

Personal Protective Equipment Use for COVID-19 Patients in Intensive Care Unit

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Cite this article as: Turkoglu M. Personal Protective Equipment Use for COVID-19 Patients in Intensive Care Unit. J Crit Intensive Care 2020; 11(Suppl. 1):1–3.

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Received: May 26, 2020

Accepted: May 27, 2020

Available online: Jun 22, 2020

ABSTRACT

World Health Organization (WHO) declared severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection disease (COVID-19) as pandemic in March 2020. Although understanding of many issues related with this virus are evolving we know that it has a high capability of rapid spread. Transmission of the virus is mainly thought to be via respiratory droplets but both contact and airborne transmissions were reported. This review will provide some recommendations on proper use of personal protective equipments (PPE) for healthcare professionals working in intensive care units (ICU) to control the spread of infection when dealing with patients with suspected or confirmed COVID-19 disease.

Keywords: Critical Care, Transmission, Prevention And Control, Contact Inhibition

Introduction

A novel coronavirus called acute respiratory syndrome coronavirus 2 was first identified in Wuhan, China at the end of 2019. The virus caused a multisystemic disease, called 2019 coronavirus disease (COVID-19) with the respiratory system effected most. Because of its character of rapid spread, it was seen all over the world in a short time and was accepted as pandemic in March 2020 by World Health Organization (WHO). While health care professional started to treat this new type of virus, many issues remained dissolved, including the transmission ways and how the proper use of personal protect equipment (PPE) for preventing dissemination was.

This review will provide the information about transmission and some recommendations on proper use of PPE for healthcare professionals working in intensive care units (ICU) to control the spread of COVID-19 infection between the health care professionals with the current literature.

Transmission of the virus

Under current evidence, it is thought that COVID-19 infection spreads from one person

to another person mainly by respiratory droplets (1). The virus infects the others directly when these droplets reach the mucosal membranes of susceptible ones. This is the direct way of transmission. Coughing, sneezing and even talking is enough for spread of these droplets from one person to another person. A secondary transmission is reported as via contact with already contaminated surfaces and then touching to mucosal membranes that is eyes, nose, mouth or rectum. This is as indirect transmission. The third way of transmission was also thought to be through aerosols which are particules smaller than 5 μ occurring during the aerosol-generating procedures or treatments. The aerosols suspends in the air longer time then droplets and travels further with air flow. Many procedures or treatments in the ICU have the potential of aerosol generation. Bronchoscopy, respiratory tract sampling, nebulizing therapies, high-flow oxygen therapy by venturi mask and high flow nasal canule, non-invasive mechanical ventilation, intubation, manual ventilation with ambu bag, filter changes, open suctioning on ventilators, tracheotomy, upper endoscopy are the well known ones (1,2).

Infection control measures

Because of three ways of transmission for the virus described above, droplet, contact and also airborne measures (during aerosol-generating procedures or treatments) are warranted for preventing spread of the infection. The proper isolation of the patient and proper use of PPE have been shown to prevent effectively the transmission of the virus (3).

1. Room isolation

According to droplet and contact isolation measures, all critically ill patients with possible or definitive COVID-19 infection should be placed in a single occupancy room with a closed door. If it is not possible, patients with confirmed COVID-19 disease can be cohorted in a single room together (1).

It should be prioritized that patients undergoing aerosol-generating procedures/treatments should be placed in a single-patient room at negative-pressure with a minimum of 6 air changes per hour. If it is not possible the patient should be placed in a single occupancy room or in a cohorted area as last choice. All the health care professionals should give a time break for removing of infectious particles after an aerosol-generating procedure or treatment before entering the room of the patient. The time for removal of infectious particles depends on the number of air exchanges per hour (4).

2. Use of proper personal protect equipment

All health care workers in the ICU must wear PPE while entering suspected or confirmed COVID-19 patient room. They should use masks, gowns or coveralls, gloves, eye or face protection (goggles or face shields) during routine examination, treatment and patient care according to droplet and contact isolation measures. During aerosol-generating procedures or treatments, respirators (N95 or other respirators including FFP2 masks) should be worn due to airborne isolation measures (5).

a. Masks: medical masks or respirators ?

According to droplet precautions during the routine care of patients, medical masks are enough for suspected or confirmed COVID 19 patients. However for aerosol-generating situations respirators are warranted due to airborne precautions. But there is a dilemma about use of respirators instead of medical masks during the routine care of these patients. General tendency is use of respirators routinely when entering these patient's room. There are also differences in recommendations of guidelines. While WHO recommends medical masks for routine care, CDC (Center for Disease Control) recommends respirators for routine care if there is no lack of equipment. Because in many institutions there are not enough negative pressure isolation rooms available in Turkey and there isn't a known certain time for aerosols cleaning after aerosol generating situations, we recommend use of respirators during routine care of patients if there is no lack of PPE.

Medical masks should not be reused and should be changed if necessary. Respirators can be reused unless proper conditions

provided. Respirators can maintain their filtering functions during 8 hours of active use in intermittent and continuous use. If intermittent reuse of respirators is required, for saving a surgical mask should be worn on to the respirators to reduce the risk of surface contamination. Masks that are kept for re-use should be kept in a breathable and clean environment, and the attention should be paid on not touching the outer surface of the mask when putting on and removing.

b. Gowns and gloves

Gowns and non-sterile gloves should be worn upon entry of the patient room or area according to contact precautions. There is a tendency to wear double gloves in some hospitals in various countries but there is no such a data demonstrating the preventive role of double gloves (5).

c. Eyes or face protection: goggles and face shields

Because of potential transmission of virus via eyes, nose and mouth, eyes and face protection is warranted during the care of patients with suspected or confirmed COVID-19 patients. Goggles and/or a face shield that covers the face should be used (1).

d. Coveralls, medical caps, shoes covers

Coveralls, medical caps and shoes covers are not included in standard contact, droplet and respiratory precautions. But, due to the high transmission potential of the virus, some institutions use these in high-risk situations in where intense contact with the body's fluid and secretions may occur. In Turkey general practice is to use coveralls and medical caps and shoes routinely entering in to the patient room or area. We think that weather coveralls, medical caps, shoes cover are needed to wear on should be decided on a patient basis.

It was well documented that contamination often occurs during putting on and putting of the PPE. So, during putting on and removing PPE, the attention should be paid on to wearing and removing order and hand hygiene should be applied after each step. PPE should be worn with the order of gown, mask, goggles / face protector and gloves. The order of removing PPE should be gloves, goggles /face protectors, gowns and masks. Masks should be removed after leaving the patient's room or area at last. It should be avoided contact of hands with face and environment when the PPE are on and in case of tearing, damage and heavy contamination of PPE, it should be replaced with new ones

Conclusion

SARS-CoV-2 virus is a new type of corona virus, has been recently announced as pandemic by WHO. Although understanding of many issues are still evolving, three ways of transmission have been reported for the disease. Proper use of PPE in the healthcare settings is the effective way for preventing the transmission of disease.

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