REVIEW ARTICLE

A Brief Review of Safe Management of COVID-19 Related Death and its Control Strategies

Mohamad Sabri PNS[a], Shaharin S[a], Chng KL[b], Abdullah NZ[a,b]

[a]Kulliyyah of Medicine, International Islamic University Malaysia, Pahang

[b]Pathology Department, Sultan Ahmad Shah Medical Centre @International Islamic University Malaysia, Kuantan, Pahang

Keywords
COVID-19 bodies, handling bodies, control strategies, infection handling bodies

Corresponding Author
Dr. Chng Kay Ly
Forensic Unit, Pathology Department, Sultan Ahmad Shah Medical Centre@International Islamic University Kuantan, Pahang, Malaysia
E-mail : chngkayly@iium.edu.my

Received: 24th January 2022; Accepted: 17th November 2022

Doi: https://doi.org/10.31436/imjm.v22i1

ABSTRACT

Coronavirus disease 2019 (COVID-19) is a disease caused by a virus named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). With the increasing COVID-19 associated deaths, the infectivity and handling of the dead bodies associated with COVID -19 has become a worldwide concern in terms of spreading the infection further during handling of these bodies. As a precaution, measures should be undertaken to contain the spread of infection while handling COVID-19 associated deaths. This article reviews the current management of COVID-19 associated deaths and control strategies in various countries in order to guide medical examiners to handle the bodies including those autopsied.

INTRODUCTION

COVID-19 was first reported in China and it has caused a major pandemic, high fatality and a large number of social wellbeing disruptions since the first reported case.[1] The World Health Organization (WHO) reported that there were more than 200,000,000 cases globally and 5,183,003 deaths that have been confirmed up to December 2021.[2] As part of prevention of the transmission of COVID-19 spread, management and safe handling of bodies in cases involving COVID-19 death must be emphasized to prevent further spread of the virus to the personnel involved. The median incubation period of COVID-19 is 5.1 days and it is expected that almost all infected persons will become symptomatic within 12 days of infection.[3] The Center for Disease Control and Prevention (CDC) has recommended 14 days to be the current period of active monitoring. As such, COVID-19 can possibly be transmitted during autopsy from the deceased body to the personnel performing the autopsy. COVID-19 transmission via surfaces and infectious body fluids during autopsy is possible in principle depending on a few factors such as temperature, humidity, surface properties, virus quantity and also the virus strain.[4] There are two schools of thought about the management of the body of COVID -19 associated deaths. The first one would be to take no extra precautions in handling the COVID-19 body because there is no risk of contamination; while the second view is that all possible precautions should be taken as the risk of contamination is enormous. Even a suspected positive COVID-19 dead body is supposed to be handled as if it is a positive COVID-19 body.[5]

MANAGEMENT OF COVID-19 ASSOCIATED DEATH AND CONTROL STRATEGIES

Death investigation

In Malaysia, under Section 16 and 17 of the Prevention and Control of Infectious Diseases Act of 1988, the management of biohazards or infectious diseases falls under the purview of a Public Health Officer including the suggestion of assessment and management of the dead. For any deaths outside of the hospital, Public Health officers should guide and supervise police officers and other practitioners on scene on the use of personal protective equipment (PPE). According to WHO (2019), the appropriate level of PPE includes eye protection, such as a face shield or goggles, as well as medical mask, gown

and gloves depending on the level of interaction with the body. As for the investigations of any death, includes a thorough medical history, travel history and any contact history with any potentially COVID-19 infected person.

Transport of dead cases

In the Netherlands, death occurring outside of health facilities is advised to be transported to the morgue in a leak-proof body bag in an attempt to limit the contact with bodily fluids. Additionally, in China, USA and India these body bags have to be disinfected. Extra precaution is taken by China and India where the body bags have to be further covered by a sheet.[5] In Malaysia setting, the body is wrapped in three layers. Firstly, it is wrapped in a layer of white cotton linen. Next, it is placed in a cadaver body bag as the second layer. The body is then put in another cadaver body bag as the third layer and the outer surface is disinfected with 0.5% sodium hypochlorite.[6] According to WHO (2019), for death occurring at health facilities, transferring of the body includes removal of all catheters and other indwelling devices. A trained medical staff should ensure any leakages of bodily fluids from orifices are contained and the body should not be disinfected before its transfer to the morgue or at any other time.

