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Infection Prevention and Control Guidelines for Outpatient Clinic Resumption in the Context of COVID-19

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TABLE OF CONTENTS

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PSMID-PHICS Infection Prevention and Control Guidelines for Outpatient Clinic Resumption in the Context of COVID-19

Introduction

SARS-CoV2, the causative agent of COVID-19, is a highly transmissible virus that can infect both patients and healthcare personnel in the community, clinic, and hospital settings. The virus is spread efficiently from person to person primarily through large respiratory droplets. A secondary mode of transmission is through touching of surfaces contaminated by droplets containing the virus. The infectious dose, however, remains unknown.

The situation in the Philippines has rapidly evolved since we detected our first COVID-19 case in January 30, 2020. We now have over 11,000 confirmed cases and almost 800 deaths[1]. The surge of cases back in March 2020 led to the implementation of an Enhanced Community Quarantine (ECQ) with the goal of flattening the curve. In line with this, healthcare facilities and physicians decided to concentrate on inpatient care and temporarily discontinued the provision of outpatient services. A steady number of confirmed cases is currently being reported in the country daily. Based on this data, the national and local government units have decided to shift the ECQ to either a modified ECQ (MECQ) or a general community quarantine (GCQ) in different areas of the country. Once the MECQ or GCQ is implemented, outpatient services are expected to resume in order to cater to stable, ambulatory patients who may or may not be infected with SARS-CoV2.

The objective of this document is to guide clinicians in preparing for the re-opening of both hospital and non-hospital-based ambulatory care facilities, and for the resumption of outpatient services during this pandemic. Recommendations in this rapid guideline are based on best available evidence and may evolve as new evidence emerges. Thus, it is important to remember that guidelines cannot always account for individual variation among patients and are not intended to supplant physician judgment with respect to particular patients or special clinical situations. These guidelines will be updated as new evidence becomes available.

I. GENERAL RECOMMENDATIONS

Main strategies to prevent or limit transmission of SARS CoV-2 include efficient triaging, early recognition, and source control; applying standard and specific isolation precautions; implementing administrative controls; and using engineering controls[2]. *Engineering controls* are aimed at reducing the spread of pathogens by providing adequate space to allow physical distance and ensuring availability of well-ventilated rooms, hand hygiene facilities, even trash cans. On the other hand, *administrative controls* ensure the availability of resources for infection prevention and control (IPC) measures, development of clear IPC and facility-specific policies and process flows, adequate staff-to -patient ratios, training of staff, facilitating access to laboratory testing and having appropriate triage and placement of patients.

A. Proper screening of the patients

All healthcare facilities should establish a triage system to screen patients seeking consult. Trained personnel should be stationed at points of first contact within a facility and be able to identify symptomatic individuals. They should know what to ask and what to do with affirmative responses to screening questions. An example of a screening tool that can be used by facilities is available in **Appendix A: OPD Patient Screening Form**.

A separate path or area for symptomatic individuals that need further assessment for the possibility of COVID-19 infection should be identified. Trained personnel at the triage should keep a distance of at least 1 meter from the patients being screened, no physical contact ideally and the encounter brief. Face mask and goggles or face shield are the minimum PPE for personnel at the triage and consider using physical barriers.

As much as possible, outpatient consultations should be scheduled and be limited. Pre-consultation screening interview with patients may be conducted.

A "No Mask, No Entry" policy should be implemented. Patients are required to wear masks upon entry and all throughout their stay at the healthcare facility. Everyone should also be reminded to follow *cough etiquette* at all times.

Physical distancing should be observed at all times. Install visual markers to ensure distancing while patients are in queue or in communal waiting areas and conveyances (escalators and elevators).

B. Hand washing and hand hygiene

This document cannot overemphasize the importance of hand washing and hand hygiene. Hand washing using soap and water for at least 20 seconds should be performed when the hands are visibly soiled. Otherwise, perform hand hygiene with alcohol-based hand rubs with at least 70% alcohol.

Every healthcare facility should ensure that enough hand hygiene facilities are in place in strategic areas.

C. Proper Personal Protective Equipment (PPE) at the OPD

Most of the guidelines emphasize the importance of "appropriate PPE," including *adherence to standards for proper donning and doffing to limit transmission*. Using more than what is recommended may further deplete already depleted supplies of PPE and are prone to contamination especially when **not** used according to recommended doffing procedure. Different specialties have different risk of exposure to COVID-19-infected secretions. Dentists and otorhinolaryngologists, for example, perform more aerosol-generating procedures and would have to consider using additional PPEs in addition to the minimum recommendations. Refer to **Appendix B for Description of Proper Personal Protective Equipment (PPE)**.

Recommendation: The PPE recommended for doctors and their staff when resuming clinic are the following[3,4]:

Minimum PPE:

1. Face mask or N95 respirator. N95 should be used if Aerosol Generating Procedure (AGP)* is expected.
2. Goggles or face shield

*AGPs include: open suctioning of airways, sputum induction, cardiopulmonary resuscitation, endotracheal intubation and extubation, non-invasive ventilation (e.g., BiPAP, CPAP), bronchoscopy, and manual ventilation

Additional PPEs:

1. Clean, non-sterile gloves (to be changed after each patient is examined) if contact with blood, body fluids, mucous membranes, non-intact skin or contaminated equipment is anticipated.
2. Surgical gown - only if there are procedures with potential blood and body fluids exposure

NOTE: Coveralls or hazmat suits, hair cover and shoe covers are NOT recommended in the clinic.

Other items needed in the clinic:

1. Hand hygiene tools: alcohol bottles or pumps, alcohol based handrubs or sink with soap and water for hand washing
2. Disinfecting wipes to clean surfaces touched by patients.

Using N95 Masks

N95s masks are designed to be worn tightly against the user's face to prevent any leakage of air. As they say with N95s, "*if it does not FIT, it does NOT work*." N95 respirators are recommended to protect against infections transmitted via the airborne route (e.g. tuberculosis, measles, varicella). N95 respirators should also be used when performing AGPs especially on patients with suspected or confirmed COVID-19. N95 respirators should be certified by the Center for Disease Control/National Institute for Occupational Health (CDC/NIOSH) and be fit tested before use [5]. A fit check or seal check should always be done.

