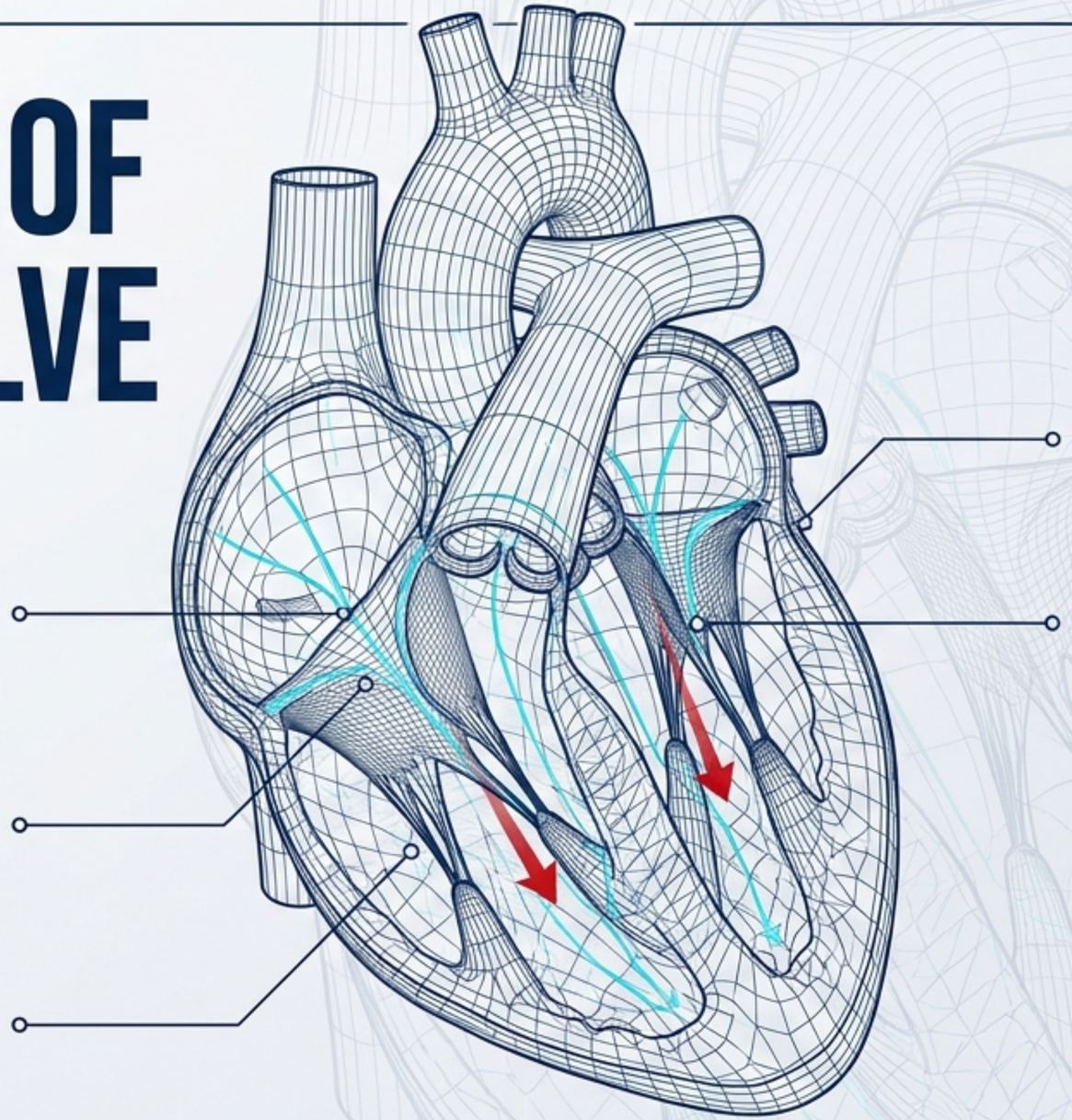
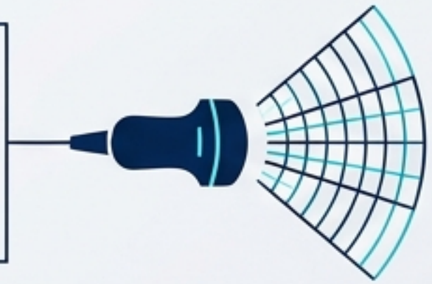
THE RENAISSANCE OF THE TRICUSPID VALVE

Transitioning the ‘forgotten valve’ into a primary target for structural intervention.



