



# Transcatheter aortic valve implantation during the COVID-19 pandemic: Clinical expert opinion and consensus statement for Asia

Edgar L. Tay MBBS<sup>1</sup> | Kentaro Hayashida MD, PhD<sup>2</sup> | Mao Chen MD, PhD<sup>3</sup> | Wei-Hsien Yin MD<sup>4</sup> | Duk-Woo Park MD, PhD<sup>5</sup> | Ashok Seth MD<sup>6</sup> | Hsien-Li Kao MD<sup>7</sup> | Mao-Shin Lin MD<sup>7</sup> | Kay-Woon Ho MBBS<sup>8</sup> | Wacin Buddhari MD<sup>9</sup> | Mann Chandavimol MD<sup>10</sup> | Fabio-Enriques Posas MD<sup>11</sup> | Quang N. Nguyen MD, PhD<sup>12</sup> | William Kong MD<sup>1</sup> | Rosli M. A. MD<sup>13</sup> | Jimmy Hon MB, ChB<sup>1</sup> | Doni Firman MD<sup>14</sup> | Michael Lee MBBS<sup>15</sup>

<sup>1</sup>Department of Cardiology and Cardiothoracic and Vascular Surgery, National University Heart Centre, Singapore, Singapore

<sup>2</sup>Cardiac Department, Keio University, Tokyo, Japan

<sup>3</sup>Department of Cardiology, West China Hospital, Sichuan University, Chengdu, China

<sup>4</sup>Cardiac Department, Cheng Hsin General Hospital, Taipei, Taiwan

<sup>5</sup>Department of Cardiology, Asan Medical Centre, Seoul, South Korea

<sup>6</sup>Department of Cardiology, Fortis Escorts Heart Institute, New Delhi, India

<sup>7</sup>Division of Cardiology, Department of Internal Medicine, National Taiwan University Hospital, Taipei, Taiwan

<sup>8</sup>Department of Cardiology, National Heart Centre, Singapore

<sup>9</sup>Cardiac Center, Division of Cardiology, Department of Medicine, King Chulalongkorn Memorial Hospital, Bangkok, Thailand

<sup>10</sup>Cardiac Department, Ramathibodi Hospital, Bangkok, Thailand

<sup>11</sup>St Lukes Medical Center, Manila, Philippines

<sup>12</sup>Vietnam National Heart Institute, Department of Cardiology, Hanoi Medical University, Hanoi, Vietnam

<sup>13</sup>Cardiac Vascular Sentral Kuala Lumpur, Kuala Lumpur, Malaysia

<sup>14</sup>Department of Cardiology and Vascular Medicine, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia

<sup>15</sup>Department of Cardiology, Queen Elizabeth Hospital, Kowloon, Hong Kong

## Abstract

**Objectives:** The impact of the COVID-19 pandemic on the treatment of patient with aortic valve stenosis is unknown and there is uncertainty on the optimal strategies in managing these patients.

**Methods:** This study is supported and endorsed by the Asia Pacific Society of Interventional Cardiology. Due to the inability to have face to face discussions during the pandemic, an online survey was performed by inviting key opinion leaders (cardiac surgeon/interventional cardiologist/echocardiologist) in the field of transcatheter aortic valve implantation (TAVI) in Asia to participate. The answers to a series of questions pertaining to the impact of COVID-19 on TAVI were collected and analyzed. These led subsequently to an expert consensus recommendation on the conduct of TAVI during the pandemic.

**Results:** The COVID-19 pandemic had resulted in a 25% (10-80) reduction of case volume and 53% of operators required triaging to manage their patients with severe aortic stenosis. The two most important parameters used to triage were symptoms and valve area. Periprocedural changes included the introduction of teleconsultation, preprocedure COVID-19 testing, optimization of protests, and catheterization laboratory set up. In addition, length of stay was reduced from a mean of 4.4 to 4 days.