A fit check or seal check is done in two parts. First, test the seal by exhaling while covering the respirator. Positive pressure should build up inside the facepiece without any evidence of outward leakage of air at the seal. Second, inhale while covering the respirator. There should be a slight collapse or "suction" with no inward leakage of air.

Addressing the shortage of supplies in PPE and N95 respirators

There is already a global shortage in the supply of PPE and approved N95 masks. In crisis setting, consider contingency measures for reuse and extended use of these items need to be in place. Please refer to **Appendix C: Guidance on the Extended use and Reuse on N95 respirators** and **Appendix D: Guidance on the Extended use and Reuse of PPEs.**

Use of KN95 masks as alternative to N95 during Aerosol-generating Procedures (AGPs)

KN95 masks are more readily available and have been in use in most healthcare facilities already. Both are filtering facepiece respirators (FFR), sometimes called disposable respirators. Quality-assured KN95 masks have the same filter performance as N95 (≥ 95%) *but* with a Total Inward Leakage (TIL) of </= 8% as compared to N95 which has no TIL. Total inward leakage is defined as the combination of contaminated air that leaks through a respirator from various sources (filter penetration itself, through the face seals, exhalation valves). **Thus, if KN95 will be used during AGPs, the user wearing the specific KN95 should pass at least a qualitative fit test to ensure adequate protection** (5, 6)

> **Recommendation:** A fit-tested N95 mask should be used when aerosol-generating procedure is to be done or anticipated. In crisis situations, *fit-tested AND quality-assured* KN95 masks may be used when NIOSH-approved N95 respirators are not available.

C. Telemedicine

Selected patient consultations may not require physical encounter and certain strategies can be performed in lieu of actual physical examination. Especially for vulnerable patients but are stable patients, the benefits of non- face-to-face encounters may outweigh the risks.

> **Recommendation:** Face to face physician-patient encounters should be minimized. Telemedicine should be considered for patients in whom the risk of getting exposed outweighs the benefit of physical encounter (e.g. patients with co-morbidities or immunocompromised but are clinically stable). If telemedicine will be done, obtain and document informed consent from the patient.

D. Immunization

> **Recommendation:** Appropriate immunizations, particularly seasonal flu and pneumococcal vaccination, is recommended for doctors and other healthcare workers, clinic secretaries and patients.

II. UPON ENTRY AND EXIT FROM THE CLINIC/HOSPITAL

A. Signages and Information Education and Communication (IEC) Materials:

Recommendations:

- One-way flow for patients and staff with clear signage of directions going to the clinic should be posted.
- IEC materials about COVID-19 and how to prevent it should be posted at entrances and waiting areas of the hospital or clinic.

B. Use of foot/shoe baths or disinfection mats

Foot/shoe baths have been in use in poultry and other livestock production facilities. Its use is also part of good manufacturing practice for food processing facilities [7]. For these purposes, the ability of these foot baths to disinfect effectively are determined by the contact time, type of disinfectant and the material that holds the disinfectant. In a study that looked at shoe soles artificially inoculated with different bacteria, sprayed isopropyl alcohol plus a quaternary ammonium compound seemed to cause the greatest reduction in bacterial load[7].

There are no studies yet that evaluated the routine use of foot/shoe baths or disinfection mats to prevent COVID-19 transmission. A systematic review done by Rashid *et al* [8] verified the obvious—that shoe soles are potential vectors of infectious diseases. This review also evaluated the evidences for the efficacy of disinfectants to decontaminate shoe bottoms such as paper-type disinfection mats, tank-type disinfection mats and water-retention type mats using different disinfectant solutions. The study reported inconsistent efficacy to decontaminate shoe bottoms using either chemical (and even non-chemical) strategies. In addition, maintaining sterility of the disinfectant is difficult. Over time and when contaminated with organic matter, disinfectants lose their antimicrobial properties and can even facilitate transmission of pathogens.

Recommendation: There is currently no evidence to recommend the use of foot/shoe baths or disinfection mats in the entry or exit sites in the outpatient clinic setting. If these will be used, ensure that manufacturer's instructions are followed especially regarding contact time (of the shoe soles in the disinfectant bath or mat) and frequency of replacement to ensure effectiveness of disinfection.

III. AT THE WAITING OR THE RECEPTION AREA OF THE CLINIC

Recommendations:

- At the patients waiting area, maintain physical distancing by placing chairs 1-2 meters apart
- Adequate ventilation should be maintained for corridors and reception area. Refer to Table 1 to approximate the air changes per hour in the waiting areas. If possible, hospital engineering should be consulted to achieve a ventilation requirement of 2.5 l/s/m3 [(9)]
- Medical secretaries and other staff should be educated about COVID-19 and preventive strategies, plans for alternative clinic management, and how to advise patients about new clinic rules.
- The medical secretary should wear a face mask or N95 mask, and goggles or face shield.
- As much as possible, there should be no accompanying person. An accompanying person will only be allowed if the patient is elderly, wheelchair borne or needs assistance.

- Remove items that can be contaminated (magazines, newspapers, toys). If not possible to remove, clean them frequently.
- Prepare supplies: alcohol pumps, alcohol based handrubs, soap, sinks, tissues and trash cans

Table 1. Approximation of the ACH in naturally ventilated waiting areas.

Windows to outdoor	Door to corridor	ACH (average value)
100% open	100% open	11.9
50% open	50% open	8.45

Table Modified from Qian H, Li Y, Seto WH, Ching P, Ching WH, Sun HQ. Natural ventilation for reducing airborne infection in hospitals. Build Environ. 2010;45(3):559-565. doi:10.1016/j.buildenv.2009.07.011

IV. INSIDE THE CLINIC

A. Schedule of doctors

Arrangement must be done amongst doctors in a facility and among doctors who share clinics to minimize crowding. Administrative control can include revisions and limitation in clinic hours per doctor and re-assignment of clinic rooms. Ensure compliance to physical distancing between patients, clinic secretaries/nurses, including doctors.