Med2Date
Clinical Reference &
Paradigm Synthesis



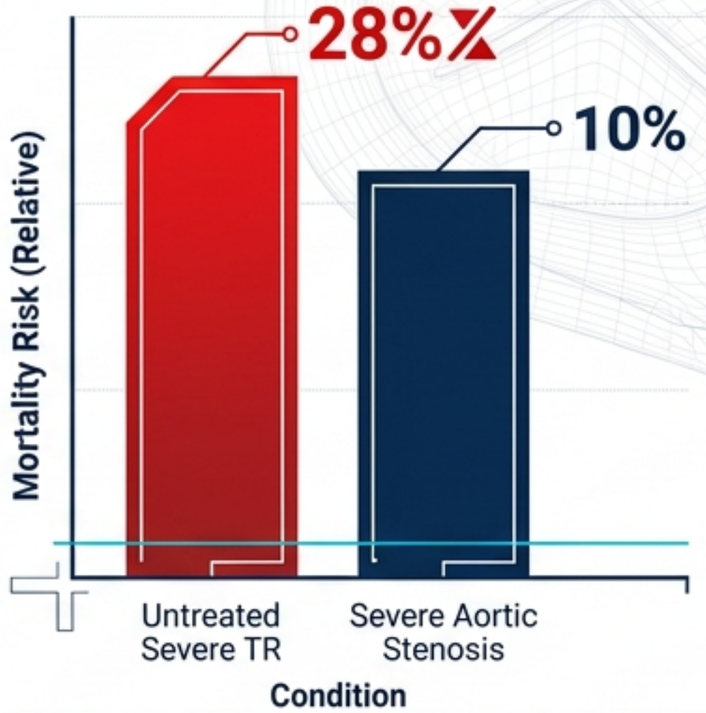
The “Forgotten Valve”

Historically considered a benign finding, managed with diuretics alone.

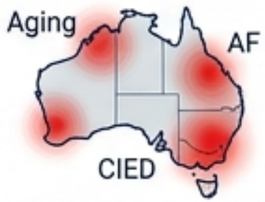
Severe TR confers a mortality risk exceeding severe aortic stenosis

Trivial/Mild TR: Present in 70-80% of the population.

