



**Philippine Association of Thoracic, Cardiac and Vascular Surgeons, Inc.
COVID-19 Crisis-Driven Recommendations on
Cardiac Surgery**



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INTRODUCTION:

This document tackles the recommendations to address the massive disruptions in the surgical care of patients with acquired and congenital heart diseases. Peculiar to this subset of surgical patients are the following:

- a. The prevalence of cardiovascular disease (CVD) among COVID-19 patients is high at 16.4%⁶. Pre-existing CVD may predispose to COVID-19 infection⁷.
- b. Infected patients with CVD have a 10.5% mortality risk due to myocarditis⁸.
- c. The medicines for the management of COVID-19 have potential adverse cardiovascular effects⁷.
- d. The side-effects of surgery especially cardiopulmonary bypass (CPB) can exacerbate the complications of COVID-19 infection (i.e., CPB-induced cytokine proliferation, immunosuppression, pulmonary reperfusion injury, acute kidney injury, myocardial stunning, coagulopathy, etc.). Risk assessment is, therefore, higher.¹²
- e. The surgical management of CVD is resource-demanding (i.e., big surgical and ICU teams with concomitant increased use of PPEs, longer duration of ICU and in-hospital stay, etc.).
- f. Longer close contact (and possible COVID-19 exposure) to a patient due to an inherently prolonged duration of surgery.
- g. Staff risk to COVID-19 exposure during perioperative cardiac arrest resuscitation.

Highlighted are the patient selection guidelines during various phases of human and material resource constraints (i.e., during the period of very limited resources in anticipation of the surge of COVID-19 cases, and the loosening of restrictions to resources during the ‘flattening of the curve’). Community quarantine is not necessarily synonymous with the level of resource availability, therefore, our recommendations are also based on resource availability determined by the hospital chief and DOH mandates.

In addition, as appropriate institutional standard PPE requirements are anticipated to be already in place, we have additional recommendations considering the inclusion of the surgical loupes and the possibility of personnel fatigue during a long procedure.

Topics on penetrating and blunt cardiac trauma are excluded in this document, as they are true emergencies manageable in any tertiary hospital.

Objectives:

- 1) To protect both the healthcare workers and non-infected patients from exposure to COVID-19 virus
- 2) To maintain readiness in providing appropriate cardiac surgical care in this time of COVID-19 pandemic
- 3) To promote the judicious use of limited operating room and ICU human and material resources

RECOMMENDATIONS:

I. Multi-phased recommendations on cases to be operated based on the degree of limitations of human and material resources

A. Cases for emergency (within hours) and urgent (average 2 days) operations during the period of severely restricted resources in anticipation of and during the surge of COVID cases. The recommendation also holds for any period when the reason for the restriction is due to drained resources with or without ECQ.

Adult Cases	Congenital Cases
a. ACS (UA/NSTEMI, STEMI) not amenable to thrombolysis/PCI with on-going ischemia or hemodynamic instability refractory to pharmacotherapy +/- IABP*	a) Congenital heart defects with PDA-dependent lesions and hypercyanosis (PDA stenting preferred over shunt surgery)
b. STEMI with mechanical complications	b) Obstructed TAPVR
c. Critical MS in NYHA IV not amenable to PTMC	c) d-TGA with intact ventricular septum
d. Severe AS with NYHA Class IV symptoms or recurrent syncope or unstable chest pain	d) Critical AS/PS (interventional procedure preferred as initial management)
e. Severe AS or severe MR in the setting of an ACS refractory to pharmacotherapy	e) Neonatal severe coarctation of the aorta/hypoplastic arch/interrupted aortic arch
f. Acute severe MR with heart failure refractory to pharmacotherapy	f) Infant with interrupted or hypoplastic aortic arch presenting with LCOS
g. Infective endocarditis and prosthetic valve complications where surgery is strongly indicated	g) Intractable CHF from shunt lesions despite high dose diuretics requiring a PA band
h. Obstructive or high risk for embolism of a cardiac tumor	h) Completely occluded BTS with cyanotic spells
i. Massive pericardial effusion with evidence of tamponade	
j. Pulse generator end-of life within 2 months	
k. Complete heart block	
l. In-patient critically ill COVID-19 patients requiring ECMO for respiratory support ⁴	

*Emergency intravenous thrombolysis is the first choice for acute ST-segment elevation myocardial infarction (STEMI). For NSTEMI patients, early or time-limited intervention strategies should be selected immediately according to the risk stratification of ACS⁹.

