Philippine Society for Microbiology and Infectious Diseases
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RISK ASSESSMENT OF SURGERIES IN THE CONTEXT OF COVID-19

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I. Introduction

The performance of surgeries, especially elective surgeries, has been affected as healthcare facilities responded to the COVID-19 pandemic. However, surgery and other interventional procedures are invaluable aspects of healthcare even during disasters, mass casualty incidents, and even during pandemics. An organized and well-planned approach is needed to protect healthcare workers performing surgery and to rationally use available PPEs.

This document aims to provide guidance on how to assess the risk of COVID-19 transmission to the surgical team and recommend the necessary PPE to be used for every scenario. This is intended for surgeons, infectious disease specialists, internists and other physicians who will perform procedures or evaluate patients prior to such procedures. Other personnel involved in the surgical team might also find this document useful. Optimizing operating room infrastructure and other infection prevention and control measures are not within the scope of this document. **Recommendations from this document may change as new evidence becomes available.**

When planning for surgery, the following aspects should be considered[1]:

- Urgency of the procedure
- Risk of procedure to transmit virus from the infected patient to the healthcare worker

- Risk of patient having COVID-19
- Access to laboratory testing
- Healthcare worker and patient safety
- Anticipated PPE stocks and availability of re-supply

Keep in mind that the primary mode of transmission of COVID-19 remains to be via **respiratory droplets**, and to some extent, via contact with contaminated surfaces. The necessary personal protective equipment that should be available for use in the operating room (OR) are listed in Table 1.

Table 1. Necessary Personal Protective Equipment (PPE) in the Operating Room during the COVID-19 Pandemic

Surgical masks
N95 masks
Sterile, water-impermeable surgical gowns
Sterile surgical gloves
Goggles or face shields
Head caps
Shoe covers (optional)
Alcohol or alcohol-based hand hygiene solution(s)

II. COVID-19 Risk Assessment for Patients About to Undergo Surgery

The risk of the patient to transmit the virus during the procedure should be evaluated based on clinical parameters, and *if available*, RT-PCR for SARS-COV-2.

- Patients should be screened based on their symptoms, exposure [close contact with confirmed or probable cases] and travel history [to areas with increased cases or increased level of transmission]. A patient screening form can be used similar to Table 2 below.

  The presence of *any* symptom should warrant referral to the emergency room or designated COVID-19 triage/testing unit for evaluation and/or testing. Any history of COVID-19 infection or close contact should be referred to an infectious disease specialist or designated COVID-19 triage/testing unit for evaluation if any additional tests should be done.

- *Consider* doing a chest x-ray to aid in the assessment of patients (e.g. symptomatic patients, in patients with prior lung conditions, etc.). Note that chest x-ray is part of the recommended diagnostic tests for patients who will require pre-operative clearance (e.g. elderly, presence of co-morbidities, etc.).

- For asymptomatic patients who will undergo high risk procedures, RT-PCR to detect SARS-CoV-2 using nasopharyngeal/oropharyngeal swabs can be done *if available*. Consider the accessibility, turnaround time, and the cost-effectiveness for the patient (cost of RT-PCR vs. cost of PPE) when RT-PCR is to be requested.

Table 2. 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. Anosmia F. Other respiratory symptoms G. Influenza-like symptoms (headache, muscle and joint pains, diarrhea, lack of 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		

III. Risk Stratification of COVID-19 Transmission

A. HIGH RISK for transmission

1. Emergency procedures. Emergency procedures during this pandemic require that patients should be treated as potentially infectious. Due to exigency, these procedures would have to be done regardless of any symptom screening or SARS-CoV-2 testing.

2. High risk procedures (e.g. aerosol-generating procedures or AGP, surgeries involving the aerodigestive tract, kindly refer to Table 3 for a list of AGPs) on patients who tested positive on RT-PCR for SARS-COV-2.

