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Recommendations for the Rational and Effective Use of Personal Protective Equipment (PPE): Guidelines for Extended Use, Re-use and Acceptable Reprocessing Methods

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The COVID-19 pandemic is exerting tremendous pressure on all healthcare systems worldwide. Strategies must be employed to care for patients the best we can while protecting health care workers (HCWs) from contracting the disease themselves. DOH has confirmed that community transmission of COVID-19 has been sustained since March, thus it is prudent to consider all patients as a suspect for COVID-19.[1] Ensuring the availability and appropriate use of personal protective equipment (PPE) is necessary for the safety of healthcare workers, especially during this time. The mandate to protect the health care workers from COVID-19 has resulted in an alarming increase in demand for PPE worldwide, especially in healthcare facilities, leading to a shortage in some areas.

A report from the Philippines[2] calculated that at least 12 PPE per patient per day is required whenever a suspected COVID-19 patient seen at the emergency room, who will undergo multiple diagnostic tests, will be admitted and monitored in 8-hour work shifts. Hence, at least 168 PPE sets from admission to discharge will be utilized in 14 days, which is the usual duration of hospital stay of COVID-19 patients. If the patient will require a surgical procedure, an additional of at least 10 PPE sets will be needed, excluding subsequent needs for the postoperative care of the patient. Using these figures, the total cost of PPE for one admitted suspected COVID-19 patient can easily be estimated adding up to a cost that becomes overwhelming.

Most institutions and regulatory bodies suggest adapting levels of protection worn by HCWs to the risk of contracting the disease based on patient COVID-19 status, the level of the interaction (procedure, time of contact, distance etc.) and transmission dynamics of the virus (contact, droplet or aerosol).[3] This will avoid the unnecessary over-consumption of precious PPEs on relatively low-risk patient encounters and conserving them for the high-risk settings.

Though it is ideal to dispose of used PPE quickly, we need to anticipate the compelling requirements and the possible disparity in supply and demand for the days to come, as we continue to combat this unpredictable pandemic. Because of this problem, apart from setting rules on the rational use of PPE, **its extended use or limited re-use** may be necessary to conserve the supply of PPE without compromising the safety of the healthcare workers. **Reprocessing methods** have been recommended for PPE made of durable materials that lead to sterilization without sacrificing its safe use and integrity. These so-called **Crisis Capacity Strategies[4] for the extended use or limited re-use** of PPE and **reprocessing methods** have been recommended as acceptable alternatives to the ideal standard of disposing used PPE.

The Philippine College of Surgeons (PCS) summarized the proper indications for the rational and appropriate use, extended use and reuse of the PPE, which are needed depending on the risk of exposure of the healthcare worker. We have also included recommendations on how to extend or limit its use, as well as some acceptable reprocessing methods for reuse. It has to be emphasized however that **these alternative strategies are only recommended in crisis situations where supplies are critically low**.

I. Definition of Terms

Personal Protective Equipment (PPE) – includes any gear to protect against infection (gloves, face masks, N95 mask/respirators, goggles, face shield, gowns, scrub suits, coveralls, shoes, booties/shoe covers)[3]

- Level 1 PPE – surgical mask, alcohol hand wash/ spray
- Level 2 PPE – surgical mask, goggles or face shield

- Level 3 PPE - N95 mask, goggles or face shield, gloves, surgical cap, scrub suits, gowns (or coveralls), shoe covers
- Level 4 PPE – N95 mask (or PAPR), goggles or face shield, double gloves, surgical cap, scrub suits, coveralls, dedicated shoes, shoe covers, (Please refer to Appendices 1 and 2)

Powered Air Purifying Respirator (PAPR) - protects the user by filtering out contaminants in the air and uses a battery-operated blower to provide the user with clean air through a tight-fitting respirator, a loose-fitting hood, or a helmet[5]

COVID area – a space or place in the hospital (e.g. private room or emergency room) where probable or confirmed COVID-19 patients stay for significant period of time (>6 hours) or where potentially aerosol generating procedures are performed

Aerosol - generating procedures (AGP) - any medical and patient care procedure that results in the production of airborne particles (aerosols)[6]