B. Consultation time

Should there be face to face consultation, encounter time should be kept at a minimum to limit exposure.

C. Protection and involvement of clinic secretaries, clerks or clinic managers

- Screen clinic secretaries, clinic clerks or managers for signs and symptoms.
- Educate them on screening for signs and symptoms that may indicate COVID-19.
- Teach basic infection control such as hand hygiene and cough etiquette.
- Teach basic disinfection inside the clinic. Clean frequently touched surfaces using disinfectants while wearing gloves.
- Familiarize them with hospital COVID-19 policies. Teach them what to do in case a suspect is identified, how to refer to other units or facility, the need to maintain patient confidentiality, and to remain calm for any eventuality.
- Teach social distancing in clinic, at home and in community
- Recommend immunization.

D. Ventilation requirements for areas affecting patient care in hospitals and outpatient facilities

According to WHO, **v**entilation is the process of allowing air from outside (outdoor) to go inside a building or a room, and distributing the air within that building or room. The purpose of ventilation is to provide healthy air for breathing by both diluting the pollutants originating in the building and removing the pollutants from it. Ventilation is described in:

- Air changes per hour (ACH) or Air exchanges – refer to the relative amount of inflow air per unit time. Simplistically, this is the number of times the air within a defined space is replaced in an hour. It is computed by measure of the air volume added to or removed from a space (normally a room or house) divided by the volume of the space.

- Ventilation rate [in liters/sec, ft^3/min (CFM) or m^3/hr] – refers to absolute amount of inflow air (considering the volume of the space) per unit time. For an airborne precaution room for example, the average ventilation rate should be 160 liters/sec per patient.

Based on the CDC guidelines for ventilation in patient examination or treatment rooms, the minimum requirement is **6 air changes per hour (ACH).** This should suffice in most outpatient clinic settings because the current known mode of transmission of SARS CoV2 is primarily via droplet inhalation [10].

However, when seeing patients with confirmed or suspected cases of airborne pathogens (e.g. TB, varicella, measles) or when aerosol generating procedures are to be performed, there should be a minimum of **12 air changes per hour.** Airborne transmission of SARS-CoV2 from person-to-person over long distances is unlikely [11]. However, the contribution of smaller particles that can be inhaled, sometimes called **aerosols or droplet nuclei,** to close proximity transmission is possible. For this purpose, facilities may want to dedicate an airborne precaution room for suspected or confirmed COVID-19 patients.

The WHO defines an **airborne precaution room as a room with high ventilation rate** and controlled direction of airflow that can be used to contain airborne infections and acute respiratory infections (ARIs) caused by a novel agent with the potential to pose a public health risk [12]. An airborne precaution room can be **naturally ventilated** (natural forces such as wind or thermal buoyancy affects airflow) or **mechanically ventilated** (use of fans attached to windows, walls or air ducts):
In a naturally ventilated airborne precaution room, the airflow should be directed to areas free of transit, or should permit the rapid dilution of contaminated air into the surrounding areas and the open air.

The table below provides an approximation of the ACH in outpatient clinic rooms. These values were taken from consultation rooms in the second floor of an outpatient hospital in Hongkong Island surrounded by buildings. All the rooms had a window each opening to the outside and a door opening to the corridor. The test was done with the air-conditioning ON and exhaust fan OFF. [13]

Table 2. Approximation of the ACH in naturally ventilated outpatient clinic rooms.

Windows to outdoor	Door to corridor	ACH (average value)
Close	Close	0.6
Close	100% open	3.4
100% open	100% open	18.8-22.5

50% open	100% open	12.8
50% open	50% open	11.5

In a **mechanically ventilated airborne precaution room**, negative pressure is created to control the direction of airflow; the ventilation rate should be at least 12 ACH. The following table provides an approximation of the effect of mechanical ventilation in different settings [14]:

Table 3*. Approximation of the ACH in mechanically ventilated outpatient clinic rooms.

Exhaust fan is:	The door connecting the room to the corridor is:	The door and windows connecting room to the balcony and outside air is:	ACH
OFF	Closed	Closed	0.71
OFF	Closed	Open	14.0
OFF	Open	Open	8.8–18.5
ON	Closed	Closed	12.6
ON	Closed	Open	14.6
ON	Open	Open	29.2

*Source: 2007 WHO Interim Guidelines in Infection prevention and control of epidemic- and pandemic-prone acute respiratory diseases in health care

NOTE:

1. The exhaust fans (if used) should be installed where room air can be exhausted directly to the outdoor environment through either a wall or the roof. Exhaust air should be directed outside, away from air-intake and populated areas. The size and number of exhaust fans depends on the targeted ventilation rate and must be measured and tested before use.
2. Installation of exhaust fans may increase the room temperature. If the environment causes thermal discomfort, ceiling fans may be added.
3. Another concern with exhaust fans is the noise it creates (especially for large fans) and the need for continuous supply of electricity.
4. If adequate ventilation cannot be achieved, consider using a portable HEPA filter to allow filtering of air before recirculation. (see section on HEPA filter)
5. Use of air-conditioning (AC) units in rooms with open doors and windows or with exhaust fan turned ON may result in higher energy consumptions, less cooling effect, and accelerated wear and tear of the AC unit.

Recommendation: Maintain adequate ventilation in outpatient clinics and waiting areas. At least 6 to 12 air changes per hour is recommended and can be achieved either through natural or mechanical

ventilation. Consider using HEPA filters to improve air quality if there is no means to improve ventilation.

E. Use of Acrylic or Plastic Barriers

According to the WHO interim guidance on the rational use of PPE for coronavirus disease (COVID-19), physical barriers to reduce exposure to the COVID-19 virus, such as glass or plastic windows, may be used in areas of the healthcare facility where patients are expected to first present such as the triage area or the registration desk at the emergency room, or the pharmacy window [3,15]. No recommendations nor studies have been done regarding the placement of these barriers in the outpatient clinic setting. The proper use of the recommended PPEs according to the risk of exposure, hand hygiene and physical distancing are the mainstays in the prevention of unnecessary exposures. Should these barriers be used, proper and regular cleaning and disinfection procedures should be planned and carried out.