B. List of priority cases for semi-urgent operations (delayed operations can cause potential harm) once there is a directive to allow more operations as the burden on resources lightens during the period of the ‘flattening of the curve’:

Adult Cases	Congenital Cases
a. Stable angina with severe 3- vessel disease or LMI	a) TOF with stable saturations between 55%-70%
b. Pulse generator end-of life within 6 months	b) Shunt lesions with controlled heart failure requiring maximal dosages of diuretics
c. Severe AS with heart failure and decline in LVEF or new-onset atrial fibrillation (especially if peak transaortic jet velocity >5.0 m/s)	c) Stable supracardiac TAPVR or infracardiac TAPVR
c. Severe MR with recent decline in LVEF and worsening NYHA Class III symptoms despite optimal medical therapy	d) Single ventricle physiology with stable saturations between 55%-70% for first surgical palliation
d. Massive pericardial effusion patients not in tamponade*	

*Requires further investigation of etiology including preop. TB tests, Chest CT scan, rheumatology/immunology; intraop. pericardial biopsy, among others.

C. Elective cases: Diagnoses not listed above.

1. Readiness for **gradual** resumption of elective operations should consider the following:
 - a) Hospital capability for human and material resources exceeding 20% of the total requirements for the number of operations proposed (i.e., PPEs, ward beds, ICU beds, ventilators, nurses, perfusionists, open heart materials supply chain, etc.).¹¹ The 20% excess for the demand should be able to supply the emergency procedures including reoperations, additional urgent cases, staff sickness, etc. Ideally, the planned number of cases and resource inventory must be good for 1 month. However, daily and weekly evaluations must be performed whenever there is a rise of staff sickness or admissions for urgent cases.
 - b) Operating rooms must meet the engineering air exchange requirements for COVID-19 as endotracheal intubation, sternotomy with possible inadvertent pleural opening and chest tube insertions are considered high risk for aerolization of viruses.¹¹

Once mass testing is in place, another gauge for increasing elective caseload is a sustained reduction in the rate of new COVID-19 cases for at least 14 days.^{10,14}

2. Elective surgical patients would require COVID-19 PCR test 2-5 days prior to surgery. If positive, the patient should be treated for the infection and shall be re-scheduled after 1 month, once proven negative as per the DOH protocol.^{11,14}
3. Elective surgery should be cleared by the Heart Team.¹⁵
4. Daily Heart Team huddle and weekly managers' evaluation of the national and institutional healthcare situations should be done to assess for escalation, decrease or suspension of the performance of elective surgeries.^{11,14}

II. Other recommendations during the entire COVID-19 healthcare crisis

A. An institutional Heart Team is activated and decides on the selection of patients for surgery.

B. Institutional process flow on specific surgical cardiac diseases must be in place.

C. Designate an intra-operative back-up team in the event of personnel fatigue and need to change the PPE. It is worth considering that the Wuhan experts recommended the change of the PPE after 4 hours of continuous usage to avoid the risk of deterioration of the materials.

D. Modifications of the institutional PPE to accommodate the surgical loupes. Simulation of the use of PPE is also recommended. This includes donning of the PPE along with the surgical loupes in the actual operating room, and worn for the duration of the average open heart and non-bypass procedures. This will allow for the necessary adjustments aimed at optimal surgical field visibility and HCW's well-being without protection compromise. This will avoid the intra-operative risk, both to the patient and the surgical team, due to personnel hypercarbia, desaturation, poor visibility from fogging, prolonged discomfort and breach of PPE (all of which have been anecdotally been reported).

Ideally, full coverage of the head and face using fit-tested N95 mask, shields, hood, +/-goggles. PAPR supplies are very limited, and if available, must have strong evidence to prevent COVID-19 infection.

