# Valvular Heart Disease · Intervention Algorithm

Native & prosthetic valve disease in adults · point-of-care reference for internal medicine

2020 ACC/AHA
VHD Guideline
JACC 2021;77:e25–197

Class I — recommended · IIa — reasonable · IIb — may consider · III: Harm — do not use

## 1 First: confirm severe disease & stage the patient

**⚠ Stage every patient A → D**

**A** at risk · **B** progressive · **C** asymptomatic severe (C1 compensated · C2 decompensated LV) · **D** symptomatic severe. Stage = **symptoms + valve anatomy + hemodynamics + ventricular & pulmonary response** — not severity alone. All severe VHD considered for intervention → **Heart Valve Team** at a Primary / Comprehensive Valve Centre [I].

**⚠ Severity thresholds (TTE first; CMR/TEE if discordant)**

**AS** $V_{max}$ ≥4.0 m/s · $\Delta P_{mean}$ ≥40 mmHg · AVA ≤1.0 cm² I **AR** VC ≥0.6 · ERO ≥0.30 cm² · RVol ≥60 · RF ≥50% I **MS** MVA ≤1.5 cm² · PHT ≥150 ms I **MR** VC ≥0.7 · ERO ≥0.40 cm² · RVol ≥60 · RF ≥50% I **TR** VC ≥0.7 · ERO ≥0.40 cm² · RVol ≥45 mL.

## 2 Aortic stenosis — timing of AVR

**Symptomatic severe AS (Stage D) → AVR** [I]

High-gradient D1 · low-flow/low-gradient ↓LVEF D2 (use **DSE** to confirm severe + flow reserve) · paradoxical LFLG preserved LVEF D3 if AS is the most likely cause of symptoms.

**Asymptomatic severe AS + LVEF <50% (C2) → AVR** [I]

Irreversible LV dysfunction risk. Also AVR for severe AS undergoing other cardiac surgery (C1) [I].

▼ asymptomatic C1, low surgical risk — any of:

**Early AVR triggers (any one)** [IIa]

$V_{max}$ ≥5.0 m/s (very severe) · BNP >3× normal · abnormal ETT (↓BP ≥10 mmHg or ↓exercise tolerance) · ΔV ≥0.3 m/s/year on serial imaging.

**Progressive ↓LVEF on ≥3 serial studies to <60%** [IIb]

Consider AVR. Moderate AS undergoing other cardiac surgery: AVR may also be considered.

## 3 AS — choice of intervention

**Mechanical vs bioprosthetic — by age**

**<50 y** + no VKA CI → mechanical reasonable [IIa].
**50–65 y** → individualise via shared decision [IIa].
**>65 y** → bioprosthesis reasonable [IIa].
Any age + VKA contraindicated / cannot be managed / undesired → bioprosthesis [I].

**SAVR vs TAVI — by age & life expectancy** [I]

**<65 y or life-exp >20 y** → SAVR. **65–80 y**, no TF-TAVI CI → SAVR or TF-TAVI by shared decision. **>80 y or life-exp <10 y** → **TF-TAVI preferred**.

**SAVR preferred over TAVI when…** [I]

Asymp with IIa indications (very severe AS, ↑BNP, abnormal ETT, rapid progression); unsuitable valve/vascular anatomy for TF-TAVI.

**High / prohibitive surgical risk → TAVI** [I]

If predicted post-TAVI survival >12 months with acceptable QoL. Otherwise palliative care after shared decision-making.

**⚠ Isolated severe native AR + SAVR candidate → do NOT use TAVI** [III: Harm]

TAVI not indicated in isolated severe AR when the patient is a SAVR candidate.

## 4 Chronic aortic regurgitation — timing of AVS

**AVS indicated — any of** [I]

- Symptomatic severe AR (Stage D), **regardless of LVEF** — symptoms = high event risk even with normal EF
- Asymptomatic severe AR + LVEF ≤55% (Stage C2) — if no other cause of LV dysfunction
- Severe AR undergoing other cardiac surgery (any Stage C/D)

**Asymp severe AR, LVEF >55% + severe LV dilation** [IIa]

LVESD >50 mm or indexed LVESD >25 mm/m² → AVS reasonable.
Progressive remodelling on ≥3 serial studies (LVEF→55–60% or LVEDD >65 mm) in low-risk patient [IIb].
**Medical**: treat HTN (SBP >140) with ACEi/ARB/DHP-CCB [I]. Vasodilators do not reduce AR severity per se. Avoid agents that markedly slow HR — ↑regurgitation per beat.

