2020-04-10

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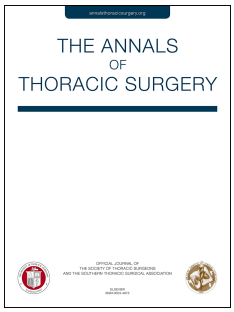
Journal Pre-proof



Adult cardiac surgery during the COVID-19 Pandemic: A Tiered Patient Triage Guidance Statement

Jonathan W. Haft, Pavan Atluri, Gorav Alawadi, Daniel Engelman, Michael C. Grant, Ansar Hassan, Jean-Francois Legare, Glenn Whitman, Rakesh C. Arora, on behalf of the Society of Thoracic Surgeons COVID-19 Taskforce and the Workforce for Adult Cardiac and Vascular Surgery

PII: S0003-4975(20)30548-8

DOI: https://doi.org/10.1016/j.athoracsur.2020.04.003

Reference: ATS 33683

To appear in: *The Annals of Thoracic Surgery*

Received Date: 6 April 2020

Accepted Date: 8 April 2020

Please cite this article as: Haft JW, Atluri P, Alawadi G, Engelman D, Grant MC, Hassan A, Legare JF, Whitman G, Arora RC, on behalf of the Society of Thoracic Surgeons COVID-19 Taskforce and the Workforce for Adult Cardiac and Vascular Surgery, Adult cardiac surgery during the COVID-19 Pandemic: A Tiered Patient Triage Guidance Statement, *The Annals of Thoracic Surgery* (2020), doi: https://doi.org/10.1016/j.athoracsur.2020.04.003.

Adult cardiac surgery during the COVID-19 Pandemic: A Tiered Patient Triage Guidance Statement

Running Head: Tiered Patient Triage in COVID-19 Pandemic

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Abstract Word Count: 117

Word Count: 1950

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The STS/AATS support this document.

Abstract

In the setting of the current novel coronavirus pandemic, this document has been generated to provide guiding statements for the adult cardiac surgeon to consider in a rapidly evolving national landscape. Acknowledging the risk for a potentially prolonged need for cardiac surgery procedure deferral, the authors have created this proposed template for physicians and interdisciplinary teams to consider in protecting their patients, institution and their highly specialized cardiac surgery team. In addition, recommendations on the transition from traditional in-person patient assessments and outpatient follow-up are provided. Lastly, we advocate that the cardiac surgeon must continue to serve as leaders, experts, and relevant members of our medical community, shifting our role as necessary in this time of need.

Word Count: 117

List of Abbreviations:

AVR - Aortic Valve Replacement

CAD – Coronary Artery Disease

COVID-19 – Novel coronavirus SARS CoV-2

EF – Ejection Fraction

LM – Left Main Coronary Artery Disease

PPE – Personal Protective Equipment

TAVR - Transcatheter aortic valve replacement

Novel coronavirus (SARS CoV-2 or COVID-19) has been declared a worldwide pandemic by the World Health Organization. At the time of writing this document, there are over 1,200,000 reported cases worldwide and over 320,000 in the United States alone.[1] There is substantial regional variation within the United States, particularly extreme in the populous northeast.[2] Dependence on hospital infrastructure to manage the outbreak is variable and difficult to predict. Mandatory quarantines are present in many states and the Center for Disease Control has stated that certain individuals are at higher risk in the setting of the pandemic and should avoid close contact with others. This specifically includes patients over 65 years of age and those with lung or heart conditions, diabetes, and obesity. This obviously represents the majority of the population that requires cardiac surgery.

The intent of this document is to provide guidance to the adult cardiac surgery perioperative community regarding management of patients considered or scheduled for surgical procedures in the context of the current pandemic. Specifically, contained within is a proposed template for physicians and interdisciplinary teams to consider and adapt to the unique aspects of each patient in the specific context of the prevalence of COVID-19 at the medical center where they are being treated. The purpose of postponing or cancelling cardiac operations is based upon these principles:

1) *Protecting the cardiac patient:* As our hospitals become increasingly populated with either suspected or confirmed COVID-19 patients, exposing the cardiac patient to the hospital environment will potentially increase their risk of nosocomial infection. It is

uncertain how acquisition of COVID-19 in the perioperative phase will impact morbidity and mortality.

