PROFESSIONAL BOARD FOR EMERGENCY CARE

SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS 2 (SARS-CoV-2) INFORMATION

BACKGROUND

In late December 2019, the World Health Organisation (WHO) China country office reported a cluster of pneumonia cases in Wuhan City, Hubei Province of China. This is now known to have been caused by a novel virus. The novel virus identified as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) has been confirmed as the virus that causes coronavirus disease 2019, now commonly referred to as COVID-19. Cases have been identified in over 200 countries, and the WHO has declared a global pandemic.[1]

EPIDEMIOLOGY OF COVID-19[2,3]

Based on the nature, spread and extent of the virus, predicting and reporting on the exact epidemiological characteristics remains difficult. In addition, the quality of the data from across the world differ. Early data (with reasonable sample sizes of patients with confirmed COVID-19) presented different rates of transmission and disease spread. A systematic review conducted in March, indicated that the extent of the pandemic was larger than originally anticipated. On average, it was found that an infected individual was infecting two to three other individuals every 3 – 7 days.

At the end of the first week in May, the WHO reported approximately 4 million cases globally, with approximately 273 000 deaths. Regionally, Europe and the Americas had a total of approximately 3.4 million positive cases with Africa experiencing a total of approximately 42 700 cases. South Africa had approximately 9420 cases, with approximately 186 deaths. Positive cases must be seen in context and in relation to the number of coronavirus tests being performed, this makes reporting exact rates complex. The Case Fatality Rate (CFRs) appears to vary significantly from region to region with CFRs ranging from 1% - 11%. Generally, the CFR appears to be lower than those experienced from previous coronaviruses such as SARS-CoV and MERS-CoV. To date, the exact extent and rate of spread is not clearly understood.

INFECTION AND TRANSMISSION SARS-COV-2[4,5]

Infection by the single-stranded RNA virus generally occurs via inhaled particles as small as aerosol (less than 5µm in size, which can stay suspended in the air for a long period of time), through to larger droplets (via coughing and sneezing, particles greater 20µm which may land on another individual or on a surface). This can lead to direct inoculation of the respiratory epithelium.

1. National Institute for Communicable Diseases. COVID-19 Quick References for Health Workers. https://www.nicd.ac.za/diseases-a-z-index/covid-19/covid-19-resources/
2. Park M, Cook AR, Lim JT, Sun Y, Dickens BL. A Systematic Review of COVID-19 Epidemiology Based on Current Evidence. Journal of Clinical Medicine. 2020, 9:967-979.
3. World Health Organisation (WHO). Coronavirus Dashboard. https://covid19.who.int
4. Gengler I, Wang JC, Speth MM, Sedaghat AR. Sinonasal Pathophysiology of SARS-CoV-2 and COVID-19: A Systematic Review of the Current Evidence. Laryngoscope Investigative Otolaryngology. 2020:1-6.
5. Arons MM, Hatfield KM, Reddy SC, Kimball A, James A, Jacobs JR et al. Presymptomatic SARS-CoV-2 Infection and Transmission in a Skilled Nursing Facility. New England Journal of Medicine. 2020; April. DOI: 10.1056/NEJMoa2008457

Other than contact with the droplets from a sneeze or cough, this direct inoculation can also occur when one touches a surface with a live virus and then subsequently touches the face, with specific regard to the mouth, nose and eyes.

It is further hypothesized that infection via the eyes occurs via drainage of virus-laden tears into the nasal cavity. Once in the respiratory tract (usually upper airway), the SARS-CoV-2 utilises its S1 spike glycoprotein to attach to the host target cells. Two host proteins are generally required for entry into the host cell. These two proteins (particularly Angiotensin Converting Enzyme -2 [ACE2]) are highly expressed throughout the aerodigestive tract, particularly in the nasal cavity, but is also found in other body systems (such as heart, ileum, kidney and bladder). Through this mechanism, the virus is predominantly transmitted through the upper respiratory tract. It has also emerged, that it appears that the virus can possibly be transmitted from one person to another, where the person transmitting the virus may not be experiencing any symptoms. This may prove to be problematic in terms of controlling the transmission of the virus.