The pictures below are some of the recommended adjustments to cardiac surgery PPE. Surgical loupes can be decontaminated using soap and water. Headlights can be decontaminated with UV light exposures.

PPE guidelines by the PCS and DOH shall be used as references regarding PPE⁵.



- E. Informed consent for surgery includes a revised risk stratification in patients with COVID-19 considering that due to cytokine-induced myocarditis, kidney failure and stroke, there is a higher overall mortality rate for CVD patients infected with COVID-19 versus non-COVID CVD patients¹.
- F. We recommend a full PPE during all emergency and urgent surgeries. Treat all emergency and urgent cases as COVID-19 positive unless proven otherwise with PCR. If the patient has been swabbed, there is **No** need to await the PCR result due to an emergency procedure. The test result will guide the postoperative management.
- G. Semi-urgent cases should be tested, treated and cleared for COVID-19.^{11,13,14}
- H. Mandatory referral to the Infectious Disease Service (IDS) to perioperatively evaluate and co-manage for COVID-19 infection. Ideally, all patients should be swabbed for PCR testing due to predilection of infection in CVD especially in CHF. The findings of the IDS can help risk stratify and manage the postoperative care.
- I. Remind the blood bank to ensure readiness at all times and confirm changes in blood donation procedures.

- J. Minimize usage of electrocautery to avoid aerosolization (note that COVID-19 has been isolated in blood cultures during days 4-5)³.
- K. Cardiac surgeon, cardiologist and cardiac nurse collaborative telemedicine with the following functions:
 - 1. Weekly or bi-weekly follow-up calls of the patients who are at moderate risk of progression of symptoms
 - 2. Answer consultations of mild to moderately symptomatic patients
 - 3. Triage patients for emergency room consultation due to severe symptoms
 - 4. Advice asymptomatic patients on important matters such as Warfarin dosing, wound care, surgery scheduling concerns, etc.

These recommendations are subject for review monthly, unless significant changes occur earlier as per DOH and hospital chief assessment of the resource allocations.

SUMMARY OF RECOMMENDATIONS:

PATACSI COVID-19 Crisis-Driven Recommendations on Cardiac Surgery

I. Multi-phased guidelines on cases to be performed based on availability of human and material resources (with or without ECG):

A. Priority Surgical Cases during Severely Restricted Resources (with or without ECG)

Adult Cases	Congenital Cases
a. ACS (UA/NSTEMI, STEMI) not amenable to thrombolysis/PCI with on-going ischemia or hemodynamic instability refractory to pharmacotherapy +/- IABP*	a) Congenital heart defects with PDA-dependent lesions and hypercyanosis (PDA stenting preferred over shunt surgery)
b. STEMI with mechanical complications	b) Obstructed TAPVR
c. Critical MS in NYHA IV not amenable to PTMC	c) d-TGA with intact ventricular septum
d. Severe AS with NYHA Class IV symptoms or recurrent syncope or unstable chest pain	d) Critical AS/PS (interventional procedure preferred as initial management)
e. Severe AS or severe MR in the setting of an ACS refractory to pharmacotherapy	e) Neonatal severe coarctation of the aorta/hypoplastic arch/interrupted aortic arch
f. Acute severe MR with heart failure refractory to pharmacotherapy	f) Infant with interrupted or hypoplastic aortic arch presenting with LCOS
g. Infective endocarditis and prosthetic valve complications where surgery is strongly indicated	g) Intractable CHF from shunt lesions despite high dose diuretics requiring a PA band
h. Obstructive or high risk for embolism of a cardiac tumor	h) Completely occluded BTS with cyanotic spells
i. Massive pericardial effusion with evidence of tamponade	
j. Pulse generator end-of life within 2 months	
k. Complete heart block	
l. In-patient critically ill COVID-19 patients requiring ECMO for respiratory support	

*Emergency intravenous thrombolysis is the first choice for acute ST-segment elevation myocardial infarction (STEMI). For NSTEMI patients, early or time-limited intervention strategies should be selected immediately according to the risk stratification of ACS.