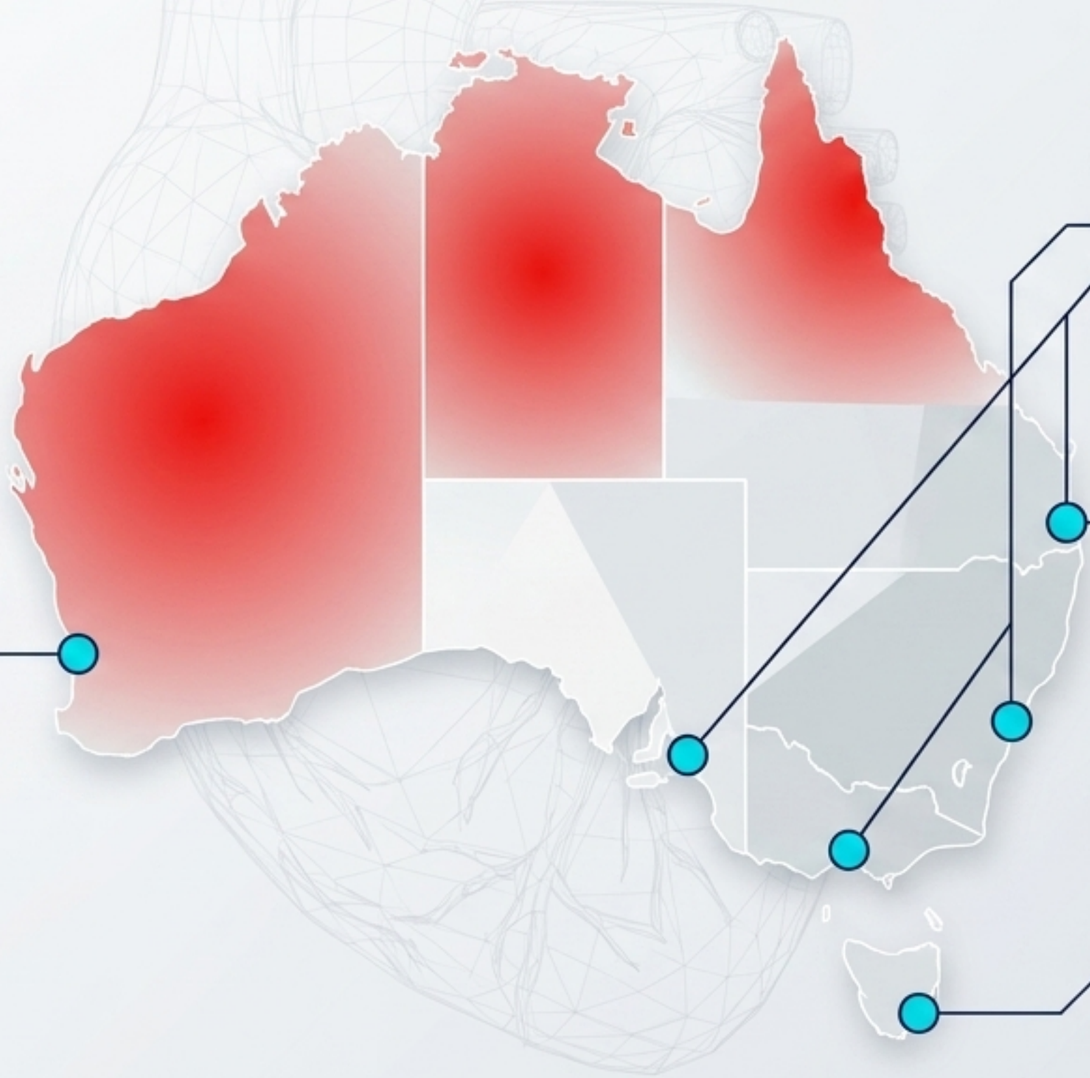
Clinically Significant (Mod/Severe): 1-2% of the population.



Australian Impact: >100,000 Australians affected (driven by aging, AF, and CIED usage).



The Australian access gap for structural interventions



National Burden:

~12,000

hospital admissions annually for valvular heart disease (AIHW).

Tertiary Structural Heart Centers

The Geographic Barrier: Patients in regional and remote areas face significant barriers to advanced imaging and transcatheter trials.

The compounding crisis of Rheumatic Heart Deart Disease in Indigenous communities

20-60x

Higher incidence rate of Acute Rheumatic Fever in Aboriginal and Torres Strait Islander Australians compared to non-Indigenous populations.

Screening

Portable echo screening for children aged 5-14 in high-risk communities (>=3/1000 ARF incidence).

Prophylaxis

Benzathine penicillin G (BPG) 1.2M units IM every 28 days (or 21 days for severe RHD).

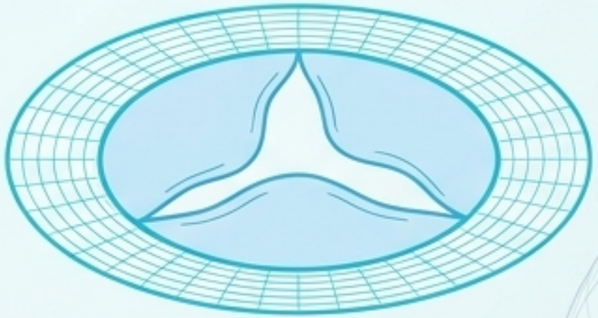
Barriers

Geographic remoteness, late presentation, and need for culturally safe ACCHO-led models.

Diagnostic Pearl: In any Indigenous Australian presenting with right heart failure, consider RHD-related valve disease as a leading differential.

Classifying etiology dictates the intervention strategy

Functional (Secondary) TR



Prevalence
80-90% (Dominant)

Mechanism
Distortion of valve apparatus without intrinsic leaflet pathology.

Key Drivers
Left-sided heart disease (MR/MS), Atrial Fibrillation (standalone RA dilation), Pulmonary Hypertension.