Based on mode of transmission described above, the level and extent of Personal Protective Equipment (PPE) is discussed and rationalised later in the document. A sound understanding of the mode of transmission, can guide the choice of PPE used by emergency care personnel.

PATHOPHYSIOLOGY OF SARS-COV-2[6,7,8]

As described above, based on the high level of expression of the ACE2 in lung epithelial cells, it is generally accepted that the respiratory system and associated lung tissue is mostly involved. This is particularly evident on the apical side of the lung. After infection and as a part of the host response, epithelial cells, alveolar macrophages and dendritic cells form the main components of airway innate immunity. These dendritic cells and macrophages respond to the virus until adaptive immunity is involved. The subsequent, complex immune response is a known attractant for neutrophils and T-cells. Neutrophils, although an important component in the immune response, can also induce lung injury. In addition, cytotoxic T-cells can contribute to neutrophil induced lung injury and vascular permeability.

An additional proposed mechanism contributing to the pathophysiology is that of a “cytokine storm” of SARS-CoV-2 which is an exaggerated cytokine response as a result of an imbalanced response by T-helper cells and hypoxaemia (due to respiratory dysfunction). This “cytokine storm” is considered a contributor to myocardial injury in COVID-19. As a result of these mechanisms, patients can present with mild symptoms to severe respiratory failure presenting as Acute Respiratory Distress Syndrome.

Severe manifestation of COVID-19 may present as a multi-system clinical syndrome. The hyperinflammatory response, together with microvascular involvement, may induce a coagulopathy as a well as a tendency to develop thromboembolic events. As a result, acute cerebrovascular events may occur in severely ill patients. Additional complications of COVID-19 may include renal failure, gut and liver dysfunction. All of these possibly contribute to mortality.

6. Yuki K, Fujiogi M, Koutsogiannaki S. Clinical Immunology. Available online 20 April https://doi.org/10.1016/j.clim.2020.108427
7. Zheng YY, Ma YT, JY Zhang, X Xie. COVID-19 and the cardiovascular system. Nature Reviews Cardiology. 2020, 17:259-260.
8. Roberts M, Levi M, Schilling R, Wei SL, Grocott M, McKee M. COVID-19: a Complex Multisystem Clinical Syndrome. BMJ. 2020. https://blogs.bmj.com/bmj/2020/05/01/covid-19-a-complex-multisystem-clinical-syndrome/

Although the above highlights the severe course of COVID-19, the exact course of all patients diagnosed with COVID-19 is not yet well understood. There appears to be differences amongst patients from different regions, different risk-factors, and different age groups. As mentioned previously, it appears that South Africa's mortality rate is lower than other regions, with a high number of recoveries.

Although the initial cases were presented as a cluster of pneumonia cases, subsequent investigations and clinical experiences highlight that COVID-19 may or may not present as classic pneumonia. COVID-19 presents with a wide range of signs and symptoms.

CLINICAL FEATURES OF COVID-19[9,10]

As discussed above, patients with COVID-19 can experience a wide spectrum of signs and symptoms. Certain positive COVID-19 cases may remain asymptomatic, whilst others experience mild to severe signs and symptoms, including malaise through to multi-organ dysfunction.

Mild disease appears in the majority of cases. Mild disease signs and symptoms include mild fever, dry cough, sore throat, nasal congestion, malaise, headache, myalgia and diarrhoea. In mild cases, more severe signs and symptoms such as dyspnoea may not be present.

As signs and symptoms become more severe, albeit in fewer cases on initial presentation, respiratory distress may become evident. Very often, severe disease may present with tachypnoea (respiratory rate >30breaths/min) and reduced pulse oximetry values. Interestingly, it is possible that in even severe disease, these signs may be absent. In particular, hypoxaemia is a poor stimulus for dyspnoea, and thus, identifying hypoxaemia using only standard techniques may be difficult. Worsening disease may present as Acute Respiratory Distress Syndrome (which requires clinical and ventilatory criteria) and associated respiratory failure.