## 5 Pre-intervention essentials & general principles

**Workup of severe VHD**

TTE for cause, severity, LV/RV size & function, PASP [I]. TEE / CMR / cardiac catheterisation if discordance, suboptimal images or pre-intervention [I]. **Coronary angiography** before any planned valve surgery in men ≥40 / post-menopausal women / ≥1 CV risk factor / suspected ischemia [I].

**Rheumatic fever — secondary prevention**

After confirmed acute rheumatic fever: penicillin G benzathine 1.2 MU IM every 4 wk [I]. Duration: **5 y or until 21** (no carditis); **10 y or until 21** (carditis, no residual VHD); **≥10 y or until 40** (carditis + residual VHD).

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Mitral & tricuspid lesions · prosthetics · special situations · page 2 of 2

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## 6 Mitral & tricuspid intervention map

| LESION | WHEN TO INTERVENE | INTERVENTION OF CHOICE | MEDICAL · NOTES |
|---|---|---|---|
| **Rheumatic MS** MVA ≤1.5 cm² · PHT ≥150 ms (C/D) | Sympt severe (D) + favourable anatomy I · Asymp severe + PASP >50 mmHg IIa · Asymp + new AF IIb | **PMBC** at Comprehensive Valve Centre if <2+ MR · no LA thrombus · favourable **Wilkins score** ≤8 (mobility · thickening · calcification · subvalvular, each 0–4) + no commissural Ca²⁺ I. Not a PMBC candidate / failed PMBC / concomitant cardiac surgery / no PMBC access → **MV surgery** (open commissurotomy if anatomy favourable, else MVR) I. | **VKA only** if AF / prior embolism / LA thrombus I — DOACs not validated. HR control (β-blocker / non-DHP CCB / digoxin / ivabradine) for rapid AF or sympt sinus tachy IIa. Calcific MS: no role for PMBC (no commissural fusion); intervention only if severely sympt + extensive MAC IIb. |
| **Primary MR** degenerative · flail · rheumatic · IE | Sympt severe (D), regardless of LVEF I · Asymp severe + LVEF ≤60% or LVESD ≥40 mm (C2) I · Severe MR at other cardiac surgery I | **MV repair preferred over replacement** when degenerative & durable repair likely I. Posterior leaflet repair: <1% mortality, >95% durability. Asymp severe + normal LV (C1) at CVC with >95% repair likelihood & <1% mortality → early repair IIa. Severely sympt (NYHA III/IV) + high/prohibitive surgical risk + favourable anatomy → **TEER** IIa. | **Do NOT replace** for ≤½ posterior leaflet disease without attempting repair at a valve centre III: Harm. No vasodilator benefit unless HTN/HFrEF; may worsen MR by ↑prolapse. Progressive ↑LV size / ↓LVEF on ≥3 serial studies → consider surgery IIb. |
| **Secondary MR** ventricular (HFrEF, ischemic) or atrial (AF, HFpEF) | Severe (ERO ≥0.40 cm²) + sympt Stage D **despite optimal GDMT**. Reassess severity 3–6 mo after optimisation — most respond to GDMT alone. | **GDMT first** I: ACEi/ARB/**ARNI** + β-blocker + MRA ± CRT ± revascularisation. Persistent NYHA II–IV despite GDMT + **COAPT** criteria (LVEF 20–50%, LVESD ≤70 mm, PASP ≤70 mmHg, favourable anatomy) → **TEER** IIa. Severe 2°MR + CABG indication → concomitant MV surgery IIa. | HF cardiologist leads GDMT I. Atrial 2°MR, preserved LVEF, severe sympt despite Rx → MV surgery may be considered IIb. CAD + severe 2°MR + NYHA III/IV → chordal-sparing MVR may beat downsized annuloplasty IIb. |
| **Tricuspid regurg.** mostly secondary — pulm HTN, AF, lead | Severe TR (C/D) at L-sided valve surgery I. Progressive TR + annulus end-diastolic >4.0 cm or prior R-sided HF signs at L-sided surgery IIa. Sympt severe primary TR IIa. | Concomitant TV surgery at time of left-sided surgery I. **Isolated TV surgery** for sympt severe primary TR or sympt isolated 2° TR — operate **before** severe RV dysfunction / end-organ damage IIa. | Loop diuretics ± aldosterone antagonist for R-sided congestion IIa. Treat 1° cause of 2° TR: pulm vasodilators, GDMT for HFrEF, rhythm control of AF IIa. Lead-related TR: weigh extraction vs surgery. |