3. Low risk procedures on symptomatic patients who tested positive on RT-PCR for SARS-COV-2.

4. Patients in whom RT-PCR is recommended but cannot be done or results are unavailable at the time of intended surgery.

B. LOW RISK for transmission

1. Asymptomatic patients who will undergo low risk surgery

2. Low risk procedures among symptomatic patients who tested negative for SARS-COV-2 RT-PCR

3. High risk procedure on symptomatic patients but SARS-CoV-2 RT-PCR is negative

Table 3. List of High-risk/Aerosol-Generating Procedures

• Airway surgeries (e.g., ENT, thoracic, trans-sphenoidal surgeries) • Autopsies • Bronchoscopy (unless carried out through a closed-circuit ventilation system) • Cardiopulmonary resuscitation • Dental procedures • Endotracheal intubation and extubation • Evacuation of pneumoperitoneum during laparoscopic procedures • Gastrointestinal endoscopy	• High frequency oscillatory ventilation • Non-invasive ventilation (e.g., BiPAP, CPAP, high-flow nasal oxygen) • Open suctioning of airways • Manual ventilation • Nebulization • Sputum induction • Surgical procedures using high-speed/high-energy devices (e.g. high speed cutters and drills, powered instrumentation, suction microdebrider) • Tracheotomy/tracheostomy

Note: The AGPs are by no means limited to this list.

IV. Recommended Algorithm for Stratification of Transmission Risk of Surgical Procedures

The risk for transmission of COVID-19 are stratified based on the following: 1) urgency of the procedure, 2) the presence of symptoms and clinical assessment of the patient, and 3) the inherent risk of the procedure (e.g. aerosolization during procedure, manipulation of the aerodigestive tract). Figure 1 illustrates a recommended algorithm on risk stratification of surgeries.

Emergent and urgent surgeries are often done regardless of COVID-19 transmission risk and are always considered HIGH RISK. Presence of COVID-related symptoms should warrant RT-PCR testing to rule out COVID-19. Consider delaying procedures among patients with symptoms especially those compatible with COVID-19. High-risk procedures increase the risk of transmission of SARS-COV-2, but may be unavoidable[2]. These include interventions involving an open aerodigestive tract, such as nasopharyngeal/ oropharyngeal/ ENT procedures, tracheostomy, bronchoscopy, endoscopy of the GI tract, surgery of the bowel with gross contamination[1, 3,4]. Table 3 lists down various aerosol generating procedures. An RT-PCR should be requested prior to the performance of these procedures. **The RT-PCR should be done within one week prior, and preferably as close as possible, to the time of surgery**. During this time, the patient should preferably be on home quarantine avoiding any possible exposure to COVID-19 while awaiting results.

The set of PPE to be worn is largely the same for both LOW RISK and HIGH risk for transmission categories EXCEPT for the type of mask to be worn. N95 mask or any equivalent filtering facepiece respirator is to be worn when there is HIGH RISK for transmission while a surgical mask is recommended otherwise. Refer to Table 4 for the recommended minimum PPE per risk category.

Table 4. Minimum recommended personal protective equipment to be used based on risk of COVID-19 transmission during surgery