As can be seen from the above-mentioned clinical features, it is possible that mild signs and symptoms could be mistaken for a simple upper respiratory infection as well as more serious conditions such as bacterial pneumonia. Further to this, it is possible to categorise a patient experiencing these signs and symptoms as a COVID-19 sufferer when in-fact, this is not the case. Therefore, it is important to rather identify and further investigate and test for the presence of the disease as opposed to making a diagnosis of COVID-19 from signs and symptoms alone. The identification and further investigation of such signs and symptoms places the patient within the "Person Under Investigation (PUI)" category.

PROCEDURE IN RELATION TO A "PERSON UNDER INVESTIGATION (PUI)"[10]

As described above, it is possible to inappropriately diagnose or misdiagnose a patient suffering from respiratory illness signs and symptoms as a COVID-19 sufferer. Therefore, the National Institute for Communicable Disease (NICD) has established criteria to further investigate whether a patient is indeed suffering from COVID-19.

9. Cascella M, Rajnik M, Cuomo A, Dulebohn S, Di Nappoli R. Features, Evaluation and Treatment. StatPearls. April 2020. https://www.ncbi.nlm.nih.gov/books/NBK554776/
10. National Institute for Communicable Disease. Guidelines for case-finding, diagnosis, management and public-health response in South Africa. March 2020. https://www.nicd.ac.za/wp-content/uploads/2020/03/NICD_DoH-COVID-19-Guidelines-10March2020_final.pdf
11. Wilcox S. Management of Respiratory Failure due to COVID-19. BMJ. 2020: 369:m1786. https://doi.org/10.1136/bmj.m1786

Keeping in mind that COVID-19 cases are considered a Category 1 Notifiable Medical Condition (require immediate reporting by the most rapid means available by a written or electronic notification to the Department of Health within 24 hours of diagnosis), it is essential that healthcare providers, including emergency care providers, are familiar and implement strategies to ensure that patients are identified and potentially categorised as a Person Under Investigation.

Below, the criteria for categorising a PUI:

Criteria for person under investigation (PUI) (Page 10):

Persons with acute respiratory illness with sudden onset of at least one of the following: cough, sore throat, shortness of breath or fever [≥ 38°C (measured) or history of fever (subjective)] irrespective of admission status **AND**
In the 14 days prior to onset of symptoms, met at least one of the following epidemiological criteria:

- Were in close contact[1] with a confirmed[2] or probable[3] case of SARS-CoV-2 infection;

OR

- Had a history of travel to areas with local transmission of SARS-CoV-2; (NB Affected countries will change with time, consult the NICD website for current updates);

OR

- Worked in, or attended a health care facility where patients with SARS-CoV-2 infections were being treated;

OR

- Admitted with severe pneumonia of unknown aetiology

[1] Close contact: A person having had face-to-face contact or was in a closed environment with a COVID-19 case; this includes, amongst others, all persons living in the same household as a COVID-19 case and, people working closely in the same environment as a case. A healthcare worker or other person providing direct care for a COVID-19 case, while not wearing recommended personal protective equipment or PPE (e.g., gowns, gloves, NIOSH-certified disposable N95 respirator, eye protection). A contact in an aircraft sitting within two seats (in any direction) of the case, travel companions or persons providing care, and crew members serving in the section of the aircraft where the case was seated. [2] Confirmed case: A person with laboratory confirmation of SARS-CoV-2 infection, irrespective of clinical signs and symptoms. [3] Probable case: A PUI for whom testing for SARS-CoV-2 is inconclusive (the result of the test reported by the laboratory) or who tested positive on a pan-coronavirus assay.

Clinicians should also be vigilant for the possibility of atypical clinical presentations among immunocompromised patients. Consider the possibility of influenza (Northern Hemisphere season ends in April or May) and bacterial pneumonia and manage accordingly.

