

## Guidelines assessment and practices during COVID-19 autopsies

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### Abstract

'PANDEMIC': A word which shook the whole world due to the fear of severe acute respiratory syndrome (SARS) - coronavirus-2 (CoV-2) outbreak in Wuhan, China which affected myriad lives worldwide till date. These numbers are increasing rapidly causing an inevitable rise in autopsy cases. Many reputed organizations stepped forward and released guidelines regarding the post-mortem examination in suspected COVID-19 cases. At present we are equipped with various such guidelines. Centre of Disease Control (CDC), Royal College of Pathologists (RCP) and WHO guidance are considered worldwide which elaborate the risks, precautions and safety measures for the Health care worker. In India, Ministry of Health & Family Welfare (MOHFW) has framed the guidelines on dead body management. The following article is a review of the guidelines given by various apex bodies with a pragmatic approach regarding applicability and feasibility in the Indian scenario with certain recommendations.

### Keywords

COVID-19; CDC; RCP; WHO; MOHFW; Guidelines.

### Introduction

Many countries worldwide are raising concerns regarding Coronavirus Disease 2019 (COVID-19) since December 2019. Different associations and stakeholders have issued guidelines in different parts of the world for the management of dead bodies, the risks involved and protection of health professionals. The brief guidance by RCP following the outbreak of the COVID-19 emphasizes that if a death is confirmed as resulting from COVID-19 infection, there is no need for a post-mortem examination and the Medical Certificate of Cause of Death should be issued. It also recommends levels of staff experience to be mandated for undertaking risky maneuvers in HG3 cases.<sup>1</sup> CDC document provides specific guidance for the collection and submission of postmortem specimens from known or suspected deceased COVID-19 cases. It also provides recommendations for biosafety and infection control practices during specimen collection and handling and during autopsy.<sup>2</sup> The interim guidance is recommended by WHO for all those, including managers of health care facilities and mortuaries, religious and public health authorities, and families, who attend to the bodies of person, suspected or confirmed COVID-19 cases.<sup>3</sup>

The CAP (College of American Pathologists) Autopsy Committee recommends that only individuals properly trained

in performing EID (Emerging infectious diseases) autopsies, with adequate personal protective equipment (PPE) and appropriate facilities should perform autopsies on patients with known or suspected COVID-19.<sup>4</sup> DGHS, MoHFW, Government of India has issued guidelines on dead body management in COVID-19 and also on rational use of PPE.<sup>5, 6</sup> International Committee of the Red Cross (ICRC) issued general guidance for the management of the dead related to COVID-19 for those involved in the management of the dead in relation to the pandemic. This is divided into two levels- General guidance and support in the management (handling) of the dead- Technical recommendations for Healthcare & Death Care workers and Preparatory Guideline for a Mass Fatality Response Plan.<sup>7</sup>

In China, they have developed the Guide to Forensic Pathology Practice for Death Cases related to Coronavirus Disease 2019 (COVID-19) which describes the background investigation, autopsy room requirements, personal prevention and protections, external examinations, autopsy practices and auxiliary examinations for institutions and staff.<sup>8</sup> Imperial college, London have outlined the hazard group categorization, pathological features and approach to the autopsy in suspected COVID-19 cases to aid mortuary workers.<sup>9</sup> The interim guidelines by Italy recommends the management of corpse with suspect, probable or confirmed COVID-19 respiratory infection for the personnel potentially exposed to material from corpses, including body fluids, in morgue structures and during autopsy practice.<sup>10</sup>

According to a study on the resistance of severe acute respiratory syndrome corona virus, the virus can survive for 2 days in hospitals or domestic sewage and dechlorinated tap water, for 3 days in faeces, and 17 days in urine at 20°C away from light. However, at 4°C, the virus can survive longer than

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14 days in the above mentioned water settings, and longer than 17 days in faeces. Human coronaviruses can remain infectious on surfaces for up to 9 days.<sup>3</sup> In a case report of a patient dying with Middle Eastern respiratory syndrome corona virus, the virus was detected in nasal secretions even 3 days after death. Operators are highly likely to be infected with pathogens during the autopsy of infectious diseases when gloves and skin are punctured by sharp objects. Therefore, prevention and control measures should be taken seriously during postmortem examination in infectious disease deaths.<sup>8</sup>