**Conclusion:** The COVID-19 pandemic has impacted on the delivery of TAVI services to patients in Asia. This expert recommendation on best practices may be a useful guide to help TAVI teams during this period until a COVID-19 vaccine becomes widely available.

## KEYWORDS

COVID 19, TAVI, TAVR, valve repair/replacement

**Correspondence**

Edgar L. Tay, MBBS, MRCP, FESC, FACC,  
National University Heart Centre Singapore, 1E  
Kent Ridge Road, Singapore 119228, Singapore.  
Email: edgartay1@gmail.com

**1 | INTRODUCTION**

The current COVID-19 pandemic has had a significant impact on healthcare delivery. There is a constant balance needed to rationalize limited resources while minimizing the risk of delaying important interventional procedures. The specific impact of COVID-19 on patients with aortic stenosis is not well studied. It is known, however, that these patients, who are older and have pre-existing cardiac disease, are especially vulnerable.<sup>1</sup> In addition, symptomatic severe aortic stenosis is a time-sensitive disease, and an increase in wait times can potentially increase mortality.<sup>2</sup> In Asia, the pandemic is at varying stages in different geographies (eg, China, Hong Kong, Taiwan, and Vietnam are seeing very few new cases, while several others are in the middle of the pandemic at the time of writing). While there has been prior guidance for the treatment of transcatheter aortic valve implantation (TAVI) from other cardiac interventional societies,<sup>3,4</sup> it is unclear how the TAVI situation is in Asia. This paper describes the collective experience of how TAVI management has changed in Asia during this time and provides expert consensus recommendations on the role of TAVI during the COVID-19 pandemic.

**2 | METHODS AND RESULTS**

This study was supported and endorsed by the Asia Pacific Society of Interventional Cardiology. Due to the pandemic and an inability to meet face to face, an online survey was sent out to 15 Asian TAVI key opinion leaders in Asia via email correspondence. These included cardiac surgeon, interventional cardiologist, echocardiologist. Table 1 shows the survey questions and the results of the survey. The response rate was 100% except for questions 13 and 14 where response was 92% (See Table 1). The results were tabulated and further discussion followed online to produce the subsequent expert consensus recommendations.

Ethics approval or waivers were obtained as required from the individual countries' local ethics boards.

**2.1 | Summary of key findings**

The online survey had shown a significant reduction in TAVI volumes during the pandemic by 25% (10-80). There was also a need for physicians to triage patients based on disease severity

(seen in 53% of all Asian centers). The two most important criteria deemed to influence triage were the presence of symptoms as well as the anatomical severity of the valve. Pre, periprocedural, and postprocedural changes were also described. The use of teleconsultation, preprocedural testing for COVID-19 as well as a tendency to reduce or minimize pre-TAVI tests were adopted by some of the centers. Similarly, changes in the site where TAVI is performed as well as modifications done in the catheterization laboratory were described. There were also reductions in the length of stay (4.4-4 days) of patients following the TAVI procedure during the pandemic.

Asian TAVI Key Opinion Leaders recommendations for the management of patients with severe aortic valve stenosis during the COVID-19 pandemic.

*The suggested flow chart for management is presented in Figure 1.*

**2.1.1 | Pre-TAVI workup and evaluation**

Minimize unnecessary testing during workup (keep visits minimal where possible without affecting the safety of the patient).

Consider teleconsultation where available.

Consider the COVID-19 test before TAVI (type would vary according to available tests on-site).