NICD CRITERIA FOR PERSON UNDER INVESTIGATION (https://www.nicd.ac.za/wp-content/uploads/2020/03/NICD_DoH-COVID-19-Guidelines-10March2020_final.pdf)

If an individual has been identified as a PUI, the NICD recommends the following:

Notification of cases and additional support: Appendix 4

- All PUI should be notified to the district provincial communicable disease control coordinator (CDCC) as per notifiable medical condition procedures (see Appendix 4 and 11 for contact details), or the NICD http://www.nicd.ac.za/notifiable-medical-conditions/.
- Clinicians should discuss the case with doctor on call before collecting and sending specimens for testing at **NICD Hot line: +27 82 883 9920 or +27 66 562 4021**

From the above, (and being a Category 1 notifiable condition) escalation and subsequent monitoring and intervention is key. This is particularly relevant to emergency care providers. Emergency care service providers are strongly encouraged to develop an internal procedure that provides ongoing training regarding identification of the PUI. These tools can be supported with local and regional data indicating areas of high transmission and infection.

Broader emergency care system processes needed to guide emergency care providers (registered individual) and emergency care service provider (in which the registered individual is functioning) once a PUI has been identified are just as important. This entails an agreed-upon escalation procedure with local, regional and provincial authorities to ensure that the PUI is adequately followed-up on, and in the appropriate circumstances, transported to a designated facility, or alternatively isolated at home. The PBEC encourages registered emergency care providers to enquire and familiarise themselves with the relevant emergency service provider procedures once a PUI has been identified. The PBEC is aware that there are a number of public and private emergency service providers who may or may not identify a PUI, and thus, local, regional and provincial familiarisation and coordination of the procedure for a PUI is essential.

COUNTRY RESPONSE TO COVID-19[12]

Subsequent to an increase in the number of cases and suspected cases, South Africa experienced a "national lockdown". This "lockdown" commenced at midnight on the 26th of March 2020 after the declaration of a state of disaster. This announcement of the "lockdown" was in support of two fundamental strategies to counteract the spread of the virus:

1. Suppression – the aim of this is to reduce the reproduction, (R), to below one. The reproduction number is defined as the average number of secondary cases each case generates. To do this, several non-pharmaceutical interventions (NPIs) are implemented. These NPIs include case isolation at home, voluntary home quarantine, social distancing of certain populations, social distancing of entire populations and the closure of places where people gather (workplaces, schools, universities, entertainment venues etc.).

2. Mitigation – the aim here is to use NPIs (and drugs and vaccines where available), not to interrupt transmission completely, but to rather reduce the health impact of an epidemic. In this way, resources are directed accordingly within a phased process, and allows for population immunity to build through the epidemic leading to an eventual rapid decline in case transmission and subsequently case numbers.

Early indications show that the infection rate and CFR have remained consistent in relation to the number of tests performed. During this period, hospitals did not experience a surge in patients presenting with COVID-19 disease. However, as South Africa moves into a state of stratified or modified lockdown, commonly termed "lockdown levels". The medium term will determine to what extent the country is grappling with the pandemic. The period of "lockdown" has given an opportunity for healthcare policy makers, facilities and providers to strengthen and capacitate existing infrastructure for an expected rise in infections and cases of patients seeking care.

12. Imperial College London. Report 9 - Imperial College COVID-19 Response Team, Impact of Non-Pharmaceutical Interventions (NPIs) to reduce COVID-19 Mortality and Healthcare Demand. March 2020.

It is critical, at this stage, that community healthcare workers through to tertiary facilities develop an integrated approach and response to an anticipated rise in COVID-19 cases. An integral part of this approach includes the involvement of emergency service providers and those working within the emergency care environment.

EMERGENCY CARE RESPONSE TO COVID-19

For a successful response to the pandemic, all sectors within the healthcare domain will be expected to deliver a coordinated effort in identifying (PUI), testing, decision-making related to patient conveyance, monitoring and treating of COVID-19 patients. In addition, this also requires a process of contact tracing to identify potential COVID-19 patients. This has commenced in several provinces throughout the country.

Below, are certain broad recommendations with specific regard to the response to the COVID-19 patient in the emergency care environment. It must be stated that an effective response to the COVID-19 patient consists of adequate and considered call-taking, response, personal protection (provider and equipment), treatment and transport considerations. The PBEC is mindful of the fact that certain emergency service providers will have nuanced approaches to elements of the recommendations below. These nuances should be communicated clearly to emergency care providers, and in addition, should be determined in conjunction with local, regional and provincial authorities.