Recommendation: Proper and rationale PPE use, hand hygiene and physical distancing are the primary strategies to prevent COVID-19 exposure in the outpatient clinics. If additional barriers such as acrylic or plastic barriers will be used, these should be regularly and properly cleaned and disinfected.

F. Disinfection of Clinic Environment

The main mode of transmission for SARS CoV 2 is still via respiratory droplet and contact transmission. SARS CoV-2 can remain viable for 3 hours in the aerosol; 8 hours in copper; 24 hours in cardboard; 48 hours in stainless steel and 72 hours in plastic [16]. Because of this, aerosol and fomites transmission of this virus is plausible. These forms of transmission were associated with nosocomial spread and super-spreading events but can also provide information for pandemic mitigation efforts.

The physical action of scrubbing with detergents and rinsing with water removes large numbers of microorganisms from surfaces. This routine cleaning is the most useful method for removing viruses on commonly touched surfaces, which may have been exposed to respiratory droplets. Equipment and surfaces in the health care setting must be cleaned with approved hospital-grade cleaners, followed by disinfection that eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects [17]

1. **Definition of Terms:**

- **Decontamination** – removes pathogenic microorganisms from objects so they are safe to handle, use, or discard
- **Cleaning** – the removal of visible soil and organic contamination from a device or surface, using either the physical action of scrubbing with a surfactant or detergent and water, or an energy-based process (e.g., ultrasonic cleaners) with appropriate chemical agents

- **Disinfection** – describes a process that eliminates pathogenic microorganisms including viruses, except bacterial spores, on inanimate objects. In health-care settings, objects usually are disinfected by liquid chemicals or wet pasteurization.
- **Low Level Disinfection (LLD)-** disinfect noncritical items that come into contact with skin
- **Noncritical items**- According to Earl Spaulding Classification refer to items that touch the skin when in use such as BP apparatus, stethoscope, other frequently touch surfaces

2. Chemicals for Disinfection

- 70% alcohol – recommended for small object surfaces like stethoscope, vials, ports, etc.
- 1:100 Sodium hypochlorite (5.25%– 6.15% bleach) - used to disinfect surfaces, and other medical equipment (Please see **Appendix D for instructions in preparing chlorine solution**)
- Calcium hypochlorite powder or granules (70%) (High Test Hypochlorite -HTH)
- Bleaching powder (Chlorine of Lime) with 30% active chlorine

3. Refer to Appendix E for Detailed Instructions on cleaning and disinfection

4. Effective use of a disinfectant for environment

- Disinfectant should be applied only after visible soil, organic matter and other impediments to disinfection have been removed by cleaning with soap and water
- Follow the manufacturer's written instructions for dilution and contact time;
- No 'double-dipping' of cloths into disinfectant
- Replenish disinfectant accordingly.
- Appropriate use of personal protective equipment, to prevent exposure to the disinfectant.

5. Frequency of cleaning [17]

Each health care setting should have written policies and procedures for the appropriate cleaning of surfaces, areas and non-critical medical equipment that clearly defines the frequency and level of cleaning and which assigns responsibility for the cleaning (Tables 4 and 5).

Table 4. Recommended frequency of cleaning and disinfections of surfaces/areas.

Type of surface	Examples	Frequency
High-touch surfaces (those that have frequent contact with hands)	Doorknobs, elevator buttons, telephones, call bells, bedrails, light switches, computer keyboards, monitoring equipment, wall areas around the toilet and edges of privacy curtains.	After every clinic session
Low-touch surfaces (minimal contact with hands)	Floors, walls, ceilings, mirrors and windowsills	May be cleaned when visibly soiled and on a periodic basis rather than a daily basis

Busy areas	Hallways, rest rooms	Housekeepers need to visit these areas hourly; May be cleaned every 4 hours or when visible soiling is observed

Table 5: Recommended Minimum Cleaning and Disinfection Level and Frequency for Non-critical Patient Care Equipment and Environmental Items [17]

Article	Minimum cleaning and disinfection level	Minimum Frequency	Remarks
Blood Pressure Cuff	LLD	between patients and when visibly soiled	Ideally dedicated BP cuff
Stethoscope	LLD	after each use	ideally use own stethoscope if shared, disinfect ear pieces
Call Bell	LLD	daily and between patients	
Chairs including recliners, patient chairs	LLD	Daily and when soiled	
Table	LLD	▪ daily ▪ when soiled ▪ between patients	
Examination Bed	LLD	between patients and when soiled	
Glucometer	LLD	after each use	
Ophthalmoscope	CL	between patients	
Otoscope Handle	CL	between patients	use disposable ear specula or high-level disinfection
Oximeter Probes	LLD	daily and between patients	refer to manufacturer's instructions for cleaning

Recommendations:

- Cleaning and disinfection of the environment is a vital infection control measure. The recommended disinfectant is 70% alcohol or 1:100 chlorine solution.
- In the context of limited patient visits during COVID-19, cleaning of the clinic can be done daily. High-touch surfaces should be cleaned and disinfected after every clinic session. Low-touch surfaces including walls, ceilings, mirrors and windowsills may be cleaned when visibly soiled and on a periodic basis rather than a daily basis. Ideally there should be dedicated equipment for

each patient, however in the OPD clinic, non-critical medical equipment should be cleaned and disinfected after every patient use.