**2.1.2 | Timing of TAVI during COVID**

*Urgent TAVI (done inpatient or within days - 2 weeks)*

1. Critical AS (defined as AVA < 0.6 cm<sup>2</sup>) with symptoms
2. Severe AS plus
  - New York heart association (NYHA) III-IV
  - Labile symptoms (including chest pain and dizziness)
  - Not responding to medical treatment
  - Recurrent heart failure
  - Cardiogenic shock

*Semi urgent TAVI (weeks to 1 month)*

1. Severe AS (0.6-0.8 cm<sup>2</sup>) with
  - NYHA II and/or
  - left ventricular ejection fraction (LVEF) less than 50%

*Elective TAVI (1-3 months) (very close phone call/telehealth review weekly if deferred)*

**TABLE 1** Survey questions and results

Questions	Results
1. Does your center treat COVID patients? <i>Number of centers answered Yes (%)</i>	12 (80)
2. Has your center been told to stop TAVI? <i>Number of centers answered Yes (%)</i>	3 (20)
3. Has your center been asked to reduce elective cases for TAVI? <i>Number of centers answered Yes (%)</i>	9 (60)
4. What percentage has been reduced (among those told to reduce)? <i>Percentage (Min-Max range)</i>	25 (10-80)
5. Is your center triaging patients with AS for TAVI? <i>Number of centers answered Yes (%)</i>	8 (53)
6. What is the most important clinical features that you would use to prioritize TAVI for your patients?	Valve severity (8 Centers voted this as most important) Symptoms (7 Centers voted this as most important)
7. Has pre-TAVI workup been changed? <i>Number of centers answered Yes (%)</i>	5 (33) Comments: 4 centers used Pre-TAVI COVID testing, 1 center minimize tests, 1 center used CT coronary angiogram to assess coronaries where possible
8. Have clinic reviews been changed? <i>Number of centers answered Yes (%)</i>	4 (27) Comments: teleconsult service initiated in two centers, combined multidisciplinary review in 1 d in one center, canceled non-essential clinics in one center
9. Has the proportion of LA/GA been changed? <i>Number of centers answered Yes (%)</i>	0 (0) Note that 11 Centers uses a default LA strategy while 4 continue with GA
10. Has the choice of valves been changed? <i>Number of centers answered Yes (%)</i>	2 (13) Reasons: 1 center stated that there was the restriction of vendor support, 1 center used more balloon-expandable platforms
11. Has the catheterization laboratory or hybrid operating room been modified for TAVI? <i>Number of centers answered Yes (%)</i>	2 (13) Comments: 1 center added of HEPA filters in the catheterization laboratory 1 Center stopped central air conditioning and improved cleaning protocols
12. What type of room do you use for TAVI	Normal Catheterization laboratory (8) Catheterization laboratory with modification (2) Hybrid OR (4) Negative pressure catheterization laboratory (1)
13. Has postprocedure management changed? <i>Number of centers answered Yes (%)</i>	5 (36) Comments: These 5 centers reported an intent to shorten hospital stays
14. What is current length of stay before COVID-19 Days (min-max)	4.4 (1-9)
15. What is length of stay during COVID-19 Days (min-max)	4.0 d (1-7)
16. Have you had to manage COVID-19 positive patients with TAVI <i>Number of centers answered Yes (%)</i>	0 (0)