EMERGENCY MEDICAL SERVICE CALL-TAKING AND DISPATCH[13]

As with all emergencies, accurate capturing of details related to the incident at the time of call receipt is vital to:

a.) identify the nature of the emergency, and

b.) to identify features and factors that may support emergency care providers responding to the incident in categorising the case as a potential PUI (described above).

It is acknowledged that based on language barriers, quality of telephone connection and lay-person familiarity with signs and symptoms that accurate information is not always possible. However, emergency service providers are encouraged to implement procedures that assist call-takers and dispatchers to identify incidents that involve possible COVID-19 patients. This information should be provided timeously to responding emergency care providers. Emergency service providers are encouraged to identify dedicated teams and structures that deal with suspected and positive COVID-19 cases in the call-taking and dispatch environment. This is important as the administrative load related to these cases is generally higher (from an external reporting perspective) than most other emergency cases.

13. Centre for Disease Control (CDC). Interim Guidance for Emergency Medical Services (EMS) Systems and 911 Public Safety Answering Points (PSAPs) for COVID-19 in the United States. March 2020. https://www.cdc.gov/coronavirus/2019-ncov/hcp/guidance-for-ems.html

Although no validated dispatch guidelines for COVID-19 patients exist, it would be appropriate to dispatch the minimum number of resources required to manage the presenting condition. The need for a multi-tiered response may require careful consideration when considering the number of emergency care providers that may be exposed to a confirmed COVID-19 patient. Certain guidelines, however, do recommend an additional emergency care provider to be present. The aim is for this person to perform non-clinical duties such as driving and situational communication to facilities and other role players.

This minimises the need for treating emergency care providers to repeatedly don and doff PPE to perform non-clinical and administrative duties in cases where COVID-19 has been identified. This is particularly relevant in the interfacility transfer context.

It is important to remind emergency service call-takers and dispatchers that callers may be activating emergency services for COVID-19 related signs and symptoms, or alternatively, for signs and symptoms not related to COVID-19 where COVID-19 may be present. Thus, a standard approach to identify possible COVID-19 patient (regardless of presenting symptomatology) should be implemented. Once the emergency care providers have assessed and applied the criteria for a PUI (as described above), it is essential that emergency service providers advise the relevant authorities in line with the Category 1 notifiable medical conditions procedure highlighted above. In addition, when transport is considered, the preparedness of the receiving facility must be confirmed.

PERSONAL PROTECTIVE EQUIPMENT (PPE) AND HAND HYGIENE PRACTICES

Emergency care providers are expected to respond to, assess, treat and make a recommendation regarding transport for all emergency cases that they encounter, including COVID-19 patients. SARS-CoV-2 patients, like any other patients suffering from communicable diseases (tuberculosis, hepatitis, meningitis etc) are entitled to emergency medical treatment as enshrined in the Constitution of the Republic of South Africa. Emergency care providers are reminded that based on the nature and scope of emergency care work that they are not permitted to refuse emergency medical treatment to any person requiring such. One area of concern, however, is related to the safety of emergency care providers. This is with specific regard to exposure and possible infection of SARS-CoV-2 whilst engaged in the delivery of emergency care. It is, therefore, mandated that adequate PPE is worn cases of suspected or confirmed COVID-19. With the correct PPE and hygiene practices, emergency care providers can safely assess, treat and transport (if necessary) COVID-19 patients.

Legislation requires that employers provide (at the cost of the employer) suitable protective equipment and clothing to employees to allow them to perform their work safely. Emergency medical services are thus mandated to provide adequate PPE to emergency care providers.

Based on the nature of the pandemic, the global demand for PPE has increased dramatically. In certain countries and regions, shortages of PPE have led to an increased risk of healthcare worker exposure to SARS-CoV-2. This actual risk has been further complicated by inaccurate information regarding the spread and transmission of the virus. As a result, a general fear and stigmatisation of COVID-19 patients has developed and in conjunction with the novelty of the disease, this may have translated to reduced care for COVID-19 patients.

