

VALVE DISEASE

Relevant Guidelines

ACC/AHA 2020 guideline on valve disease

2020 ACC/AHA Guideline for the Management of Patients With Valvular Heart Disease *J Am Coll Cardiol.* 2020

ESC/EACTS 2025 guidelines on valve disease

2025 ESC/EACTS Guidelines for the management of valvular heart disease. *Eur Heart J.* 2025.

ESC 2021 guidelines on heart failure

2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. *Eur Heart J*

ESC 2021 guidelines on pacing and cardiac resynchronization

2021 ESC Guidelines on cardiac pacing and cardiac resynchronization therapy. *Eur Heart J.* 2021.

ESC 2022 Guidelines on ventricular arrhythmias and prevention of sudden cardiac death

2022 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death. *Eur Heart J.* 2022.

ACCF/AHA/HRS 2018 guideline on bradycardia and conduction delay

2018 ACC/AHA/HRS Guideline on the Evaluation and Management of Patients With Bradycardia and Cardiac Conduction Delay. *J Am Coll Cardiol.* 2019;74:e51-e156.

ESC 2022 Guidelines on noncardiac surgery

2022 ESC Guidelines on cardiovascular assessment and management of patients undergoing non-cardiac surgery. *Eur Heart J.* 2022

AHA/ACC 2024 Guideline on noncardiac surgery

2024 AHA/ACC/ACS/ASNC/HRS/ SCA/SCCT/SCMR/SVM Guideline for Perioperative Cardiovascular Management for Noncardiac Surgery. *JACC* 2024

ESC 2020 Guidelines on sports

Pelliccia A, Sharma S, Gati S, et al. 2020 ESC Guidelines on sports cardiology and exercise in patients with cardiovascular disease. *Eur Heart J.* 2020.

ESC 2026 Guidelines on Rehabilitation

2026 ESC Guidelines on cardiac rehabilitation. *Eur Heart J.* 2026.

ESC 2025 guidelines on pregnancy

ESC 2025 Guidelines on the management of cardiovascular diseases and pregnancy. *Eur Heart J.* 2025

Relevant Scientific Statements

AHA 2021 Scientific Statement on Aortic Stenosis in Chronic Kidney Disease

Evaluation and Management of Aortic Stenosis in Chronic Kidney Disease. *Circulation* 2021.

AHA 2024 Scientific Statement on Tricuspid Valve

The Tricuspid Valve: A Review of Pathology, Imaging, and Current Treatment Options: A Scientific Statement From the American Heart Association. *Circulation.* 2024

EHRA 2022 statement on arrhythmic mitral valve prolapse

EHRA expert consensus statement on arrhythmic mitral valve prolapse and mitral annular disjunction complex in collaboration with the ESC Council on valvular heart disease and the European Association of Cardiovascular Imaging endorsed by the HRS, by the APHRS, and by the LAHRS. *Europace.* 2022;24:1981-2003.

AHA 2024 Statement on Mechanisms of Valvular Heart Disease

GENERAL PRINCIPLES

Epidemiology

Data are provided by epidemiological studies, mostly retrospective, and registries.¹⁻⁴ According to the GBD 2021 data, there were an estimated 54.8 (95% UI, 43.3–67.6) million people living with rheumatic HD, 13.3 million with nonrheumatic calcific aortic valve disease, and 15.5 million with nonrheumatic mitral valve disease globally.⁵ The global prevalence of nonrheumatic VHD in 2021 was 28.4 million with a 95% UI of 26.3 million to 30.6 million. Previously undetected VHD affects 1 in 2 of the elderly population and is more common in lower socioeconomic classes.¹ In Europe data are collected by the EuroHeart Survey among patients with established valve disease. Prevalence in patients with valve disease is AS 43%, MR 31.5%, AR 13.3%, and MS 12.1%.³ The burden of disease attributable to calcific aortic valve disease and degenerative mitral valve disease is increasing. Aging and population growth led to a 112% increase in the number of deaths attributable to nonrheumatic valve diseases since 1990.⁶ Table 1 presents the classification of the progression of VHD by the ACC/AHA 2020 guidelines.⁷

Cardiac Auscultation

Heart Sounds

First Sound (S₁) is due to simultaneous MV and TV closure.

Loud: MS, hyperkinetic states, short PR<160 msec.

Soft: long PR (>200 msec), severe MS, LV dysfunction.

Widely split: RBBB

Second Sound (S₂) is due to AV followed by PV closure. Splitting normally increases with inspiration. A loud P₂ suggests pulmonary hypertension.

Single: AS or PS.