List of Aerosol-generating procedures but not limited to;[5]

- Intubation, extubation and related procedures; for example, manual ventilation and open suctioning
- Tracheotomy/tracheostomy procedures
- Cardiopulmonary resuscitation
- Bronchoscopy
- Dental procedures – high speed drilling
- Surgical procedures in which high-speed devices are used (include energy devices)- high speed cutters and drills, powered instrumentation, suction microdebrider
- Non-invasive ventilation (NIV) e.g. bi-level positive airway pressure ventilation (BiPAP)
- Continuous positive airway pressure ventilation (CPAP)
- High frequency oscillatory ventilation (HFOV)
- High-flow nasal oxygen (HFNO)
- Induction of sputum
- Gastrointestinal endoscopy (unless carried out through a closed-circuit ventilation system)
- Evacuation of pneumoperitoneum during laparoscopic procedures

Extended use – The use of PPE without removing for up to 6 hours, when caring for a cohort of COVID-19 patients.[3,4]

Reprocessing / Reuse – Process to decontaminate using disinfection or sterilization methods.[3,4]

Decontamination - refers to a process of decreasing antimicrobial presence in an area or on a surface.

Disinfection - refers to the elimination of virtually all pathogenic organisms on inanimate objects and surfaces thereby reducing the level of microbial contamination to an acceptably safe level.

Sterilization - a process of destruction of all forms of living microorganisms from a surface or substance.

II. Rational Use Of Personal Protective Equipment (PPE)

The use of Personal Protective Equipment (PPE) must be strengthened by appropriate institutional administrative and engineering controls to be deemed effective. These include the creation of infection control policies (including training of personnel on proper PPE use), increased testing capabilities, appropriate infrastructure, provision of adequate manpower and triaging systems to effectively reduce the spread of infection. Environmental controls like physical distancing, good ventilation/airflow design, properly institute workflow and proper disinfection processes all help curb infection rates. Without them, the use of PPE alone will not be as effective. The setting, patients and risk for exposure determine the type of PPE to be used. Strict adherence to proper hand hygiene must be ensured at all points of care and in all areas.

Practical Strategies to conserve PPE:[2,3]

1. Minimize the need of patients to go to health care facilities for consultation and evaluation, by using telemedicine and telephone hotlines
2. Use physical barriers in areas of the health care facilities where patients will first present such as, triage, screening areas and registration desks to reduce exposure.

3. Zoning of COVID and non-COVID areas into color coded zones based on risk levels of transmission Green zone for low risk, Orange zone for moderate risk, and Red zone for high risk
4. Improve operational efficiency via monitoring, audits, and use of safety officers
5. Earning commitment of healthcare workers to use PPEs judiciously
6. Extended use, reprocess followed by reuse and use of alternative items compared with recommended standards

III. Specific Areas and Recommended Use of Personal Protective Equipment (PPE)[4]

Setting in Health Care facility	Activity	Risk level	Type of PPE
EMERGENCY ROOM COMPLEX			
Triage area	Preliminary screening for prioritization of care according to severity	Low	Maintain physical distance of at least 1 meter • Ideally, build glass/plastic screens to create a barrier between health care workers and patients • Level 1 PPE • Perform hand hygiene When physical distance is not feasible and yet no patient contact, • Level 2 PPE • Perform hand hygiene
Emergency room setting Patient room/ward	Providing direct care to COVID-19 patients, in the **absence** of AGP	Moderate	• Level 3 PPE • Perform hand hygiene
Emergency room setting Patient room/ward	Providing direct care to COVID-19 patients in settings where **AGP** are frequently in place	High	• Level 4 PPE • Perform hand hygiene
OUTPATIENT DEPARTMENT			
Triage area	Preliminary screening not involving direct contact	Low	Maintain physical distance of at least 1 meter. • Ideally, build a glass/plastic screen to create a barrier between health care workers and patients • Level 1 PPE • Perform hand hygiene When physical distance is not feasible and yet no patient contact, • Level 2 PPE • Perform hand hygiene
Consultation room	Physical examination of patients **without** symptoms suggestive of COVID-19	Low to Moderate	• PPE according to standard precautions and risk assessment. • Level 2 PPE • Perform hand hygiene
Consultation room	Physical examination of patient **with** symptoms suggestive of COVID-19	Moderate	• Level 3 PPE • Perform hand hygiene