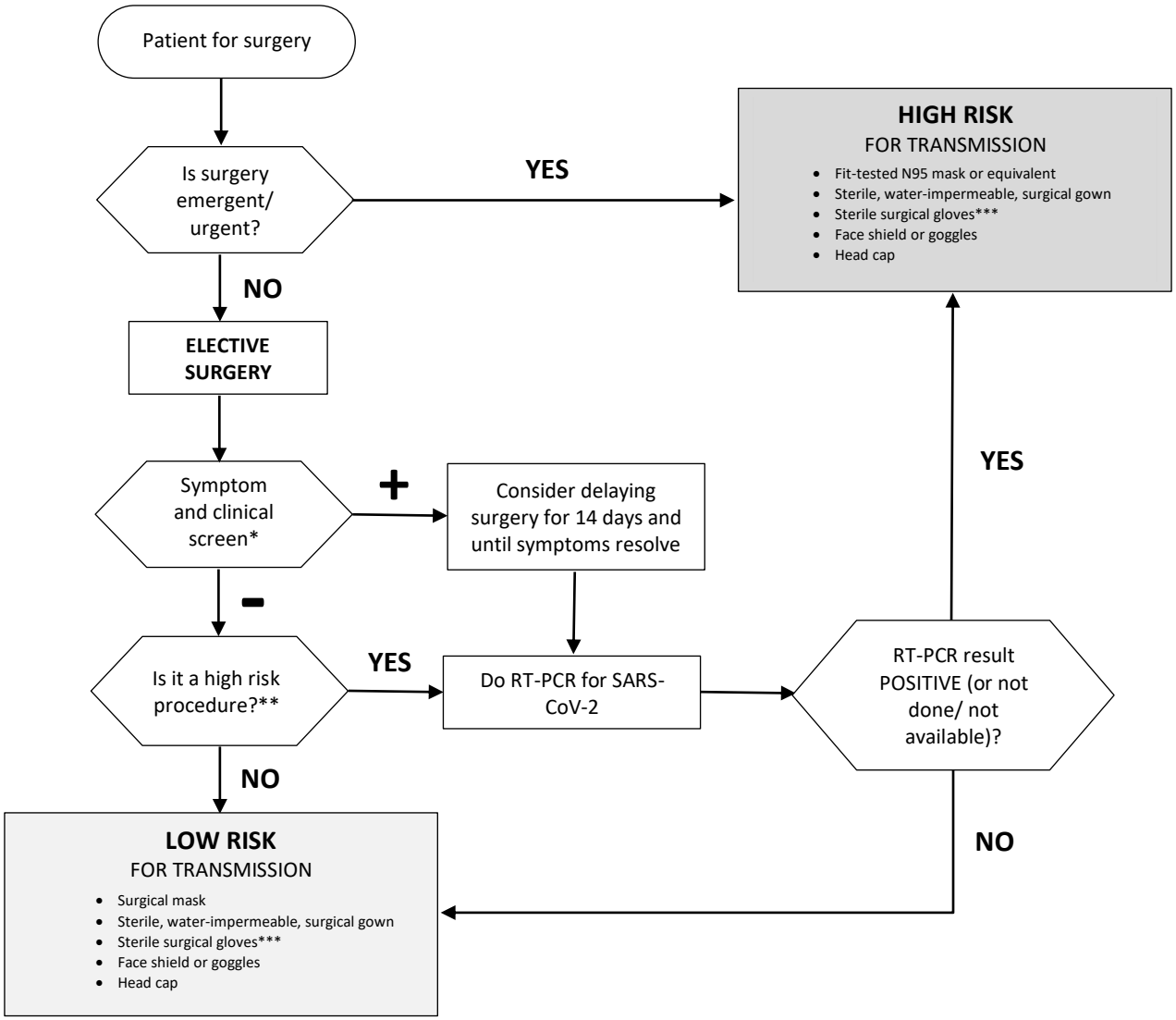
RISK LEVEL	MINIMUM PPE
HIGH RISK for transmission	• Fit-tested N95 mask or any equivalent filtering facepiece respirator • Sterile, water-impermeable, surgical gown • Face shield or goggles • Sterile surgical gloves* • Head cap
LOW RISK for transmission	• Surgical mask • Sterile, water-impermeable, surgical gown • Face shield or goggles • Sterile surgical gloves* • Head cap

* Use double gloves if double gloving is part of institutional policy when performing surgery.

Table 5. Personal Protective Equipment to be used by Healthcare Workers in the Operating Room during the COVID-19 Pandemic

HEALTHCARE WORKER	PPE
Surgeon (s)	Based on risk described in Table 4
OR nurse, technicians	Based on risk described in Table 4
Anesthesiologist	Follow PPE recommendations for HIGH RISK for transmission If LOW RISK for transmission, use N95 and goggles/face shield. Use additional PPE as necessary (gowns or gloves when contact with blood or body fluids is anticipated). Important: Other personnel should leave the room during bag mask ventilation or intubation for general anesthesia.
Operating Room Cleaners	Gown, gloves, face shield, surgical mask

Figure 1. Algorithm for risk stratification of surgical procedure based on urgency of procedure, clinical assessment and RT-PCR results



***** For symptomatic patients and the RT-PCR for SARS-CoV-2 is negative, consider working-up for appropriate diagnosis and management of the symptoms.