G. Ultraviolet germicidal irradiation (UVGI)

Ultraviolet (UV) surface disinfection machines work through the use of lamps that generate high-intensity ultraviolet C (UV-C). The process is called Ultraviolet germicidal irradiation (UVGI). UV light destroys microbial nucleic acid by causing thymine-thymine dimerization. The maximum bactericidal effect occurs at wavelengths 240-280 nm [18]. UV light with longer wavelengths such as UV-A (315-399 nm) and UV-B (280-314 nm) have other medical uses but are ineffective disinfectants. There are various types of UV-C machines available such as portable UV disinfectants (used for hospital rooms and spaces), UV cabinets, UV sterilizers, UV air purifiers and even UV hand-held devices (note that "salon" UV lights such as those for speed drying nail polish are commonly UV-A). Essentially, their effectiveness is affected by several factors including:

- *Shadowing*. Obstruction of the target surface for decontamination from the source of UV light, e.g. medical equipment, fixtures, dust on the lamp, presence of organic matter on the surface. Remove items that cause obstruction or reposition items for adequate exposure coverage.
- *Wavelength and light intensity*. The optimal bactericidal wavelength is 240-280 nm while intensities as low as 4 to 12 J/m^2 have been found to be effective. [19]
- *Humidity*. Humidity increases the injurious effects of UV light [20]
- *Type of microorganism targeted.* SARS-CoV-2 is expected to be easily destroyed by UV-C as demonstrated in a study using influenza virus, an acceptable analogue (because both SARS-CoV-2 and the influenza virus are enveloped, single-stranded RNA viruses) [19]. UV light is ineffective against bacterial spores.
- *Exposure time*. Exposure may be dependent on the intensity of UV light. Check on manufacturer's instructions to determine appropriate exposure times.
- *Distance from the UV light source*. The intensity of light decreases with distance. Determine the optimal placement of portable UV devices inside the room. Check on the specifications of the portable UV device to determine if all areas can be reached sufficiently.

The effectiveness of UVGI has been reviewed in a health technology assessment in Canada. [21] UVGI reduced the rate of HAI and colonization with nosocomial pathogens but the ten peer-reviewed publications included were inconsistent and with very low to low methodologic qualities. The use of UVGI locally has been in decontaminating rooms (after standard terminal cleaning) previously occupied by patients infected with pathogens necessitating airborne and contact precautions (TB, multidrug-resistant organisms).

Caution should be exercised when using UVGI. An epidemic of UV-induced skin irritation and keratoconjunctivitis (also photokeratitis) has been previously reported. [22] Procedure on the proper use of these UVGI devices should follow manufacturer's instructions and precautions (cleaning procedure, remote control of shutter). Avoid looking straight into the light source and use of skin and eye protection if exposure is unavoidable. Limit access to the area while the UV light is on. They should never be used while the clinic is ongoing. High intensity lamps when used in a closed area may produce significant

amount of ozone causing cough, shortness of breath, exacerbations of lung diseases, dizziness, headache and nasal irritation. Allow time 5-10 minutes for air to circulate by opening windows, doors or exhaust in an area with poor ventilation where UV light has been used.

Recommendation: The use of UVGI is an ***adjunct*** to standard disinfection procedures. If this strategy will be used, ensure that the (a) UV product specifications are compliant with minimum standard UVGI recommendations, (b) manufacturer's operating protocols are followed (time of exposure, recommended placement, proper device use and maintenance, etc.), and (c) safety precautions on its use are strictly followed.

H. High-efficiency Particulate Air (HEPA) Filters

HEPA stands for **High-efficiency particulate air** (**HEPA**) but can also mean **high-efficiency particulate absorbing** and **high-efficiency particulate arrestance**. HEPA filters are typically made of fiberglass and are able to filter at least 99.95% (EU Standards) or >99.97% (US Standards) of particles whose diameter is ≥ 0.3 μm. To allow efficient filtration, the rate at which the machine allows to pass through air is limited. Hence, standard HEPA filters are designed to filter air and **NOT** to provide ventilation. For example, given a room with a size of 8m x 4m x 4m (LxWxH) and a HEPA filter unit with a clean air delivery rate (CADR) will be able to filter air but will only provide 2.3 ACH. These parameters can be computer by looking at the manufacturer's specification of every device.

Opening doors and windows to provide natural ventilation as well as installation of fans are strategies to improve ventilation. Some clinics however do not have any window and installation of [exhaust] fans are not possible. In such conditions, HEPA filters can be used to improve air quality. Always consult with the vendor/manufacturer on the proper configuration, use, maintenance of these HEPA filter units, and future technical support. The HEPA filters of every unit need to be replaced regularly according to manufacturer's recommendations.

Recommendation: The use of HEPA filters provide additional benefit in improving air quality especially in settings where adequate ventilation cannot be achieved. If HEPA filters will be used, ensure that the manufacturer's operating protocols are followed including configuration, maintenance and replacement of the HEPA filters within the unit.

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Appendix A
OPD Patient Screening Form

In the past two weeks did the patient have any of the following:	**YES**	**NO**
1. Respiratory symptoms A. Cough B. Shortness of breath C. Colds D. Throat pain E. Other respiratory symptoms F. Influenza-like symptoms (headache, muscle and joint pains, diarrhea, lack of smell or taste)		
2. Fever more than 38^{o}C		
3. History of COVID-19 infection		
4. Household member diagnosed with COVID-19		
5. Travel or Residence in an area reporting local transmission of COVID-19		
6. Contact or exposure to someone with recent travel to an area with local transmission of COVID-19		

If a patient answers YES to ANY of the questions, refer to the Emergency Department or the designated COVID-19 area in your facility for COVID-19 screening

Appendix B

Description of Proper Personal Protective Equipment (PPE)

PPE	Description	Size
Gloves	single-use and reaching well above the wrist	Small, Medium, Large, Extra-Large
Goggles	Good seal with skin of the face, flexible PVC frame to easily fit with all face contours with even pressure, enclose eyes and the surrounding areas, accommodate wearers with prescription glasses, clear plastic lens with fog and scratch resistant treatments, adjustable band	
Face shield	Made of clear plastic and providing good visibility to both the wearer and the patient. Adjustable band to attach firmly around the head and fit snuggly against the forehead, fog resistant (preferably). Completely cover the sides and the length of the face. Mya be re-usable (made of robust material which can be cleaned and disinfected) or disposable/	
Particulate respirator, grade N95 or higher	N95 or FFP2 respirator, or higher	
	Good breathability with design that does not collapse against the mouth (e.g. duckbill, cup-shaped)	
	Preferably N95 (3M 1860 or 3M 8210) or N100 respirator	Small, Regular
Surgical Mask	Good breathability, internal and external faces should be clearly identified	
Coverall Suit	fluid resistant, with zipper and flap	Small, Medium, Large, Extra-Large
Surgical gown	Splash proof, thick material	
Hair cap	Disposable	
Booties or cover boots	fluid resistant, disposable	