PRIVATE ROOMS			
Private room	Patient **without** symptoms suggestive of COVID-19	Low to Moderate	• PPE according to standard precautions and risk assessment • Level 2 PPE • Perform hand hygiene
Private room	Patient is probable or confirmed COVID-19	High	• Level 3 PPE • Perform hand hygiene
OPERATING ROOM			
Operating Room procedures Local/ Regional anesthesia (No AGP)	Surgery on COVID-19 positive or probable patients	High	• Level 3 PPE • Sterile gown and gloves over PPE • Perform hand hygiene
Operating Room procedures 1. With AGP 2. Patients under general anesthesia	Surgery on COVID-19 positive, probable or suspect patients	High	• Level 4 PPE • Sterile gown and sterile gloves over coveralls, use of PAPR if available • Perform hand hygiene

IV. APPROPRIATE USE OF PERSONAL PROTECTIVE EQUIPMENT (PPE) IN RELATION TO RISK LEVEL OF TRANSMISSION IN HOSPITAL AREAS (ZONING) (Used by HICU, UP-PGH, from the University of Kansas Health System)

Low risk level of transmission (Green Zone)
Level 1 or 2 Personal Protective Equipment

Moderate risk level of transmission (Orange Zone)
Level 3 or 4 Personal Protective Equipment

High risk level of transmission (Red/Hot Zone)
Level 3 or 4 Personal Protective Equipment

V. APPROPRIATE USE OF LEVEL 3 VS. LEVEL 4 PERSONAL PROTECTIVE EQUIPMENT IN MODERATE RISK OR HIGH-RISK ZONES (Used by HICU UP-PGH)

1. **If a Healthcare Worker (HCW) is in a moderate** (Orange Zone) **or high risk** (Red/ Hot Zone) zone in COVID-19 Areas he/she wears Level 3 PPE in the following instances:
   a. Required to stay for <4 hours
   b. Brief interaction with patients such as: History taking, Physical examination, X-rays, blood draws, daily rounds
   c. Perform nasopharyngeal swabs/ oropharyngeal swabs
   d. Assigned as safety officer at the doffing area

2. **If a HCW is in a moderate** (Orange Zone) **or high risk** (Red/Hot Zone) zone **in COVID-19 Areas he/she wears Level 4 PPE in the following instances**:
   a. Required to stay for >4 hours
   b. Perform close contact procedure with patient (Carrying patient, changing bed linen while patient on bed, changing diaper, suctioning, performing oral or ET care, inserting NGT and similar procedures) – use additional apron/ raincoat material
   c. Perform procedures such as intubation
   d. Perform CPR, use additional apron/ raincoat material
   e. Perform surgical procedures under GA in the Operating Room theaters or endoscopy suites
   f. At the Emergency room where you will evaluate, triage, stabilize a COVID-19 suspect patient
   g. **When in doubt if Level 3 or 4 PPE, opt for level 4**

VI. Description of Each Personal Protective Equipment (PPE)

1. Surgical Mask

Specifications:
Disposable, non-woven, pleated, hypoallergenic, high filtration capacity, with adaptable nose bar, very low resistance to breathing

Recommended use for HCW who are:
- Not directly handling COVID-19 patients
- No risk of splashing or spraying of bodily fluids

Extended use of surgical mask without removing for up to 6h[3,4], when caring for a cohort of COVID-19 patients is feasible but increases the risk of contamination. The use of a face shield over a surgical mask (covering the chin and sides of the face) may extend the use of the face mask

Reprocessing of surgical masks is NOT RECOMMENDED.

Cloth masks are NOT considered as an alternative to surgical masks for health care workers.[6]

2. Eye Protection (Goggles/ Face Shields)[7]

Specifications:
- Anti-fog with side shield is preferred
- Made of polycarbonate material
- Lightweight with adjustable head-strap
- Must cover the side of the face and below the chin.