Similarly, in China, India and Germany, wound openings should be cleaned, disinfected and covered with a waterproof band aid. Not only that, these three countries further determined that body orifices such as mouth, nose and anus should be plugged.[5] WHO also recommended that the body should be wrapped in cloth and no body bags should be used unless they are recommended by standard mortuary practice. As for the vehicle of transport, WHO (2019) did not recommend any special transportation equipment or vehicles. However, in the USA, the transport vehicle was disinfected with a dilute bleach solution.[7] Meanwhile India, recommended that the used vehicle or stretcher must be disinfected with disinfectants containing chlorine before it can be used again.[8]

Infectivity and transmission of SARS-CoV-2 virus during autopsy

According to WHO (2019), the transmission of COVID-19 is believed to occur when a person is exposed to infectious droplets either directly or indirectly. These infectious droplets originate from the respiratory tracts of the infected persons and it may be released to the surroundings by sneezing, coughing, talking or by aerosolizing procedures such as intubation or autopsy.[7] According to CDC (2021), these droplets can be breathed in by other people or the virus land on their eyes, nose, mouth or in some circumstances. It can also contaminate surfaces that the infected people touched. Viable SARS-CoV-2 virus was discovered up to 72 hours after being placed onto plastic and stainless-steel surfaces.[7] The human coronavirus can remain infectious for up to 9 days on inert surfaces depending on the type of surfaces and also the surrounding temperature where the viral presence becomes shortened at temperature of more than 30 degree Celsius.

Potential risk faced by forensic personnel

Potential risk of infection can occur whilst conducting investigations at the death scene, during an autopsy, during transfer and storage of samples.[9] During a death scene investigation, forensic personnel may not have sufficient time to gather relevant information on the history of the deceased. Accurate current health conditions, travel history in a pandemic area or the contact history with suspected infected persons may not be acquired immediately during the scene. Thus, these uncertainties may pose a risk of infection if usage of personal protective equipment (PPE) is not practiced during initial investigation. Furthermore, the various invasive procedures such as tissue segmentation, organ extraction and organ incision may expose the forensic practitioner to the COVID-19 infection. Due to the duration of the autopsy itself and the close proximity with the dead body during these procedures, the SARS-CoV-2 virus can be passively released and thus increasing the risk of inhaling the virus.[9]

Autopsy Requirements

In order to minimize exposure to harmful biological agents, personal protective equipment (PPE) is used as a protective gear to preserve health.[10] In India, it is highly recommended to wear a complete set of PPE and the use of PPE was issued by the Ministry of Health and Family Welfare Government as it possesses a moderate risk of handling dead body in the mortuary.[10] Wearing a triple-layer medical mask and gloves would be adequate to protect from the respiratory droplets of infectious materials. However, a N95 respirator mask has a higher filtration efficiency to stop airborne particles as it provides a tighter air seal than the triple-layer medical masks. The masks used must be replaced with new ones if they become wet, soiled, damaged or the person faces difficulty to breathe through. In the United States of America, the autopsy is carried out in an independent negative-pressure isolation room neighboring to the main morgue room but it has its private heating, ventilation, and air-conditioning circuit with 16 air changes per hour.[7] It is further elaborated that a small isolation cooler attached to the isolation room plays the role of airlock during the procedure in order to expedite the transfer of relevant materials into and out of the isolation suite. In Malaysia, post-mortem examinations are carried out in the Biosafety Level 3 (BSL-3) autopsy suite which is available in the National Institute of Forensic Medicine (IPFN), Kuala Lumpur, which adheres strictly to the protocols and precautions on the use of recommended full PPE with powered air-purifying respirator (PAPR) as established in the guidelines for managing infectious disease cases, including sample collection.[6] PPE during autopsy includes scrub suits which consist of tops and trousers including garments, single-use fluid resistant, long sleeve gown, surgical mask or particulate respirator such as protective as a National Institute for Occupational Safety and Health (NIOSH)-certified N95, European Union Filtering Facepiece (EU FFP) 2 or equivalent, face shield or goggles, either autopsy gloves or two pairs of non-sterile gloves and knee-high boots.

There are also some guidelines for packing and transferring of the dead bodies from the isolation room to mortuary, crematorium or burial grounds. The work force, for instance the morgue staff, medical healthcare workers or the burial teams are expected to imply standard safety measures which incorporate hand hygiene when coming into contact with the dead body and the environment surfaces besides adhering to the proper level of PPE. With regards to COVID-19 unidentified bodies, procedures such as taking facial and multiple body photographs, fingerprints of both hands, scalp hair plucking using forceps including the hair bulb for DNA analysis should be preserved for usage of the identification process.[10]

External examination and auxiliary examination

Two precautionary measures, especially during the dissection have been emphasized. Firstly the use of blunt-ended scissors and PM 40 blades with rounded points focuses to limit the danger of sharp injuries, and the fresh unfixed organs must be held firm and sliced with a sponge on the table. The second relevant safety measures comprise the usage of an oscillating saw with vacuum suction extraction, and the needles should not be re-sheathed following sampling of fluid, and finally directly placing the needles and syringes in a sharp bin for safety purposes. Further investigation in confirming or establishing the post mortem diagnosis of COVID-19 infection includes immunohistochemical and molecular methods can be tested on formalin-fixed and formalin-fixed paraffin-embedded tissue specimens. Ideally, tissues collected are preferably 5 mm thickness, placed in the respective cassettes and followed by placement into a suitable container containing buffered formalin of 10% to be kept for 3 days for optimal fixation.[10] Post-autopsy, the dead body should be closed in the standard manner followed by further cleaning with damp towels and disinfectants. The body is then moved onto a shroud, wrapped firmly, sealed with tape, and afterwards zipped into a clean body bag and finally labeled by the personnel in-charge of the mortuary.[7]