### **Categorization of infectious hazards**

The categorization of infectious hazards across all areas of medicine is regulated by the Health and Safety Executive's (HSE) Advisory Committee on Dangerous Pathogens (ACDP). Control of substances hazardous to health (COSHH) defines four containment levels.<sup>1, 9</sup> These hazard groups (HG1–4) are assigned according to the risk of human infection, the likelihood spread and access to treatment or prophylaxis. HG3 agents can cause severe human disease and may be a serious hazard; the agent may spread to the community, but usually effective prophylaxis or treatment is available. SARS-CoV-2 has recently been categorized as a HG3 organism.<sup>1, 12</sup>

The incubation period of COVID-19 is approximately 14 days and at times lasts for 24 days or more.<sup>13</sup> It may be possible that a person can get COVID-19 with close contact (i.e. within about 6 feet) via respiratory droplets or by touching a surface or object that has the virus on it and then touching their own mouth, nose, or possibly their eyes.<sup>2</sup> In the mortuary infections may be acquired via puncture, skin contamination, ingestion, inhalation or contamination of mucosal surfaces.<sup>1</sup>

### **Obstacles to COVID autopsy**

These include the fact that even with the proper personnel equipment, and facilities, the risk of possible infection can be mitigated but not eliminated. A further complication in the case of COVID-19 is the unknown rate of asymptomatic carriage. Published estimates of the asymptomatic carriage are in the range of 18%- 30% with some authors suggesting even higher rates.<sup>10</sup> A preliminary report from China found that 59% of patients who tested positive were either asymptomatic or mildly symptomatic. The lack of a suspicious clinical history does not guarantee that a person is free of the novel coronavirus. In the face of these risks and uncertainties and the infrastructural demands of the COVID pandemic, some hospitals in USA have made the decision to temporarily suspend the performance of all autopsies.<sup>4</sup> Asymptomatic infected persons, patients in incubation period, unidentified dead bodies and cases with negative result may not meet the diagnostic criteria for

suspected cases, but should be treated as suspected COVID-19 death cases as false negative result is not uncommon.<sup>11</sup>

### **Information relevant to the autopsy & staged autopsy**

In cases of autopsies on patients with unknown COVID-19 status, COVID testing should be performed to ascertain status prior to performing the autopsy. This is referred to as a staged autopsy by the Royal College of Pathologists.<sup>4, 9</sup> The autopsy should also be performed in a manner to completely document co-morbidities.<sup>4</sup> Information about the circumstances of death, standard clinical information, location of death and knowledge of past (International) travel, laboratory data and microbiology data (positive and negative) are critical. In addition travel history of any relatives at home, any symptoms like fever, cough, cold and shortness of breath, any history of contact with suspect, any comorbid condition, recent visit to hospital, history of home quarantine, history of being tested for COVID are important. This information along with clinical features is important in identifying suspected cases.<sup>11</sup> It is important not to assume that the information provided is accurate.<sup>1</sup>

### **Biosafety and infection control practices during autopsy**

Safety and wellbeing of staff involved in managing the dead of COVID-19 should be the utmost priority. Latest recommendations from national and international health organizations are important.<sup>7</sup> All updated RCP and CDC guidelines for postmortem COVID-19 testing and autopsy procedures can be followed.<sup>1, 2</sup>

### **Human Resource Management & Mortuary Factors**

Inexperience and lack of upfront protective practices are risk factors for accidentally acquiring potentially severe infections. Training is to be provided to HCWs.<sup>5, 14</sup> Keep all the necessary equipment in the vicinity and close the door while performing the autopsy.<sup>8</sup> Allow only one person to cut at a given time, Dissect one body cavity at a time. Limit the number of personnel working in the autopsy suite at any given time.<sup>2, 4, 5</sup> Minimally invasive autopsies (MIA) with needle sampling is recommended by RCP.<sup>1</sup> A logbook including names, dates, and activities of all workers participating in the postmortem and cleaning of the autopsy suite should be kept to assist in future follow up, if necessary.<sup>2</sup>

The mortuary must be kept clean and properly ventilated. Aerosol generating procedures such as use of an oscillating bone saw should be avoided for known or suspected COVID-19

cases. Consider using hand shears as an alternative cutting tool. If an oscillating saw is used, attach a vacuum shroud to contain aerosols.<sup>1,2</sup> Round ended scissors and PM40 blades should be used.<sup>1,5</sup> CDC recommends the use a biosafety cabinet for handling and examination of smaller specimens and other containment equipment whenever possible.<sup>2</sup> Use caution when handling needles or other sharp objects, and dispose of contaminated equipment in puncture-proof, labeled closed containers. Clothing worn by deceased must be disposed of as contaminated special waste.<sup>8</sup> After the procedure, body should be disinfected with 1% Sodium Hypochlorite and placed in a body bag, the exterior of which will again be decontaminated with 1% Sodium Hypochlorite solution.<sup>5</sup> Instruments used during the autopsy should be cleaned and disinfected immediately after the autopsy.<sup>3</sup>