Recommended use for HCW who are:
- Involved or performing AGP
- Directly caring for probable or confirmed COVID-19 patients
- Performing procedures with risk of splashing or spraying of blood and other bodily fluids

Extended use or limited re-use of goggles/ face shields is accepted.

Situations where goggles/face shields should be discarded:
- Goggles or face shields are damaged
- item can no longer fasten securely to the HCW
- Visibility is obscured upon use of the item

Reprocessing of goggles/face shields is accepted.

Method of Reprocessing goggles/face shields:

a. The most common method of reprocessing is by washing with soap/detergent and water first, followed by disinfection[8], then rinsing with water and lastly by airdrying. Disinfection Alternatives:[8]
   1) soak with 0.1% sodium hypochlorite for 5 minutes
   2) wipe with 70% ethanol with a minimum contact time of 5 minutes.
   3) soak with 3% hydrogen peroxide for 30 minutes

b. Another method to reprocess goggles is to clean it then decontaminate the goggles, then expose to ultraviolet radiation in a UV sterilizing cabinet for 15 minutes. This method is supported by a study by Ziegenfuss where decontamination of eye protection equipment was found effective, using ultraviolet radiation (UV): at 253.7 nm wavelength.[9]

The reuse/reprocessing of goggles/face shields without appropriate decontamination sterilization is strongly discouraged because it is one of the principal sources of transmission to health care workers.

3. Respirators (N95, N99, N100)

Specifications:
At least 95% filtration efficiency, fluid resistance, with nose clip, 2-strap design with welded strap attachment, with nose foam.

Fit testing is a critical component to a respiratory protection program whenever workers use tight-fitting respirators. Use a test agent, either qualitatively detected by the wearer's sense of taste, smell, or involuntary cough (irritant smoke) or quantitatively measured by an instrument, to verify the respirator's fit.[10]

Recommended use for HCW:
- involved in or performing aerosolizing procedures (endoscopy, intubation, etc.)
- directly caring for COVID-19 suspect or confirmed patients
- performing procedures with risk of splashing or spraying of blood and other bodily fluids
- can be used for up to 8 hours[12-13]

Extended use is safe and accepted provided that the respirator must maintain its fit and function.[13]

Conditions that will prevent extended use of N95 masks[3,4,11-12]
- soiled with blood or bodily fluids
- discarded following use in aerosol generating procedures
- following close contact with, or exit from, care area of COVID-19 suspect or confirmed patients
- damaged (tie or ear loops are torn or broken)
- hard to breathe through

Extended use is favored over reuse.[3-4,11-12]

Reuse after extended use is not accepted.

Reuse is permitted provided the following steps are observed to reduce contact transmission[3,4,11-12]
- Can rotate 5-7 pcs of N95 respirators for each HCW
- Use one N95 in a particular day, take off and store
- Store by hanging used respirators in designated storage area or use a breathable container such as a paper bag in between uses
- Avoid respirators touching each other in storage to minimize potential cross contamination
  - o this amount of time in between use, exceeds the 72-hour expected survival time for SARS- CoV-2
- Minimize cross contamination by labeling one respirator per HCW.
- Use of face shield over an N95 respirator

Limited re-use for not more than 5 times per device to ensure adequate safety margin.[11-12]

Contact transmission caused by touching a contaminated mask is identified as a primary hazard for use and reuse of respirators.[11-12]

Reprocessing Methods: There are three decontaminating methods for ensuring effectiveness and integrity of respirator after reprocessing.[13-15]
- Vapor of hydrogen peroxide (VHP) – STERRAD gas plasma sterilizer for 55 mins.
- UV radiation lamp – UV sterilizing cabinet for 15 minutes
- Moist heat incubation – hot air (oven) 70ºC for 30 minutes

VHP and UV technique allows reuse up to three times; moist heat allows reuse for up to two times.

Decontamination methods not recommended by current evidences[12-16]
- Ethylene oxide
- Ionizing radiation
- Microwave
- High temperature above 75ºC, such as autoclave or steam

Expired N95 can still be used, as long as there are no signs of damage (discoloration, residue

shedding, loss of elasticity of earloops). However, it is advised to get in touch with the manufacturer prior to use.