APPENDIX C
Guidance on the Extended use and Reuse on N95 respirators

I. Respirator Extended Use Recommendation

- Respirators can be used within the design's specifications for 8 hours of continuous or intermittent use
- The maximum length of time for continuous use is based on the manufacturer's recommendation
- If N95 will be used for an extended time, engineering controls to limit respirator surface contamination should be done:
    - Respirators must maintain its fit and function
    - Barriers should be used to lessen surface contamination
        - Consider use of cleanable face shield over an N95 respirator
    - Additional training to staff should be done to minimize unnecessary contact with the mask's surface
        - Perform hand hygiene with soap and water or alcohol-based hand sanitizer before and after using the respirator

II. Respirator Reuse Recommendations

- IMPORTANT: N95s can be reused only if they are free from visible soiling (from organic matter, blood or body fluids, oil and grease including make-up) and if they remain functional (has maintained its physical integrity and when used properly provides protection consistent with the assigned protection factor for this class of respirator).
- Use manufacturers guidance on the reuse of N95 respirators. Maximum number of uses depends on the manufacturer's recommendation. If no information from the manufacturer, preliminary data suggests limiting the number of reuses to less than five per device
- If N95 will be reused, engineering controls to limit respirator surface contamination should be done
    - Must be only be used by a single wearer
    - Use of barriers to lessen surface contamination
        - Consider use of face shield over an N95 respirator
    - Hang used respirators in a designated storage making sure that they do not touch each other.
    - Keep them in a clean, breathable container in between uses.
    - Respirators should be stored in a separate container with proper identification/label of the user.
    - Storage containers should be disposed of or cleaned regularly
- In periods of short supply, N95s should be prioritized for use with patients in **intensive care units or during aerosol-generating procedures.**
- Reuse should be avoided after encounters with a higher risk of contamination (e.g., performing aerosol-generating procedures).
- If performing aerosol-generating procedures, practice extended use of N95s over reuse. If reuse cannot be avoided, use a barrier such as a full-face shield (preferable) or face mask over the N95 to limit contamination.
- Avoid touching the inside of the respirator and use clean gloves when donning a used N95 and performing a user seal check.

- Between use, N95s (labeled with the provider's name on the strap) should be stored in a clean paper bag.
- The U.S. CDC have reported several processes on decontamination of N95 masks. UVGI, vaporous hydrogen peroxide, and moist heat (60°C and 80% RH) have the greatest potential for decontamination of N95s (Refer to the table below). Ethylene oxide is not recommended by the CDC as it may confer toxic effects to the wearer. In all cases, reuse will require training for workers to properly inspect, handle, don, and seal check reprocessed N95s.
- Four different decontamination methods – UV radiation (260 – 285 nm), 70 degrees C dry heat, 70% ethanol and vaporized hydrogen peroxide (VHP) – were analyzed for their ability to reduce contamination with infectious SARS-CoV-2 and their effect on N95 respirator function. VHP treatment exhibited the best combination of rapid inactivation of SARS-CoV-2 and preservation of N95 respirator integrity. UV radiation killed the virus more slowly and preserved comparable respirator function. 70 degrees C dry heat killed with similar speed to UV and is likely to maintain acceptable fit scores for two rounds of decontamination. Ethanol decontamination is not recommended due to loss of N95 integrity. This experiment showed that N95 respirators can be decontaminated and re-used in times of shortage for up to three times for UV and VHP, and up to two times for dry heat. However, utmost care should be given to ensure the proper functioning of the N95 respirator after each decontamination using readily available qualitative fit testing tools. It is critical that guidelines for fit-testing, seal check and respirator re-use are followed.

Method	Treatment level	Microbe tested	Antimicrobial efficacy
Vaporous hydrogen peroxide (VHP)	**Battelle report:** Bioquell Clarus C HPV generator: The HPV cycle included a 10 min conditioning phase, 20 min gassing phase at 2 g/min, 150 min dwell phase at 0.5 g/min, and 300 min of aeration. **Bergman et. al.:** Room Bio-Decontamination Service (RBDS™, BIOQUELL UK Ltd, Andover, UK), which utilizes four portable modules: the Clarus® R HPV generator (utilizing 30% H_2O_2), the Clarus R20 aeration unit, an instrumentation module and a control computer. Room concentration = 8 g/m_3, 15 min dwell, 125-min total cycle time. **Kenney personal communication:** Bioquell BQ-50 generator: The HPV cycle included a 10 min conditioning phase, 30–40 min gassing phase at 16 g/min, 25 min dwell phase, and a 150 min aeration phase.	*Geobacillus stearothermophilus spores* T1, T7, and phi-6 bacteriophages	>99.999%
Ultraviolet germicidal irradiation (UVGI)	0.5–1.8 J/cm_2	Influenza A (H1N1) Avian influenza A virus (H5N1), low pathogenic Influenza A (H7N9), A/Anhui/1/2013 Influenza A (H7N9), A/Shanghai/1/2013 MERS-CoV SARS-CoV H1N1 Influenza A/PR/8/34 MS2 bacteriophage	99.9% for all tested viruses
Microwave generated steam	1100–1250 W microwave models (range: 40 sec to 2 min)	H1N1 influenza A/PR/8/34	99.9%

Microwave steam bags	1100 W, 90 sec (bags filled with 60 mL tap water)	MS2 bacteriophage	99.9%
Moist heat incubation	15–30 min (60°C, 80% RH)	H1N1 influenza A/PR/8/34	99.99%

Table adapted with minor modification from U.S. CDC. Decontamination and Reuse of Filtering Facepiece Respirators available from https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/decontamination-reuse-respirators.html accessed on 17 May 2020.