Widely split: RBBB, MR

Fixed splitting: ASD

Reversed splitting: LBBB, AS, HOCM, RV pacing.

Third Sound (S₃) is pathological over the age of 30 years. Probably due to rapid LV filling. Audible in LV failure, severe MR, VSD. A high-pitched S₃ may be heard in restrictive cardiomyopathy and pericardial constriction.

Fourth Sound (S₄) corresponds to atrial contraction and is produced at end-diastole before S₁. It can be heard in conditions with LVH or after acute MI.

Ejection Sound: bicuspid AV or PS.

Mid-systolic (nonejection) click: mitral leaflet prolapse.

Opening snap: MS, rarely TS, Ebstein's anomaly.

Murmurs

Murmurs are produced by turbulent blood flow and are described according to their location, intensity, timing, frequency, and radiation (Table 2).

Innocent murmurs are due to pulmonary flow and can be heard in children, pregnancy and high flow states such as hyperthyroidism and anemia. They are heard over the left sternal edge, are ejection systolic, and there are no added sounds or thrill. The **cervical venous hum** is a continuous murmur common in children and typically reduced by turning the head laterally or bending the elbows back. The **mammary soufflé** is a continuous murmur that may be heard in pregnancy.

Dynamic auscultation manoeuvres may help bedside diagnosis of systolic murmurs.^{8,9}

Murmurs originating within the right-sided chambers of the heart can be differentiated from all other murmurs by augmentation of their intensity with inspiration and diminution with expiration. The murmur of hypertrophic cardiomyopathy is distinguished from all other systolic murmurs by an increase in intensity with the Valsalva maneuver and during squatting-to-standing, and by a decrease in intensity during standing-to-squatting action, passive leg elevation, and handgrip. The murmurs of MR and VSD have similar responses but can be differentiated from other systolic murmurs by augmentation of their intensity with handgrip and during transient arterial occlusion.⁸

Investigations

Recommendations for assessment of patients with valve disease are presented in Table 3 and Figure 1. They are also discussed in individual chapters. Patients with severe VHD should be evaluated by a multidisciplinary Heart Valve Team when intervention is considered (Tables 4 and 5).^{7,10} Trans-oesophageal echocardiography (TOE) is mandatory when valve intervention is considered (ACC/AHA 2020 GL on VHD, I-C-EO). CMR is indicated on certain occasions, and especially when TOE is nondiagnostic.¹¹

Indications for valve interventions and surgery are provided in individual chapters of valve disease. Evaluation and management of CAD in patients undergoing valve surgery are presented in Table 6, and Figure 2.

Atrial Fibrillation

Recommendations for the management of AF in patients with valvular heart disease are provided in Table 7.

Rheumatic Fever and Endocarditis prophylaxis

Secondary prevention of rheumatic fever is indicated in patients with rheumatic heart disease, and especially mitral stenosis, and is discussed in detail in Chapter on Rheumatic Fever.

Prophylaxis of infective endocarditis is discussed in the Chapter on Endocarditis.

Prophylaxis is indicated only in high risk patients (ie patients with prosthetic cardiac valves), and only before dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa, and before vaginal delivery.

Prophylaxis against infective endocarditis is not recommended for nondental procedures (such as transesophageal echocardiogram, esophagogastroduodenoscopy, or colonoscopy) in the absence of active infection. In patients with unoperated valve disease, prophylaxis is not recommended any more for any procedure.

Chronic Kidney Disease

Comprehensive TTE is recommended in patients with suspected valve disease and CKD irrespective of symptoms to evaluate the presence and severity of valvular heart disease and assess cardiovascular risk (ESC 2026 GL on CKD, I C). Clinical and TTE evaluation should be considered after initiating dialysis in patients with known moderate to severe valvular heart disease to identify optimal timing of intervention due to haemodynamic changes during dialysis (ESC 2026 GL on CKD, IIa-C).¹²

Noncardiac Surgery

Preoperative echocardiography is mandatory for assessment of disease severity. If possible, intervention should be performed before elective noncardiac surgery to reduce perioperative risk if possible, depending on the urgency and risk of the noncardiac procedure (Table 8).

Recommendations are also discussed in Chapters on specific valve diseases.

Pregnancy

Significant valvular disease is associated with high maternal and/or fetal risk during pregnancy.^{10,13,14} General recommendations are provided in Figures 3 and 4 and Tables 9 and 10. Valve disease in pregnancy is also discussed in Chapters on specific valve diseases.

Pregnancy in patients with prosthetic valves is discussed in the relevant Chapter.

References

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