Damage to the shape of respirators due to reprocessing may affect fit and protection properties.

4. Personal Air-Purifying Respirators (PAPR)

Principle:

- Battery powered blower that forces air through filter cartridges or canisters and into the breathing zone of the wearer, an airflow is created inside, either a tight-fitting facepiece or loose-fitting hood or helmet, providing a higher assigned protection factor (APF)
- Uses high-efficiency particulate air (HEPA) filter which implies that they have a greater level of respiratory protection than N95 masks.

Components:

- Headgear or Hood, face shield, head harness, nose cup assembly, spectacles, visor covers, inhalation and exhalation valves, port adapter, cartridge filter, PAPR system, belt, air hose, battery chargers, etc.

Some useful information about loose fitting PAPR[18]

- Better than tight-fitting non-powered approved air-purifying respirators[5]
- A fit test is not required
- Can be worn with a limited amount of facial hair.
- May offer significant splash protection for the face and eyes.
- Patients can see the face of the HCW, providing better interpersonal communication.
- Can be cleaned, disinfected, re-used, and shared.
- Less taxing from a physiological/ breathing resistance perspective than other respirators.

Limitations of PAPR[5,18]

- May interfere with the user's visual field because of the limited downward vertical field of view.
- Ability to hear may be reduced because of the blower noise, and noise induced by the movement of a loose head covering.
- Ability to use a stethoscope may be limited.
- Batteries have to be recharged or replaced.
- Requires a significant amount of storage space in between shifts.
- Highly recommended for health facilities to have a program on
  - o Maintenance, cleaning and proper disinfection
  - o Battery supply and maintenance
  - o Formal Training on donning and doffing, because removal of the hood is more complicated

Role of PARPs in contingency and capacity settings

Access to PARPs may be even more limited due to cost and need for routine maintenance[19]

5. Gowns

Specifications:

- PPE gown - also commonly known as Surgical gown, sometimes called isolation gowns
- Material Non-woven polypropylene (disposable single use), or non-woven cloth, polyester or polyester-cotton (washable, reusable)
- Long sleeved, tie back, covers down to mid-calf, light weight, durable, breathable, water and blood resistant

Appropriate use of gowns.

- Gowns are worn over scrub suits.
- In conventional capacity situation use, surgical or isolation gowns (polypropylene-made).
- In contingency capacity strategies, shift gown use towards use of cloth gowns.

- Upon entry to a room or area of a suspect or confirmed COVID patient, use clean isolation gown.
- In actual and close contact patient encounter with COVID suspect or confirmed case, use two layers of gowns as much as possible. One may opt to combine the use of polypropylene made gowns with cotton made gowns.
- If a combination of cotton made gown and polypropylene made gown is needed, use the polypropylene made gown as inner layer, followed by the cotton gown as the outer layer. Quickly dispose of the cotton gown once it is stained or soiled and replace immediately if necessary.
- In the operating Room, don an unsterile gown as first layer protection at the donning area and then proceed inside the operating cubicle for another layer of sterile gowning process.

Removal/disposal of gowns, if it is:
- Wet, soiled or damaged
- Exposed to chemicals, infectious substances or bodily fluids
- Used in providing care outside designated cohort of COVID-19 patients

Extended use is acceptable in HCW providing care for a cohort of COVID-19 patients[20]

Reuse/Reprocessing of gowns made of cloth is accepted.[20]

Cloth gowns are to be laundered after each use.[20]

Reprocessing:[20]

- Cotton gowns:
  - o Washing machine – wash and disinfect with warm water (60-90ºC) and laundry detergent
  - o Manual washing – soak and stir with hot water and soap followed by soaking in 0.05% chlorine for 30 minutes then rinse with water and dry fully.

- Disposable gowns
  - o The CDC cites easy breakage of disposable gown ties and fasteners, making them less amenable to washing and reuse than reusable gowns.