B. Priority Surgical Cases during Less Severe Resource Restriction (with or without ECG)

Adult Cases	Congenital Cases
a. Stable angina with severe 3- vessel disease or LMI	a) TOF with stable saturations between 55%-70%
b. Pulse generator end-of life within 6 months	b) Shunt lesions with controlled heart failure requiring maximal dosages of diuretics
c. Severe AS with heart failure and decline in LVEF or new-onset atrial fibrillation (especially if peak transaortic jet velocity >5.0 m/s)	c) Stable supracardiac TAPVR or infracardiac TAPVR
c. Severe MR with recent decline in LVEF and worsening NYHA Class III symptoms despite optimal medical therapy	d) Single ventricle physiology with stable saturations between 55%-70% for first surgical palliation
d. Massive pericardial effusion patients not in tamponade*	

*Requires further investigation of etiology including preop. TB tests, Chest CT scan, rheumatology/immunology; intraop. pericardial biopsy, among others.

C. Resumption of Elective Operations (diagnoses not listed above)

- Readiness for **gradual** resumption of elective operations should consider the following:
 - Hospital capability for human and material resources exceeding 20% of the total requirements for the number of operations proposed (i.e., PPEs, ward beds, ICU beds, ventilators, nurses, perfusionists, open heart materials supply chain, etc.).
 - Operating rooms must meet the engineering air exchange requirements for COVID-19 as endotracheal intubation, sternotomy with inadvertent pleural opening and chest tube insertions are high risk for aerolization of viruses. Once mass testing is in place, another gauge for increasing elective caseload is a sustained reduction in the rate of new COVID-19 cases for at least 14 days.
- COVID-19 PCR test 2-5 days prior to surgery. If positive, should be treated and re-scheduled after 1 month, once proven negative as per protocol.
- Elective surgery should be cleared by the Heart Team.
- Daily Heart Team huddle and weekly managers' evaluation of the national and institutional healthcare situations should be done to assess for escalation, decrease or suspension of the performance of elective surgeries.

II. Other recommendations during the period of COVID-19 Healthcare Crisis

- An institutional Heart Team is activated and decides on the selection of patients for surgery.
- Institutional process flow on specific surgical cardiac diseases must be in place.
- Designate an intra-operative back-up team in the event of personnel fatigue and need to change the PPE. Consider the Wuhan experts recommendation to change of the PPE after 4 hours of continuous usage to avoid the risk of deterioration of the materials.
- Modifications of the institutional PPE to accommodate the surgical loupes. Simulation of the use of PPE to allow for adjustments aimed at improved surgical field visibility and personnel well-being without protection compromise.
- Informed consent for surgery includes a revised risk stratification in patients with COVID-19 considering possible cytokine-induced myocarditis.
- Use full PPE during all emergency and urgent surgeries.
 - Treat all emergency and urgent cases as COVID-19 positive unless proven otherwise with PCR. If the patient has been swabbed, there is **No** need to await the PCR result due to the urgency of the procedure. The test result will guide the postoperative management.
- Semi-urgent cases should be tested and cleared for COVID-19.
- Mandatory referral to the Infectious Disease Service to evaluate and co-manage perioperatively for COVID-19 infection. Ideally, all patients should be swabbed for PCR testing due to predilection of infection in CVD especially in CHF. The findings of the IDS can help risk stratify and manage the postoperative care.
- Remind the blood bank to ensure readiness at all times and confirm changes in blood donation procedures.
- Minimize usage of electrocautery to avoid aerosolization (note: COVID-19 has been isolated in blood cultures during days 4-5).
- Cardiac surgeon, cardiologist and cardiac nurse collaborative telemedicine with the following functions:
 - Weekly or bi-weekly follow-up calls of the patients who are at moderate risk of progression of symptoms
 - Answer consultations of mild to moderately symptomatic patients
 - Triage patients for emergency room consultation due to severe symptoms
 - Advice asymptomatic patients on important matters such as Warfarin dosing, wound care, surgery scheduling concerns, etc.

These recommendations are subject for review monthly, unless significant changes occur earlier as per DOH and hospital chief assessment of the resource allocations.

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