2) *Protecting the institution and society at large:* Reducing the number of cardiac surgical procedures will result in the preservation of valuable resources that will allow for intensive care unit beds, mechanical ventilators, circuitry for extracorporeal membrane oxygenation (ECMO), pharmaceuticals, personal protective equipment (PPE) and healthcare workers with advanced skills to be used for the ever growing numbers of COVID-19 admissions.

3) *Protecting the healthcare team:* Cardiac surgery requires a relatively small dedicated team of uniquely skilled individuals (cardiac operating room scrub and circulators, perfusionists, cardiac anesthesiologists, and perioperative caregivers). Utilizing these individuals for potentially non-essential operations may increase their chances of COVID-19 exposure, threatening their availability for future more urgent procedures.

There is obviously a balance of risk, as patients with significant cardiovascular disease have their definitive treatment delayed versus increasing the likelihood of acquiring a nosocomial COVID-19 infection and its consequences. The factors resulting in delaying a cardiac surgery procedure are multifold. Blood products are in short supply as volunteer donation rates are substantially reduced under the advisory of avoiding close contact. Each cardiac surgical procedure will necessarily consume increasingly scarce resources (in-patient space, human resources, PPE, etc.) that might delay or prevent treatment of a patient suffering from the

sequela of a COVID-19 infection. Lastly, there is an increasing awareness of the importance of preventing infections of the healthcare team by patients who may be asymptomatic carriers. Screening of asymptomatic patients should be determined based upon instutional practice.

At a time when our nation's healthcare resources are insufficient to meet this unprecedented demand, it is necessary to prioritize needs in the hopes of maximizing lives saved. Although delaying definitive treatment of cardiovascular disorders may present risk to certain individuals, countless others will be afforded life saving resources necessary to overcome the most threatening manifestation of this illness (see Tables 1-4). As the duration of COVID-19 burden in our hospitals is presently unknown, it is foreseeable that reduction in cardiac surgery capacity may be impacted for several months or longer. For patients whose cardiac surgical procedures are being delayed and in whom alternative therapies are not deemed appropriate, programs are encouraged to develop an orchestrated follow-up mechanism for regular communication (i.e. 1-2 week intervals) to monitor for progession of symptoms by tele or video conference. Timely reprioritization can be considered given the dynamic nature of some patients with cardiovascular disease. Each individual case should be given careful consideration, weighing risks and potential therapeutic alternatives, including medical treatment, catheter based therapy, or even a recommendation to transfer to a center with lower COVID-19 penetrance and more available resources. Under these circumstances, it is important to recognize that regional competitors must now become collaborators.

Programs are encouraged to limit in-person clinic evaluations and testing for appropriately selected patients who can be safely deferred, understanding the uncertainty of the pandemic duration. Tele and video visits should be incorporated for both new patient evaluations and postoperative assessments. As the morphology of the typical cardiac surgery practice evolves, programatic leaders must determine how to effective and safely "skeletonize" hospital and office staffing including surgeons, advance practice providers, administrative and clerical personnel, and in some cases creating opporutnites for team members to work from home. There should also be specific consideration to accommodate individuals at higher risk of COVID-19 because of advanced age or the presence of underlying health conditions.

As our surgical volume declines over the next several months, it is essential that the cardiothoracic surgical community maintains its commitment to the health and safety of its patients. While hospitals shift their focus to medical management of this outbreak, cardiac surgeons may feel uncertainty about their role. In addition to our expertise in the care of advanced cardiac disease, there will also likely be an expanded need for the use of ECMO, requiring cardiac surgical direction and partnership with the Extracorporeal Life Support Organization[3]. We must continue to serve as leaders, experts, and members of our medical community, willing to play any role necessary in this time of need.