Although the apprehension is acknowledged, it is important to base decision-making and guidelines regarding PPE and hygiene practices around objective data related to the virus, its infection and transmission patterns. As described above, the virus is spread through aerosol/droplet spread which

comes into contact with an exposed persons aerodigestive tract.[4,13] This means that either direct contact with the droplets/aerosol occurs, or transfer from the treating provider's hands to the face, mouth, eyes and nose occurs may lead to infection.

In relation to PPE, the following is recommended:[14]

Emergency Medical Services (EMS)			
Setting	Target Personnel or Patients	Activity	Type of PPE or Procedure
Ambulance/transfer vehicle	**Clinical staff**	Care for and transport of **suspected COVID-19 patients** to a referral health care facility	Surgical mask A40 suit (apron not practical when worn outside, especially if windy) Non-sterile Gloves Eye protection (goggles or visor)
	Clinical staff	**Intubation and suctioning** of suspected COVID-19 patients	N95 Respirator A40 suit (apron not practical) Non-sterile Gloves Eye protection (goggles or visor)
	Suspected COVID-19 patient	While being **transported**	Surgical mask
	Cleaners	**Cleaning the vehicle** after transport of suspected COVID-19 patients to the referral facility	Surgical mask Apron Eye protection (goggles or visor) Long rubber utility cleaning gloves (ideally up to elbow) Closed work shoes

It is acknowledged that local guidelines from the National Institute for Communicable Disease (NICD) recommend the A40 suit for the care and transport of suspected COVID-19 patients to a referral healthcare facility. However, it is also important to understand the purpose and role of an A40 suit. An A40 suit is a double-layer fabric suit which is resistant to most aerosols, sprays and splashes. In the context of SARS-CoV-2, the aerosols, sprays and splashes still need to be transmitted to the face, mouth, nose and eyes of the treating provider for transmission to occur. In addition, the sprays, splashes and aerosols generated by the patient need to be of such a nature and volume that sufficient splash, spray and aerosol can be conveyed to cover the suit/clothing and then subsequently to the face, mouth, nose and eyes of the treating emergency care provider. This generally occurs when symptoms are severe. The risk of this spray/splash/aerosol is further reduced the sooner the suspected patient wears a surgical mask. Although considered impractical, in certain instances an apron may be effective in place of an A40 suit. Emergency service providers and emergency care providers are encouraged to develop dynamic policies and procedures to ensure safety of workers and patients as well ensuring sustainability and availability of PPE.

14. National Institute for Communicable Disease. COVID-19 Disease: Infection Prevention and Control Guidelines. April 2020. https://www.nicd.ac.za/wp-content/uploads/2020/04/Covid-19-Infection-and-Prevention-Control-Guidelines-1-April-2020.pdf

As highlighted above, N95 masks (filters approximately 95% of airborne particles) are a mandatory item whilst performing Aerosol Generating Procedures (AGPs). Aerosol Generating Procedures include (but may not be limited to):

- Tracheal intubation and associated procedures (including surgical airways)
- Oro and nasopharyngeal suctioning
- Bag-valve-mask ventilation
- Nebulisation
- Cardiopulmonary Resuscitation
- Oxygen mask manipulation
- Administration of pressurised humidified oxygen
- High-flow nasal oxygen administration

For N95 masks to be effective, seal tests should be performed. These include both negative and positive seal tests*:

Negative seal check:

- Coned shape respirator: Cup hands over respirator without excessive pressure. Breathe in sharply. A light collapse of the respirator should be felt with no air leaking in around the face to-face piece seal.
- Duck- bill and V-flex type respirator: Breathe in sharply. The respirator should collapse inwards.

+ Positive seal check:

- Coned shape respirator: Cup hands over respirator. Blow out. A build-up of air should be felt with no air leaking out around the face-to-face piece seal edges of the device.
- Duck-bill and V-flex type respirator: Breathe out forcefully; the respirator should expand on the exhale.