When gowns are in short supply, the following are the alternatives but be aware of their limitations:[20]
- Disposable lab coats are less durable than gowns
- Disposable impermeable plastic aprons cannot protect arms and back of torso
- Reusable patient gowns or lab coats but design or thickness may not be comparable
- Combination of pieces of clothing such as the following may be considered for activities that may involve body fluids and when there are no gowns available:
  - o Long sleeved aprons in combination with long sleeved patient gowns or laboratory coats
  - o Open back gowns with long sleeved patient gowns or laboratory coats
  - o Sleeve covers in combination with aprons and long-sleeved patient gowns or laboratory coats

6. COVERALL (Hazmat Suit)

Specifications:[21]
- Made of high-density polyethylene (HDPE) formed into non-woven fabric; other materials are polypropylene fiber with polyethylene coating, breathable, light weight, water-based liquids and aerosol repellant, low linting, tunneled elastic bands for the wrists, ankles and face, and thumb loops
- Ideal color is white or light blue, ideally single use, biohazard protective cover all clothing

Recommended only for HCW who are:

- Involved or performing aerosol-generating procedures (endoscopy, intubation, etc.)
- Directly caring for COVID suspect or confirmed cases
- Performing procedures with risk of splashing or spraying of blood and other bodily fluids

Coveralls provide 360-degree protection including back and lower legs, sometimes the head and feet as well

Reuse or reprocessing of coveralls is acceptable in times of severe shortage.[19]
Ideally, coveralls are for single use. However, if supply becomes an issue, recycle those, which can be adequately cleaned, disinfected and sterilized.[22,23]

Reprocessing:
The most common method of reprocessing is to initially, wash with soap/detergent and water followed disinfection.[9] then by rinsing with water and finally by air and sun drying
Disinfection Alternatives:[9]

1) soak with 0.1% sodium hypochlorite 5 minutes
2) soak with 3% hydrogen peroxide for 30 minutes

Alternatives to commercially available coveralls:
Non-woven polypropylene –

- same material used to make reusable shopping bags
- made from thermoplastic polymer
- recyclable and reusable
- coveralls can be washed if they are used in low-risk areas.

Infectious disease experts do not recommend this type of non-woven polypropylene coverall as these are not meant for health care workers who come into direct contact with infected patients.[23]

Advise on locally manufactured coveralls[24]

- Current recommendations on specifications on medical grade coveralls is still undergoing quality and safety assessment by DOH and DTI.
- Local manufacturers are mandated by the FDA to:
  - o secure a License to Operate (LTO) as medical device manufacturer
  - o be guided by local (Philippine National Standard) and applicable international standards (ISO or IEC), in the absence of Philippine National Standard.
  - o comply with technical requirements for the registration of medical devices
  - o undergo safety testing by appropriate accredited laboratories.

Donated PPEs must also be subjected to the scrutiny and approval of individual hospital infection control committees and caution must be applied for use in Level 4 areas without the aforementioned precautions.

7. Surgical Cap

Specifications:
Disposable, non-woven surgical bouffant cap, shower type

8. Shoe cover

Specifications:

- Disposable, non-woven
- Fabric does not tear/break easily
- Non-skid, does not slip on wet floor

No recommendation can be made for the use of shoe covers versus no shoe covers for health care personnel caring for patients with suspected or known COVID-19 as part of appropriate PPE. No studies conducted at this time.[19]

9. **Gloves**

Specification:

- Hypoallergenic, nitrile, powder free, latex free (some are too thin), standard thickness, beaded cuff, smooth with micro textured finish, safe grip easy downing and comfort, excellent hand fitting.
- Superb tensile strength.
- With left and right hand marking on gloves

Recommendations:

- Should be worn when providing direct care for a COVID-19 patient and then removed, followed by hand hygiene in between patients.
- Should be worn when in close contact with a patient during physical examination then immediately removed followed by hand hygiene in between patients.
- Do not use the same pair of gloves for multiple patients.
- Double gloving is not recommended except in surgical procedures carrying a high risk of glove perforation.
- Extended use of gloves (using the same gloves for a cohort of COVID-19 cases) must not be done.
- Changing gloves between dirty and clean tasks in the delivery of care to a patient and when moving from a patient to another, accompanied by hand hygiene, is absolutely necessary.