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Acknowledgment: The authors would like to acknowledge the work of the Canadian Society of Cardiac Surgeon Board of Directors that shared an earlier draft of their national guidance documents with this team of authors.

Table 1: Guiding statement for patient triage during Tier 1 (0-30% inpatient COVID-19 Load, mild reduction in operative capacity)

TIER 1	
Essential services	**Deferred**
• All in-patients waiting for surgery including emergency services (i.e. ascending aortic dissections, acute coronary syndromes, acute valvular endocarditis, and heart failure patients awaiting heart transplant or VAD) • Outpatients who are at greatest risk of adverse event, examples of which include: o Symptomatic critical AS o CAD ▪ Severe CAD with large territory of myocardium at risk. ▪ Asymptomatic CAD with reduced systolic function. ▪ Progressive angina o Cardiac tumors at risk of obstruction or embolization o Aortic aneurysm at risk based on size and familial association o Patients with correctable, anatomic causes of heart failure (valvular or	• Asymptomatic Outpatients • Truly elective intervention could include o Asymptomatic or minimally symptomatic severe MR o ASD and or PFO surgery o Asymptomatic aneurysm with demonstrated stable size o Isolated arrhythmia procedures

myocardial, ie. HCM, adult congenital) o End-stage heart failure patients in evaluation for mechanical assist devices whom are inotrope dependent	
➢ **Programs are encouraged to adopt a mechanism by which patients can be screened regularly in order to identify those having increased symptoms or progression of disease** ➢ **Transcatheter interventions will follow the same recommendations** ➢ **Alternative percutaneous therapies with rapid discharge from the hospital should be considered** ➢ **Thoracic Organ Transplant guidance is provided by the United Network for Organ Sharing**	

Table 2: Guiding statement for patient triage during Tier 2 (30-60% inpatient COVID-19 Load, moderate reduction in operative capacity)

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TIER 2	
Essential services	Deferred
• All in-patients waiting for surgery including emergency services • Outpatients with progressive symptomatology who have demonstrated failure to medical management o **Symptomatic CAD** • **Asymptomatic CAD with impaired systolic function**	• Asymptomatic outpatients and patients with anatomy and physiology suggesting delay can be provided with reasonable safety.
➢ **Programs are encouraged to adopt a mechanism by which patients can be screened regularly in order to identify those having increased symptoms or progression of disease** ➢ **Transcatheter interventions will follow the same recommendations** ➢ **Alternative percutaneous therapies with rapid discharge from the hospital should be considered** ➢ **Thoracic Organ Transplant guidance is provided by the United Network for Organ Sharing**	

Table 3: Guiding statement for patient triage during Tier 3 (60-80% inpatient COVID-19 Load, severe reduction in operative capacity)

TIER 3	
Essential services	**Deferred**
• All **in-patients who cannot be discharged safely without surgical intervention/ correction** including emergency services	• All patients who are outpatients • Patients deteriorating while waiting would need to meet criteria for admission before consideration for surgery
➢ **Programs are encouraged to adopt a mechanism by which patients can be screened regularly in order to identify those having increased symptoms or progression of disease** ➢ **Transcatheter interventions will follow the same recommendations** ➢ **Alternative percutaneous therapies with rapid discharge from the hospital should be considered** ➢ **Thoracic Organ Transplant guidance is provided by the United Network for Organ Sharing**	

Table 4: Guiding statement for patient triage during Stage 4 (>80% inpatient COVID Load, minimal operative capacity)

TIER 4	
Essential services	**Deferred**
• Only emergency services based on resource availability	• All inpatients judged to be stable and capable of waiting • All outpatients
➢ With extreme reductions in operative capacity, ability (or inability) to perform surgery should be evaluated in the case of emergent cases, alternate arrangements at peer institutions with potential capacity should be sought ➢ Thoracic Organ Transplant guidance is provided by the United Network for Organ Sharing	