all of the domestic waste and medical waste in the hospitals with concentrated admissions of confirmed patients and suspected patients, for example, the "Wuhan Cabin Hospital," "Vulcan Mountain hospital," "Thor Mountain hospital," should be incinerated with a disposal time less than 24 hours and a frequency of twice a day if possible.

## CONCLUSIONS

The SARS-CoV-2 is a newly discovered, highly pathogenic, and infectious virus, all aspects of prevention and control shall be highly valued. Standardization and strict implementation of the management of COVID-19 related medical waste should be with careful consideration to reduce the risk of epidemic within hospitals.

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