Mortuary care

In Malaysia, claimants or next-of-kin of the dead persons are not allowed to open the sealed coffin or handle the body directly. Religious and ritual practices are to be performed minimally with adherence to the stipulated

safety precautions.[6] All probable or confirmed COVID-19 positive cases are prohibited from embalmment and the dead body is preferably to be taken for burial or cremation directly from the mortuary. Systematic review by the COVID-19 Systematic Urgent Reviews Group Effort (SURGE) group highlights that embalming is not recommended. If, however, it has to be done, then it must be done by trained personnel with strict protective procedures.[11] Burial and cremation are allowed to be carried out as long as there is no contact with the dead body and Malaysian standard operating procedures (SOP) are followed. The families and relatives are not permitted to directly be in contact with the body; hence touching or kissing the body is prohibited. Hand hygiene should be at optimum level to prevent infection.[10] The religious or ritual practices that are allowed including of the funeral prayer for non-Muslims and *tayammum* (purification) for Muslims, and this must be performed only on the outer body bag layer by the Islamic authorities under the supervision of the health authorities.[6] Body fluids from orifices should be contained, and a plastic shroud or a second body bag is a safe method to prevent fluid leakage.[7]

Infection Prevention and Control Measures

Due to the long viable period of COVID-19 virus to remain on inanimate surfaces, the environmental surfaces should be cleaned with soap and water, or a commercially available detergent solution, and preparation using surface disinfection with 0.1% sodium hypochlorite or 0.5% of hydrogen peroxide solutions with the contact time of 30 minutes or by using at least 70% ethanol can help in reducing the virus infectivity on surfaces within 1 minute exposure time.[10] In addition, COVID-19 has been proven to be inactivated by formalin fixation at room temperature.[7]

RECOMMENDATIONS

Forensic disciplines play a major role in combating the current pandemic, working closely with the police and many other related authorities to manage COVID-19 associated deaths. There have been some disputes whether or not to practice precautions during handling of COVID-19 associated dead bodies. Although there is still limited scientific evidence to show the exact infectivity of COVID-19 bodies, COVID-19 itself has been proven to be highly contagious and there are possibilities of contracting the disease via improper body handling. Therefore, in times of pandemic, there is no harm to practice extra precautions to prevent the spread of the disease. Various guidelines and protocols in the management of the dead bodies were produced throughout the recent years and many more updates may be made available especially with the emerging of new strain variants and the availability of vaccines.

ACKNOWLEDGEMENTS

We would like to thank the Dean, Kulliyyah of Medicine, Directors of SASMEC @IIUM and all the co-workers in the above named hospital who has contributed directly or indirectly to the report.

Competing interest

The authors declare that they have no competing interests.

REFERENCES

1. Yong SS, Sia JK-M. COVID-19 and social wellbeing in Malaysia: A case study. Curr Psychol. 2021 Sep 12;
2. World Health Organization. (2020). Infection prevention and control during health care for probable or confirmed cases of novel coronavirus (MERS-CoV) infection: Interim guidance. Who, (January), 1–3.
3. Lauer SA, Grantz KH, Bi Q, Jones FK, Zheng Q, Meredith HR, et al. The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported Confirmed Cases: Estimation and Application. Ann Intern Med. 2020 May 5;172(9):577–82.
4. Schröder AS, Edler C, Ondruschka B, Püschel K, Schädler J, Heinemann A, et al. The handling of SARS -CoV-2 associated deaths - infectivity of the body. Forensic Sci Med Pathol. 2021 Sep 2;17(3):411–8.
5. Dijkhuizen LGM, Gelderman HT, Duijst WLJM. Review: The safe handling of a corpse (suspected)

with COVID-19. J Forensic Leg Med. 2020 Jul;73:101999.
6. Khoo LS, Hasmi AH, Ibrahim MA, Mahmood MS. Management of the dead during COVID-19 outbreak in Malaysia. Forensic Sci Med Pathol. 2020 Sep 9;16 (3):463–70.
7. Lacy JM, Brooks EG, Akers J, Armstrong D, Decker L, Gonzalez A, et al. COVID-19. Am J Forensic Med Pathol. 2020 Sep;41(3):143–51.
8. Vidua RK, Duskova I, Bhargava DC, Chouksey VK, Pramanik P. Dead body management amidst global pandemic of Covid-19. Med Leg J. 2020 Jul 5;88(2):80 –3.
9. Xue Y, Lai L, Liu C, Niu Y, Zhao J. Perspectives on the death investigation during the COVID-19 pandemic. Forensic Sci Int Synerg. 2020;2:126–8.
10. Rani S. A review of the management and safe handling of bodies in cases involving COVID-19. Med Sci Law. 2020 Oct 16;60(4):287–93.
11. Yaacoub S, Schünemann HJ, Khabsa J, El-Harakeh A, Khamis AM, Chamseddine F, et al. Safe management of bodies of deceased persons with suspected or confirmed COVID-19: a rapid systematic review. BMJ Glob Heal. 2020 May 14;5(5):e002650.