### Engineering Control Recommendations

Autopsies of known or suspected COVID-19 cases should be conducted in Airborne Infection Isolation Rooms (AIIRs). These rooms are at negative pressure to surrounding areas, have a minimum of 6 air changes per hour (ACH) for existing structures and 12 ACH for renovated or new structures, and have air exhausted directly outside or through a HEPA filter. If an AIIR is not available, ensure the room is at negative pressure with no air recirculation to adjacent spaces.<sup>2</sup> The recommended mortuary set up can be (biosafety level) BSL-2 or BSL-3.<sup>15</sup>

### PPE Recommendations

Check the integrity of the PPE.<sup>8</sup> The donning and doffing of PPE should be done cautiously. Double surgical gloves interposed with a layer of cut-proof synthetic mesh gloves, fluid-resistant or impermeable gown, waterproof apron, goggles or face shield, N-95 respirator or higher like PAPR (Powered, air-purifying respirators), surgical scrubs, shoe covers, and surgical cap should be used as per routine protocols.<sup>1,2,5,6</sup>

After removing PPE, discard the PPE in the appropriate laundry or waste receptacle. Reusable PPE (e.g., goggles, face shields, and PAPRs) must be cleaned and disinfected according to the manufacturer's recommendations before reuse. Immediately after doffing PPE, wash hands with soap and water for 20 seconds. If hands are not visibly dirty and soap and water are not available, an alcohol-based hand sanitizer that contains 60%-95% alcohol may be used.<sup>2</sup> PPE gives as much protection as reasonably possible against the majority of HG3 infections, including blood-borne viral agents. Only infective aerosols (e.g. TB) are not 100% protected against.<sup>1</sup>

### Collection of Postmortem Specimens

CDC recommends collecting and testing postmortem nasopharyngeal swabs (NP swabs) and if an autopsy is performed then lower respiratory specimens (lung swabs). RCP recommends BAL (Lower respiratory tract) and blood for serology also.<sup>2</sup>

The preferred specimens would be a minimum of eight blocks and fixed tissue specimens representing samples from the respiratory sites listed below in addition to specimens from major organs (including liver, spleen, kidney, heart, GI tract) and any other tissues showing significant gross pathology.<sup>1,4</sup> The recommended respiratory sites include:

1. Trachea (proximal and distal)
2. Central (hilar) lung with segmental bronchi, right and left primary bronchi
3. Representative pulmonary parenchyma from right and left lung<sup>2</sup>

### Cleaning and Waste Disposal Recommendations

Ensure workers are trained about hazardous chemicals used in the workplace. Keep ventilation systems active while cleaning. Use disposable gloves, long-sleeved fluid-resistant gown, eye protection, N-95 respirator. Use disinfectants that are believed to be effective against COVID-19. Use of tongs and other utensils can minimize the need for personal contact with soiled absorbent materials. Large areas contaminated with body fluids should be treated with disinfectant following removal of the fluid with absorbent material. Dispose of human tissues according to routine procedures for pathological waste. Clean and disinfect or autoclave non-disposable instruments using appropriate precautions with sharp objects. Materials or clothing that will be laundered can be removed from the autopsy suite in a sturdy, leak-proof biohazard bag that is tied shut and not reopened. These are then sent for laundering according to routine procedures. Wash reusable, non-launderable items (e.g. aprons) with detergent solution on the warmest setting possible, rinse with water, decontaminate using disinfectant, and allow items to dry completely before next use. Keep camera, telephones, computer keyboards, and other items in the autopsy suite clean by wiping after use with appropriate Environmental Protection Agency (EPA)-approved disinfectant. When cleaning is complete and PPE is removed, follow hand hygiene protocol.