## 7 Prosthetic valves — antithrombotic Rx · AF · IE prophylaxis

### Mechanical valves — VKA only DOACs III: Harm — I

**Mech AVR**: INR 2.5 (2.0–3.0) I + ASA 75–100 mg IIa.
**Mech MVR** / older-gen AVR / additional thrombotic risk: INR 3.0 (2.5–3.5) I + ASA IIa.
Non-cardiac surgery: bridge with UFH/LMWH; resume VKA 12–24 h post-op.

### Bioprosthetic AVR (SAVR or TAVI) — IIa

ASA 75–100 mg long-term. Surgical bioprosthetic AVR + low bleeding risk: VKA INR 2.5 × 3–6 mo may be reasonable IIb.
Routine DAPT post-TAVI not beneficial; SAPT preferred.

### AF + VHD anticoagulation — I

By **$CHA_2DS_2$-VASc**: VKA or DOAC. **VKA only** if **rheumatic MS** or **mechanical prosthesis**. DOACs acceptable for bioprosthetic valves >3 mo post-implant.

### IE prophylaxis — dental/respiratory mucosal procedures — IIa

High-risk groups: prosthetic valve · prosthetic-material valve repair · prior IE · congenital cyanotic HD · cardiac transplant valvulopathy. Regimen: amoxicillin 2 g PO 30–60 min pre-procedure (or alternatives if PCN-allergic).

## 8 Special situations — pregnancy · valve thrombosis · pearls

### Pregnancy in mechanical valve — anticoagulation

**1st trimester**: continue VKA if warfarin dose ≤5 mg (or equivalent) IIa; if >5 mg → dose-adjusted LMWH (anti-Xa 0.8–1.2 U/mL 4–6 h post-dose) IIa or IV UFH (aPTT ≥2× control) IIb.
**2nd / 3rd trimester**: VKA preferred — lowest maternal valve thrombosis risk I. ASA 75–100 mg may be added IIa.
**Peripartum (≥36 wk)**: stop VKA → IV UFH; resume VKA post-partum.

### Pregnancy + native VHD

Severe rheumatic MS + NYHA III/IV refractory to medical Rx → **PMBC** at CVC IIa.
Severe AS with hemodynamic deterioration or NYHA III/IV → valve intervention IIa.
Severe regurgitant lesion + NYHA IV refractory → valve surgery IIa; **otherwise valve surgery is** III: Harm (30–40% fetal mortality, up to 9% maternal).

### Mechanical valve thrombosis — left-sided, symptomatic — I

Urgent **emergency surgery** or **slow-infusion low-dose fibrinolysis** (echocardiogram-guided).
**Surgery favoured**: large thrombus (>0.8 cm²) · NYHA IV · LA thrombus · recurrent · CAD requiring revascularisation · expertise available.
**Fibrinolysis favoured**: small thrombus · NYHA I–II · first episode · high surgical risk · no expertise · no CI.
Right-sided mechanical thrombosis → fibrinolysis usually first-line.

### Remember

- **Severe AS + ↓LVEF**: usually afterload mismatch — EF often recovers post-AVR. Avoid vasodilators / hypotension; use **DSE** to confirm severity + flow reserve.
- **LFLG paradoxical AS** (D3): exclude measurement error, control BP, index AVA to BSA, consider CT calcium score.
- Both **TAVI in isolated severe native AR + SAVR candidate** and **DOACs in mechanical valves**: III: Harm.