**** Aerosol-generating procedures include, but not limited to, the following:**

Tracheal intubation, non-invasive ventilation, tracheotomy (tracheostomy), cardiopulmonary resuscitation, manual ventilation before intubation, and bronchoscopy (unless carried out through a closed-circuit ventilation system), open suctioning, sputum induction, non-invasive ventilation including high flow nasal oxygen, gastrointestinal endoscopy, evacuation of pneumoperitoneum during laparoscopic procedures, surgical procedures in which high-speed devices are used (include energy devices)- high speed cutters and drills, powered instrumentation, suction microdebrider, dental procedures – high speed drilling, high frequency oscillatory ventilation (HFOV)

*** Use double gloves if double gloving is part of institutional policy when performing surgery

Note: Anesthesiologists should wear fit-tested N95 mask (or equivalent) and face shield or goggles in anticipation of any unplanned or future exposures such as intubation or bag mask ventilation.

V. Special Considerations

- The surgical needs for a given procedure should be established by the primary surgeon, placing special attention to the needs of the patient, protection of the surgical team and logistical capability of the hospital. This includes, but is not limited to, human resource, PPE supplies, availability of beds and equipment[5]. Approval of the Chief Medical Officer, Anesthesiology chair, Surgery chair, and Infection Control Committee chair may be needed especially when procedures are classified under HIGH RISK.

- If there is a choice between surgical approaches, the team should prefer to perform a procedure that will limit OR time, whilst maximizing safety for both the patients and healthcare workers. Once procedure has been completed, all staff not involved in the patient's care should leave the OR and remove all PPEs in a dedicated doffing area.

VI. Use of other Personal Protective Equipment

A. Elastomeric respirators

Elastomeric respirators, such as half facepiece or full facepiece tight-fitting respirators, provide equivalent or higher protection from particulates. They make use of replaceable filter cartridges or flexible, disc or pancake-style filters (e.g. P100 filters) that need to be replaced regularly based on manufacturer's instructions. These respirators can be used as alternatives to N95 masks[6]. However, if these will be used, ensure that proper donning, doffing, cleaning and disinfection, and storage procedures are followed. Use of these respirators might be more uncomfortable for the user (especially during prolonged use) and can cause difficulty in communication among the surgical team

B. Powered Air-Purifying Respirators (PAPRs)

PAPRs provide comfortable, air and barrier protection for the user especially in the case of surgeons who might do surgeries for extended periods of time. These respirators produce positive pressure airflow from the user to the outside posing a theoretical risk of contaminating the surgical field with flora coming from the user. Some papers have reported no additional risk in terms of contamination of the operating field[7,8]. An article published online by Association of periOperative Registered Nurses (AORN) in the US highlights the protection of the sterile field when PAPRs are used. Ensure that the PAPR blower exhaust and the exhaled air is not blown into the sterile field. Partially cover the portion of the sterile field that is not in immediate use with a sterile drape or sterile surgical towels. Choose a hood-style PAPR that can be worn under a sterile surgical gown.[9] Keep in mind also that using PAPRs might cause difficulty in communication among the surgical team.

C. Coveralls (or Hazmat) Suits

The American College of Surgeons and most other foreign references such as The University of Kansas Health System only recommend the use of gown during surgical procedures in the context of COVID-19[10]. However, there has been rampant use of coveralls in many other facilities and settings.

Coveralls were initially used in industrial settings where there is a high risk of exposure to noxious gas and chemicals. During the Ebola outbreak in 2014, the importance of coveralls was highlighted considering contact with infected blood and body fluids as the main mode of transmission. In the context of COVID-19, coveralls gained popularity because they are able to provide a high level of barrier protection to the user from a novel and yet-to-be-understood virus. The probability of skin contact is significantly reduced especially when high quality, water-resistant coveralls are used. However, there are disadvantages to the use of coveralls in the OR setting. Use of coveralls entails a certain level of experience and proficiency. Especially when doffing is done improperly, there is an even greater risk of contamination. Coveralls are packed unsterile and when used in the OR, it requires disinfection before donning an additional layer of sterile surgical gown on top. This can cause a lot of discomfort and heat to the user, even suffocation. The benefit of using coveralls should be weighed against the potential risks when contemplating use of coveralls inside the OR.

Technical Working Group:

Gelza Mae A. Zabat, MD FPCP FPSMID
Jemelyn U. Garcia, MD FPCP FPSMID
Marisse J. Nepomuceno, MD FPCP DPSMID
Karen Marie R. Gregorio, MD FPCP FPSMID
Arthur Dessi E. Roman, MD FPCP FPSMID
Evalyn A. Roxas, MD FPCP FPSMID
Regina P. Berba, MD FPCP FPSMID

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