*to be performed prior to exposure to engaging in any clinical contact/activity

In the context of a global shortage of PPE, there are further recommendations related to the extent to which PPE may be re-used/continued to be worn. These appear below:

Type of PPE	Extended use	Reprocess
Gloves (non-sterile)	No	No
Face masks	Yes. Until damp or torn, or to end of shift. Change if contaminated	No
N95 respirators	Yes. Up to 1 week for same HCW (as TB protocol), unless respirator integrity or leak-proof seal is compromised	Pending (WHO)
Aprons	Yes, if not visibly contaminated (maintain 1m distance)	No
Gown Cotton gowns and aprons	Water resistant - yes if not visibly contaminated (1m)	Yes - launder cotton
Goggles	Yes but do not contaminate hands	Yes - wash with soap and water. Dry. Wipe over with alcohol wipes
Face shields	Yes, but do not contaminate hands	Yes - wash with soap and water. Dry. Wipe over with alcohol wipes

RECOMMENDATIONS REGARDING EXTENDED USE OF PPE

The above-mentioned are the current, recommended guidelines in relation to PPE. However, it must be stressed, that inappropriate hygiene practices may make PPE ineffective. It is therefore, important that emergency care providers are reminded, regardless of the level of PPE that if hygiene practices are not followed, risk of transmission and infection still exist. Greater emphasis on hand-washing and disinfection procedures prior to donning and after doffing PPE will reduce the risk of transmission considerably. Finally, the use of "non-medical/cloth masks" is not recommended in the context of healthcare activities. Surgical masks and N95 masks are to be reserved for healthcare providers and patients (surgical masks) suspected of suffering from COVID-19.

EQUIPMENT AND VEHICLE HYGIENE PRACTICES[15,16]

Besides good personal hygiene practices, surface decontamination and hygiene are equally important. Where possible, (and if the nature of the case is known beforehand), equipment that is not required for a specific can be removed to prevent unnecessary exposure Thorough ambulance and equipment cleaning is recommended for all cases, regardless of whether COVID-19 was suspected or not. Keeping in mind that certain COVID-19 patients may be asymptomatic, large droplets that have fallen on the equipment or ambulance surfaces may contain the virus. Human coronaviruses, in general, are known to persist on inanimate surfaces such as metal, glass or plastic for up to 9 days. Emergency care providers are reminded that virus transmission can occur when touching these surfaces and then touching one's face, mouth, eyes or nose.

Whilst little is known about this novel virus, similar genetic characteristics between SARS-CoV-2 and MERS-CoV suggest that this novel virus is susceptible to the same disinfectants which have proved effective against enveloped viruses. These include:

- Sodium Hypochlorite (*Bleach:* 5000 parts per million - ppm [0.5%] for general surface cleaning and 10 000ppm [1%] for disinfection of blood or body fluid spills)
- 62% - 71% Ethanol
- 0.5% Hydrogen Peroxide
- Disinfectants containing quaternary ammonium compounds

When using these agents, it is important to allow for adequate contact time (minimum 10 minutes) and the correct concentration. Manufacturer guidelines should further guide use of the various agents.

EXPOSURE OF EMERGENCY CARE PROVIDERS TO SUSPECTED AND CONFIRMED COVID-19 CASES

Although local, regional and provincial authorities may have specific guidelines outlining procedures that are required when healthcare workers are exposed to COVID-19 patients, all would generally follow a risk-based assessment. Emergency service providers are strongly urged to establish policies and procedures in relation to post COVID-19 patient exposure monitoring and surveillance of emergency care providers.

15. World Health Organisation (WHO). Laboratory Biosafety Guidance related to Coronavirus Disease 2019 (COVID-19). February 2020. https://apps.who.int/iris/bitstream/handle/10665/331138/WHO-WPE-GIH-2020.1-eng.pdf
16. Jiang B, Wang T, Du Z, Zhu F, Cao Z, An Y et al. Comorbities and Multi-Organ Injuries in the Treatment of COVID-19. Lancet. 2020;395(10228): E52. https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30558-4/fulltext

TREATMENT OF COVID-19 PATIENTS[11,16]

To date, there is neither a specific treatment nor a vaccine for COVID-19. A wide range of trial therapies are currently undergoing testing, but none have shown overwhelmingly positive results. Primary care, emergency care and critical care is supportive in nature.