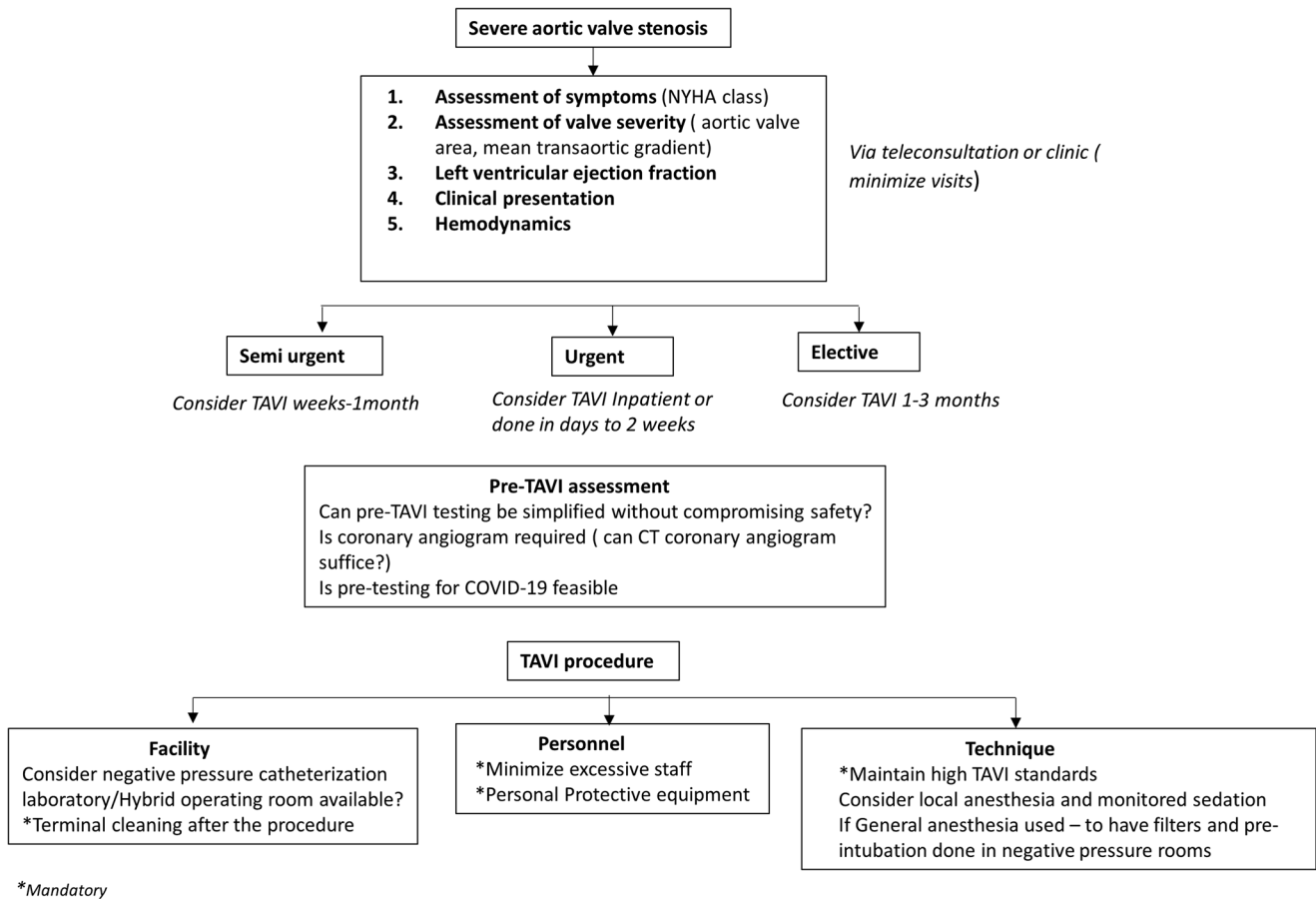
Abbreviations: AS, aortic stenosis; CT, computed tomography; GA, general anesthesia; LA, local anesthesia; TAVI, transcatheter aortic valve implantation.

- Severe AS (0.8-1 cm<sup>2</sup>)
  - NYHA I
  - Normal LVEF
- Asymptomatic with AVA less than 0.75 cm<sup>2</sup>, transaortic gradient of more than 50 mm Hg or peak velocity more than equal to 4.5 m/s