### Safe management of dead body of COVID-19

The safety and well-being of everyone who handles bodies should be the first priority. The dignity of the dead, their cultural and religious traditions, and their families should be respected and protected. Standard infection prevention control

practices should be followed at all times. These include:

1. Hand hygiene.
2. Use of PPE.
3. Safe handling of sharps.
4. Disinfect bag housing dead body; instruments and devices used on the patient.
5. Disinfect linen and environmental surfaces.<sup>3,5</sup>

It is advisable to collect nasopharyngeal swabs at the emergency department/casualty/ward/ICU and then send it for COVID-19 RT-PCR test in all Suspected/ Latent/ Unascertainable cases before moving the body to mortuary for preservation if the same was not done procedurally. SARS-CoV-2 RNA may still be detected up to 3 days postmortem and possibly longer. The existing mortuary facility for body storage should be strictly divided into COVID-19 and Non COVID-19 bodies.<sup>11</sup>

### **Packing the Body for Transfer from patient room**

Remove all lines, catheters and other tubes. Ensure that any body fluids leaking from orifices are contained. Any puncture holes or wounds (resulting from removal of catheter, drains, tubes, or otherwise) should be disinfected with 1% hypochlorite and dressed with impermeable material. Plug oral and nasal orifices of the dead body to prevent leakage of body fluids. If the family of the patient wishes to view the body at the time of removal from the isolation room or area, they may be allowed to do so with the application of Standard Precautions. Place the dead body in leak-proof plastic body bag. The exterior of the body bag can be decontaminated with 1% hypochlorite. The body will be either handed over to the relatives or taken to mortuary. All used/ soiled linen should be handled with standard precautions, put in bio-hazard bag and the outer surface of the bag disinfected with hypochlorite solution. The health staff who handled the body should remove PPE, perform hand hygiene steps and provide counseling to family members.<sup>5</sup> Management of the emotional reactions of the relatives throughout the grieving process is often the prime responsibilities of the doctors.<sup>11</sup>

### **Environmental cleaning and disinfection**

As human coronavirus remains infectious on surfaces for days, cleaning the environment is of paramount importance. All surfaces of the isolation area (floors, bed, railings, side tables, IV stand, etc.) should be wiped with 1% Sodium Hypochlorite solution, allowing a contact time of 30 minutes and then be allowed to air dry. Environmental surfaces, where the body was prepared, should first be cleaned with soap and water, or detergent solution. After cleaning, disinfect with a minimum

concentration of 0.1% sodium hypochlorite (bleach), or 70% ethanol should be used on the surface for at least 1 minute.<sup>3</sup>

### **Transportation and Burial/Cremation**

The body, secured in a body bag, exterior of which is decontaminated poses no additional risk to the staff transporting the dead body. The personnel handling the body may follow standard precautions (surgical mask, gloves). The vehicle, after the transfer of the body to cremation/ burial staff, will be decontaminated with 1% Sodium Hypochlorite.<sup>5</sup>

COVID 19 body can be buried or cremated. Crematorium/ burial Ground staff should be sensitized that COVID 19 does not pose additional risk. The staff will practice standard precautions of hand hygiene, use of masks and gloves. Viewing of the dead body by unzipping the face end of the body bag (by the staff using standard precautions) may be allowed. Bathing, kissing, hugging, etc. of the dead body should not be allowed.<sup>3</sup> Ensure that family members reduce their exposure as much as possible. Children, older people (>60 years old), and anyone with underlying illness (such as respiratory illness, heart disease, diabetes, or compromised immune systems) should not be involved in preparing the body.<sup>3</sup>

The funeral/ burial staff and family members should follow hand hygiene after cremation/ burial. The ash does not pose any risk and can be collected to perform the last rites. Large gatherings at the crematorium/ burial ground should be avoided as part of the social distancing measure.<sup>5</sup>

### **Recommendations**

1. If death is confirmed due to COVID-19 infection, there is no need to conduct post-mortem examination and the Medical Certificate of Cause of Death should be issued.
2. Knowledge, experience, preparation and updating with recent protocols issued by the international and national associations and stakeholders are the key aspects in managing any possible COVID-19 post-mortem examination.
3. All health care workers- all the personnel associated with the care of the dead, from doctors to mortuary staff, to hearse van drivers and crematorium/ burial ground staff should follow the precautions in managing such cases.
4. Standard operation protocols for safe and effective practice are essential.
5. Staged autopsy is preferred in such situations.
6. Nasal swabs are the preferred method for confirming COVID-19 infection that can be obtained from the



deceased. If a deceased person is suspected of COVID-19 infection, nasal swabs should be taken and examined. This will improve the tracing and safety of the Health care worker and relatives involved in the process of body handling.

7. Ensure safe and dignified management of Covid-19 dead bodies including preservation, transportation and disposal.

**Conflict of interest:** None to declare

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