- Another good resource for N95 reprocessing is the N95decon website at https://www.n95decon.org/

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3. Fischer R, Morris DH, van Doremalen N, Sarchette S, Matson J, Bushmaker T, et al. Assessment of N95 respirator decontamination and re-use for SARS-CoV-2 medRxiv 2020 doi: https://doi.org/10.1101/2020.04.11.20062018

APPENDIX D
Guidance on the Extended use and Reuse of PPEs

In times of severe shortages, such as during the coronavirus disease 2019 (COVID-19) outbreak, consider contingency measures for reuse and extended use of personal protective equipment (PPE). **In general, extended use is preferred over reuse to reduce the risk of self-contamination from repeated donning (wearing) and doffing (removal) of the same equipment.**

I. Reuse of PPE

Reuse refers to the practice of using the same PPE for multiple encounters with patients but doffing between each of those encounters. The equipment is safely stored in between patient encounters. Previously used PPE should never be taken outside of patient care areas unless the item is decontaminated or placed in a clean breathable container.

A. Reuse of eye protection (e.g., disposable face shields or goggles):

- Disposable face shields and non-disposable eye protection should be decontaminated and reused whenever possible provided that the integrity of the equipment remains intact and visibility is not compromised.

- One study was found on decontamination of eye protection, using ultraviolet radiation (UV):

  Ziegenfuss et al. used a germicidal UV light cabinet (at 253.7 nm wavelength) using the bacterium Staphylococcus aureus as the indicator organism. Using minimal UV doses, 2.4 log reduction was achieved in S. aureus post-UV treatment. This study context was of lateral transmission e.g., between wearers of the same device with decontamination between uses, such as visitors at an industrial site. (https://journals.sagepub.com/doi/full/10.1177/1535676018786962)

- Avoid touching eye protection when wearing as it should be considered contaminated. Immediately wash hands or use hand sanitizer after touching or adjusting eye protection during patient care.

- Eye protection should be decontaminated when visibly soiled or each time it is removed prior to reusing it. Store in a clean paper bag or other container between use.

  a. While wearing gloves, carefully wipe the *inside, followed by the outside* of the face shield or goggles using a clean cloth saturated with neutral detergent solution or cleaner wipe.
  b. Carefully wipe the *outside* of the face shield or goggles using a wipe or clean cloth saturated with EPA-registered hospital disinfectant solution.
  c. Wipe the outside of face shield or goggles with clean water or alcohol to remove residue.
  d. Fully dry (air dry or use clean absorbent towels).
  e. Remove gloves and perform hand hygiene.

B. Reuse of isolation gowns:

- During shortages of isolation gowns, consider using **washable gowns** that are laundered after use.
- Reuse of single-use isolation gowns is difficult due to breakage of ties when removing and should be avoided.
- If single-use gowns must be reused, care should be taken to minimize contact with the outside of the gown to limit self-contamination.
- Cloth gowns could be considered for reuse without washing if there was minimal to no direct physical contact with the patient or nearby surfaces (e.g., bedrails).

II. Extended use of PPE

Extended use refers to the practice of wearing the same equipment for repeated encounters with patients without removing the PPE. This approach could be used while seeing multiple patients with confirmed or possible COVID-19.

- Eye protection, isolation gowns, face masks and N95s can be considered for extended use. Gloves should be changed between each patient, if possible, or perform hand hygiene (wash hands or use hand sanitizer) with gloves before and after donning and doffing if unable to change out.
- Gowns and gloves should be changed between patients if the patient is on contact precautions for different pathogens (e.g., *Candida auris*).
- Extended use of PPE should be done in conjunction with cohorting of patients as described below.
- Areas designated for donning and doffing should be identified for high- and moderate-risk units if extended use PPE is adopted.
- The maximal amount of time PPE can be worn continuously is not well defined. Studies show that **N95s remain effective for up to 8 hours of continuous use**. However, provider tolerability may limit this to shorter durations.
- PPE equipment should be removed if the integrity is damaged, visibly soiled, wet or becomes difficult to breathe through.

III. Cohorting as a strategy to maximize PPE supplies

Facilities should identify high-, moderate-, and low-risk units and begin cohorting patients accordingly.

A. **High-risk units (ICUs)**

- Includes patients with confirmed or possible COVID-19 who are likely to require ongoing aerosol-generating procedures (e.g., intubation, frequent suctioning or high-flow oxygen delivery).
- Use negative pressure rooms or spaces when possible to reduce contamination of PPE.
- PPE in these units should include eye protection, isolation gown, N95 and gloves.
    - Powered air-purifying respirators (PAPRs), when available, should be prioritized to these high-risk units.
- If PPE resources are limited
    - Eye protection and N95s can extend use between patients.
    - Isolation gowns should be changed between patients if supplies permit (can extend use if patient is not on contact precautions for other pathogens).
    - Gloves should be changed between patients if possible.

B. **Moderate-risk units:**

- Should include patients with confirmed or possible COVID-19 who are not critically ill and do not require ongoing aerosol-generating procedures.
- Confirmed COVID-19 positive patients can be cohorted in the same room. If possible, isolate patients with possible COVID-19 in individual rooms until diagnosis can be confirmed.
- PPE in these units should include face mask, eye protection, gown and gloves.
- If an aerosol-generating procedure is to be performed in moderate-risk units, the patient should be moved to an airborne isolation room, if available and appropriate PPE including an N95 should be donned.

C. **Low-risk units**

- Should include all other patients admitted to the hospital without confirmed or possible COVID-19 and no aerosol generating procedures are being performed.

- PPE requirements should follow standard precautions in accordance with hospital PPE conserving protocols.

REFERENCES:

U.S. CDC. Strategies for Optimizing the Supply of Eye Protection available from https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/eye-protection.html accessed on 17 May 2020.

U.S. CDC. Strategies for Optimizing the Supply of Isolation Gowns available from https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/isolation-gowns.html accessed on 17 May 2020.