A thorough assessment of the patient must take place to determine any acute/life-threatening conditions. One of the most serious consequences of COVID-19 is acute hypoxaemic respiratory failure. Currently recommendations suggest supplemental oxygen delivered either via nasal cannula or oxygen mask.

Target saturations of between 92% and 96% are considered adequate in the acute stages. Further escalation involving non-invasive positive pressure ventilation, high-flow nasal cannula and early intubation remain unanswered and controversial. Considering the risks associated with provider exposure and aerosol generating procedures, all attempts should be made at maintaining target saturations with the least invasive means possible. This includes patient coaching, optimisation of FiO_2, and altering different oxygenation techniques.

At this stage, a single approach is not likely to be successful in a disease with such heterogeneity. Determining more invasive airway management techniques and the related considerations should be done within a team context and should not be performed in isolation as an emergency care provider. Implications regarding referral facilities, resource availability, practitioner safety and physiological reserve are a serious consideration when considering invasive airway management techniques.

Various societies and organisations have published specific guidelines related to conditions that may be experienced in the context of COVID-19 such as cardiac arrest.[17] Emergency care providers are, again, reminded regarding personal safety in the context of aerosol generating procedures.

NON-TRANSPORT OF SUSPECTED COVID-19 PATIENTS[17]

The WHO recommends that non-urgent, severe, and critical care patients are not immediately transported to potentially over-crowded or unprepared healthcare facilities. Once a PUI has been identified, and the patient's condition allows, it would be reasonable to delay transport to determine whether a.) further testing/monitoring can take place at home, or b.) transport is facilitated to a specific referral facility equipped to test and possibly admit COVID-19 patients.

According to the WHO, mild cases should be instructed to self-isolate and contact COVID-19 information lines for advice on testing and referral. However, because EMS may have been activated for these specific cases, it would be appropriate for the emergency care provider and emergency service to facilitate such discussions with the relevant authorities. Decisions to not transport patients, should be done within a comprehensive system where adequate support structures are in place to ensure patients are followed-up. The HPCSA has recently published updated guidelines regarding telemedicine during and applicable for the duration of the COVID-19 pandemic.[18]

17. Resuscitation Council of Southern Africa. COVID-19 Pandemic in Sub-Saharan Africa – Resuscitation Considerations. 2020 March. http://resus.co.za/wp-content/uploads/RCSA_CPR_Covid-19-1.pdf
18. Health Professions Council of South Africa. Guidance on the application of telemedicine guidelines during the COVID-19 Pandemic. 2020 March. https://www.hpcsa.co.za/Uploads/Events/Announcements/APPLICATION_OF_TELEMEDICINE_GUIDELINES.pdf

These guidelines can be used to augment existing internal emergency service escalation and consultation processes. Emergency care providers are reminded, that regardless of telemedicine support, they are to perform procedures only within their scopes of practice in which they are registered.

EMERGENCY CARE PROVIDER MENTAL WELLBEING[19]

The COVID-19 pandemic has put both the general member of the public as well as healthcare worker at an increased risk of moral injury. This could pose a threat to the mental health of all healthcare workers tasked with dealing with the pandemic. Emergency service provider employment structures must ensure that adequate support exists to support the mental health of emergency care providers. Emergency care providers can be supported by reinforcing team and community work and within these structures fear and anxiety can be shared. Emergency care providers should be actively monitored and supported. In cases where treatment regarding mental health is required, evidence-based approaches are recommended.

CONCLUSION

Although this document does not encompass all aspects related to the role of emergency care providers in the COVID-19 pandemic, it intends providing key information and general principles regarding the response by emergency care providers. It is acknowledged that emergency service providers and health authorities will have detailed operating procedures to deal with consequences of the pandemic. Finally, emergency care providers are encouraged to consult and revise national and international COVID-19 guidelines as information regarding the virus, its transmission and its treatment develop, certain principles may change.

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