Use of Double Gloves or Single Gloves

- No recommendation as no comparative studies were conducted.
- Using a single pair of gloves puts one at a theoretical risk that the organism may transfer from contaminated PPE to the hands after removal of the contaminated gloves or clothing, which may contribute to infection.[19]

Keypoints:

1. Most personal protective equipment (PPEs) are designed for single use, but in situations where supply is limited, extended use and reuse after reprocessing may be considered. The following PPEs may be reprocessed then reused: N95 mask, goggles, face shields, scrubs, coveralls, covered shoes and cotton gowns.
2. Reprocessing should follow the principles of cleaning and decontamination before disinfection and sterilization. Reprocessing should be performed by a trained staff in the sterile services department of a health care facility or at a bigger scale under controlled and standardized conditions.[5]
3. Disinfection and reuse of disposable PPE may be possible, but always be aware that the processes used may compromise the integrity of the product and impact its effectiveness.
4. It must be understood that reprocessing of disposable PPE is an evolving subject where research and development is currently ongoing. More evidence may become available in the future.
5. It cannot also be overemphasized that these alternative strategies are only recommended in crisis situations where there is a critical shortage of supplies.

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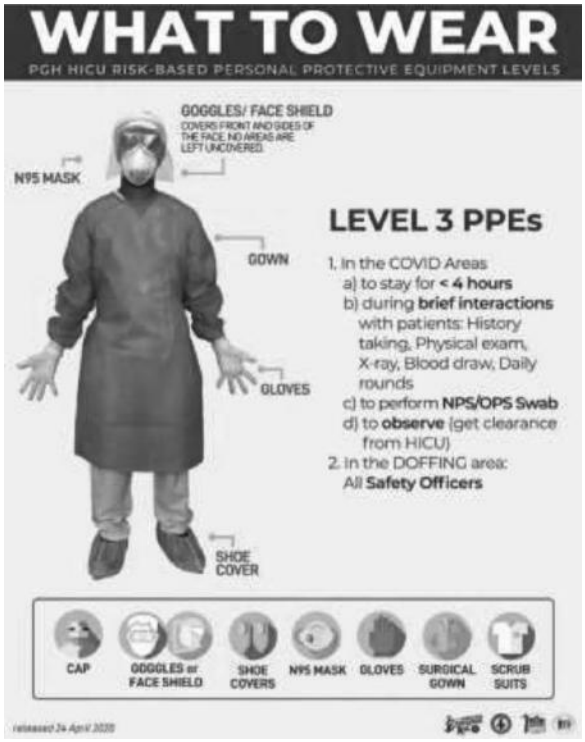
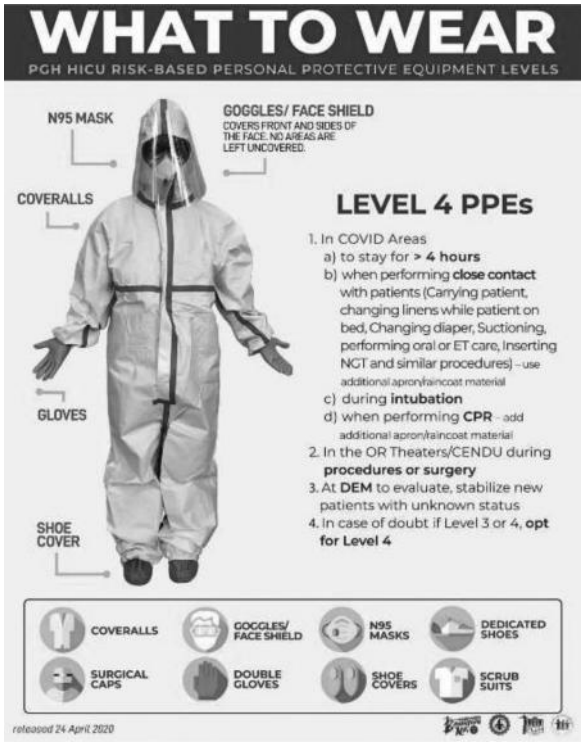


Appendix 1. Level 3 PPE
(With permission from Philippine General Hospital – Information, Education Communication)



Appendix 2. Level 4 PPE
(With permission from Philippine General Hospital – Information, Education Communication)