Appendix E

Preparation of Chlorine Solutions

Sodium Hypochlorite (available in the market)	Ratio	Dilution		Desired Concentration
		Sodium Hypochlorite Volume	Clean Water Volume	
5.25% - 6.15% (liquid form) e.g. Zonrox	1:10	100 ml	900 ml	1 liter of 10% solution
	1:100	10 ml	990 ml	1 liter of 1% solution
Calcium hypochlorite powder or granules (70%) (High Test Hypochlorite -HTH)	1:10	7 grams or 0.5 tablespoonful	1 liter	1 liter of 10% solution
	1:100	7 grams or 0.5 tablespoonful	10 liters	10 liters of 1% solution
Bleaching powder (Chlorine of Lime) with 30% active chlorine	1:10	16 grams or 1 tablespoonful	1 liter	1 liter of 10% solution
	1:100	16 grams or 1 tablespoonful	10 liters	10 liters of 10% solution

Appendix F
Cleaning and Disinfection Instructions

A. Items to Prepare for Cleaning

1. Personal Protective Equipment (PPE)
    - Gloves
    - Surgical mask
    - Change of clothes
2. Plastic/trash bags
3. Water
4. Disposable cloth or rags
5. Pail
6. Mop
7. Disinfectant

B. How to care for the disinfectant stock

1. Prepare chlorine solution enough for a day use.
2. Always put a label: a) Date and time prepared; b) Date and time of expiry.
3. Prepare the solution in a well-ventilated room.
    - Use appropriate personal protective equipment such as heavy-duty gloves, mask, apron.
    - Use nontransparent plastic bottle to store solution.
    - Store in a place not exposed to sunlight.
4. Safety Data Sheet should always be available in storage area

C. Environmental Cleaning Instructions

Before cleaning

1. Remove clutter before cleaning
2. Gather materials required for cleaning before entering the room
3. Clean hands on entering the room
4. Put on a pair of gloves, N95 mask, eye goggles and a disposable gown.
5. Avoid touching your face, mouth, nose and eyes during clean-up.
6. Gloves should be removed and discarded if they become soiled or damaged, and a new pair worn. Prepare the disinfectant according to manufacturer's recommendations or bleach solution. For bleach, dilute 1000ppm or 0.1% sodium hypochlorite; bleach solutions with 5.25-6.00% sodium hypochlorite can be diluted with 1part bleach in 49 parts water. Alcohol can be used for surfaces where the use of bleach is not suitable.
7. Keep windows open for ventilation.

8. Keep cleaning equipment to a minimum.

During cleaning

9. Progress from the least soiled areas (low-touch) to the most soiled areas (high-touch) and from high surfaces to low surfaces
10. Dry mop prior to wet/damp mop
11. Mop floor with prepared disinfectant or bleach solution, starting from one end of the premises to another. Never shake mops
12. Soak cloths with prepared disinfectant or bleach solution and use them to wipe all frequently touched areas (e.g. doorknobs, arm rests, seat backs, tables, air/ light controls, keyboards, switches, etc.) and allow to air dry. A steady wiping motion should be used when cleaning either floors or horizontal surfaces, to prevent the creation of aerosols or splashing.
13. Avoid using a spray pack to apply disinfectant on potentially highly contaminated areas (such as toilet bowl or surrounding surfaces) as it may create splashes which can further spread the virus. Also, alcohol-based disinfectant is flammable, do not spray it into the air.
14. Clean toilets with a separate set of equipment (disposable cleaning cloths, mops, etc) using disinfectant or bleach solution. Use an appropriate disinfectant and note that different active ingredients require different periods of contact time to be effective.
15. Throw away disposable cleaning equipment made of cloths/ absorbent materials (e.g. mop head and wiping cloths) after cleaning each area, to prevent cross contamination. Discard cleaning equipment into doubled-lined biohazard waste bags arrange for proper disposal of this waste as biohazards waste.
16. Disinfect non-porous cleaning equipment used in one room, before using for other rooms. If possible, keep the disinfecting equipment separated from other routine equipment.
17. Disinfect buckets by soaking in disinfectant or bleach solution.
18. Containers for liquid soap, cleaners/disinfectants are disposable; the practice of 'topping up' is not acceptable since it can result in contamination of the container and solution
19. Collect waste, handling plastic bags from the top (do not compress bags with hands)

After cleaning

20. After cleaning and disinfection is completed, remove disposable gown (if worn) and gloves. Wash your hands with soap and water.
21. All other disposable PPEs should be removed and discarded after cleaning activities are completed. Hands should be washed with soap and water immediately after each piece of PPE is removed, following completion of cleaning. Eye goggles, if used, should be disinfected after each use, according to the manufacturer's instructions.
22. Throw PPE into doubled-lined biohazard waste bags.
23. All waste generated from the clean-up (disposable cloths, used PPE etc) should be segregated from other waste (e.g. food waste), and disposed of as biohazards waste as soon as possible.
24. Air and ventilate the premises.
25. Launder mop heads daily; all washed mop heads must be dried thoroughly before reuse

26. Clean housekeeping cart and carts used to transport waste daily

Reference:
National Environmental Agency. Interim Guidelines for Environmental Cleaning and Disinfection of Areas Exposed to Confirmed Case(s) of COVID-19 in Non-Healthcare Premises. April 29, 2020

Appendix G
Dr. Earl Spaulding Classification of Medical Device and the Level of reprocessing

Category	Examples of items	Access to body parts when in use	Level of Reprocessing in between patient use
Noncritical	Linen, bed, eating utensils, BP apparatus, stethoscope, other frequently touch surfaces in a room	Touches skin when in use	Decontamination, cleaning, **disinfection**, dry and store
Semi-critical	Speculum, endoscope	Touches mucus membrane of body parts	Decontamination, cleaning, **high level disinfection**, dry and store
Critical	Surgical instruments, canula, needles	Penetrates sterile body parts such as cannulation, surgery	Decontamination, cleaning, dry, pack, **sterilize** and store