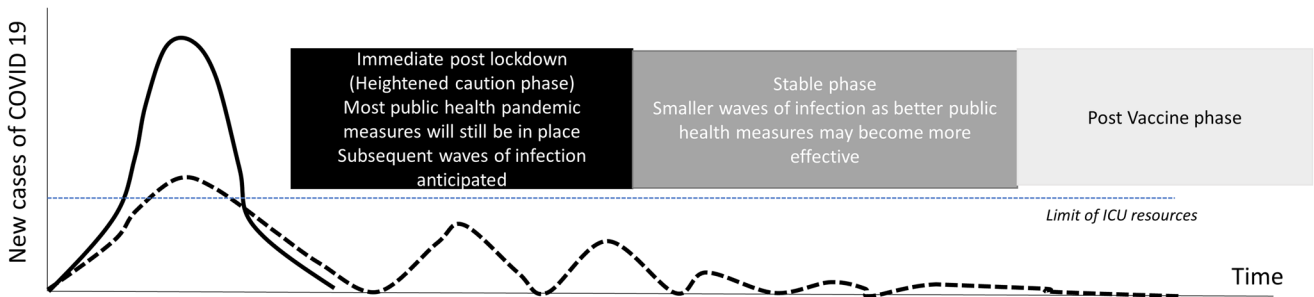
### 3 | TAVI PROCEDURE

Consider negative pressure cardiac catheterization laboratory room (catheterization/hybrid operating room) if available.

Minimize unnecessary personnel in the room (eg, fellows/students/visitors).



**FIGURE 1** Flow chart depicting the recommended pathway for the assessment and management of patients with severe aortic valve stenosis undergoing transcatheter aortic valve implantation (TAVI)



Management	Immediate post	Stable phase	Post vaccine
Pre	Likely to include more COVID 19 pre-testing Triage to continue prioritizing urgent cases Semi urgent cases may also be expedited depending on extent infection rates in the various regions	COVID 19 pretesting may become common Urgent cases continue to be done. Semi-urgent cases are also expedited. Elective cases may be done earlier depending on infection rates in the region. Anticipated increase in waitlist may require expedited reviews and treatment	Back to routine medical care?
Peri	Same as in pandemic phase	COVID negative cases may be done in the usual catheterization laboratory/Hybrid OR. Local anesthesia and monitored sedation techniques may be favored	Back to routine although efficiencies built up may be continued ( eg use of local anesthesia and monitored sedation)
Post	Same as in pandemic phase	Given anticipated in wait list, more patients may be done and length of stay post procedure may have to be optimized	Back to routine but overall post procedure care may have been already optimized and continued – eg length of stay

**FIGURE 2** Postlockdown management of TAVI patients. This figure shows the possible outcome after the lifting of aggressive lockdown measures on the new COVID-19 cases. It is depicted as three possible phases where the management of TAVI patients may be different. ICU, intensive care unit; TAVI, transcatheter aortic valve implantation

Local anesthesia and monitored sedation if possible.

Adequate personal protective equipment if suspected/confirmed COVID-19 patients.

Terminal disinfection after TAVI procedure for suspected/confirmed COVID-19 patients.

Consider preintubation in patients with a high risk of heart failure (in negative pressure room before arrival in catheterization laboratory).

Maintain high TAVI standards.

## 4 | POSTPROCEDURE

Streamline post-TAVI procedures to expedite safe early discharge if possible (eg, early mobilization).

Teleconsult postdischarge where available.

## 5 | POSTLOCKDOWN MEASURES

There is likely to be a protracted period of close vigilance required before the current COVID pandemic resolves or when the presence of an effective vaccine becomes widely available. The strict lockdown measures are already being gradually lifted in several Asian countries. However, requirements of social distancing as well as the above measures recommended are likely to be relevant. Increased number of pretesting of patients with aortic stenosis for presymptomatic or asymptomatic COVID-19 infections before intervention may further mitigate the risks to healthcare workers. When the number of COVID-19 infections is kept under control and when hospital and intensive care resources become less overwhelmed, a cautious approach to increase the capacity for the number of patients treated should be considered in tandem with guidance from local public health experts (Figure 2).

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## CONFLICT OF INTERESTS

Michael Lee, Ho Kay Woon, and Hsien Li Kao are proctors for Medtronic. Kentaro Hayashida, Michael Lee, and Mann Chandavimol are proctors for Edwards Lifesciences. Ashok Seth is a Consultant/Advisor/Speaker for Abbott Vascular, Medtronic, Boston Scientific, and Meril Lifesciences. None of the other authors have a conflict of interests related to this study

## ORCID

Edgar L. Tay  <http://orcid.org/0000-0002-9811-6030>

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