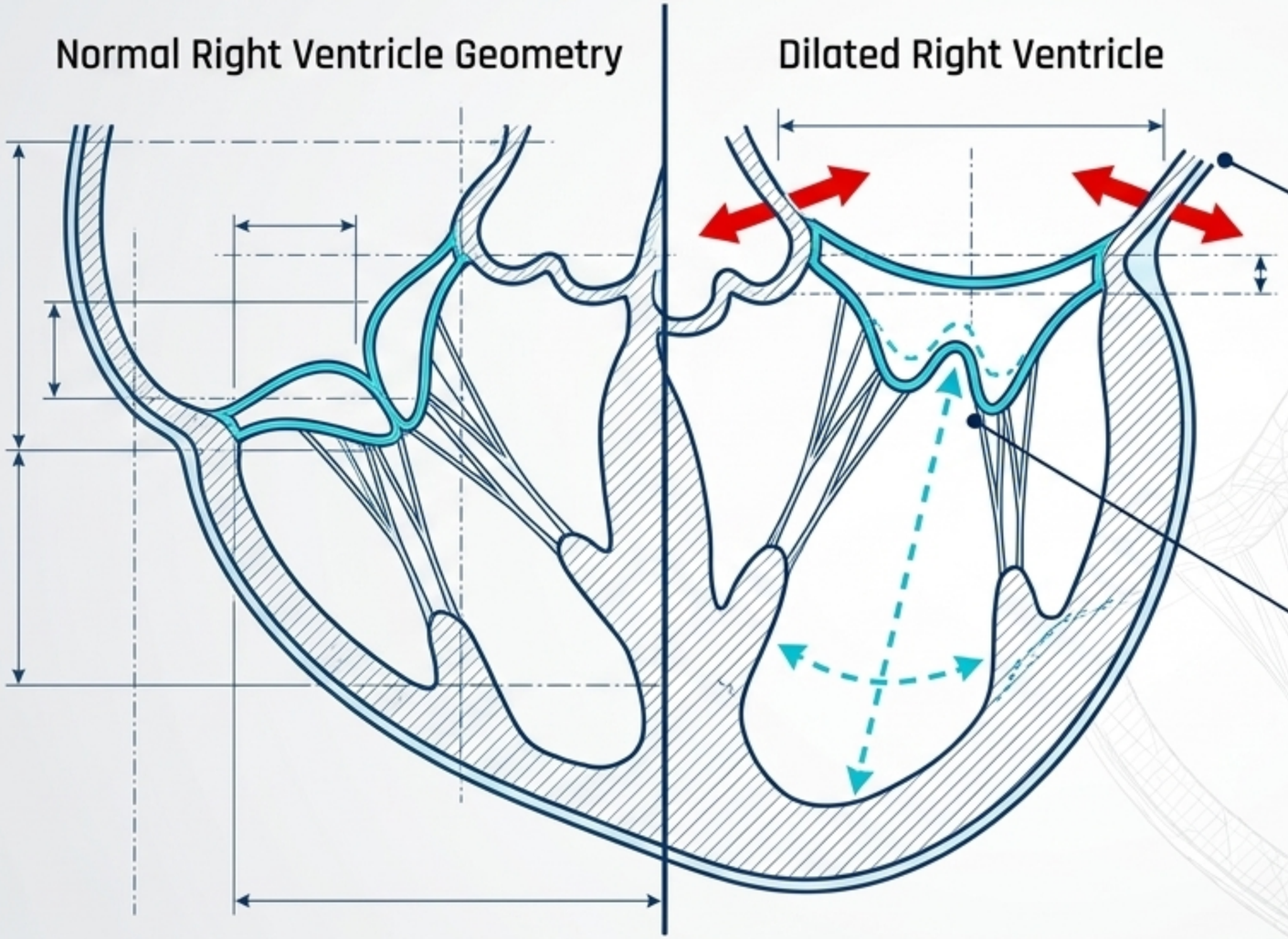
Primary (Organic) TR

Prevalence
10-20%

Mechanism
Intrinsic abnormality of leaflets, chordae, or papillary muscles.

Key Drivers
Rheumatic Heart Disease, Infective Endocarditis, Ebstein anomaly, Carcinoid syndrome, Chest trauma.

The mechanics of Functional TR: Annular dilation and leaflet tethering



Annular Dilation

Right atrial/RV remodeling expands the saddle-shaped annulus.

Diameter >40 mm (or >21 mm/m2) prevents coaptation.

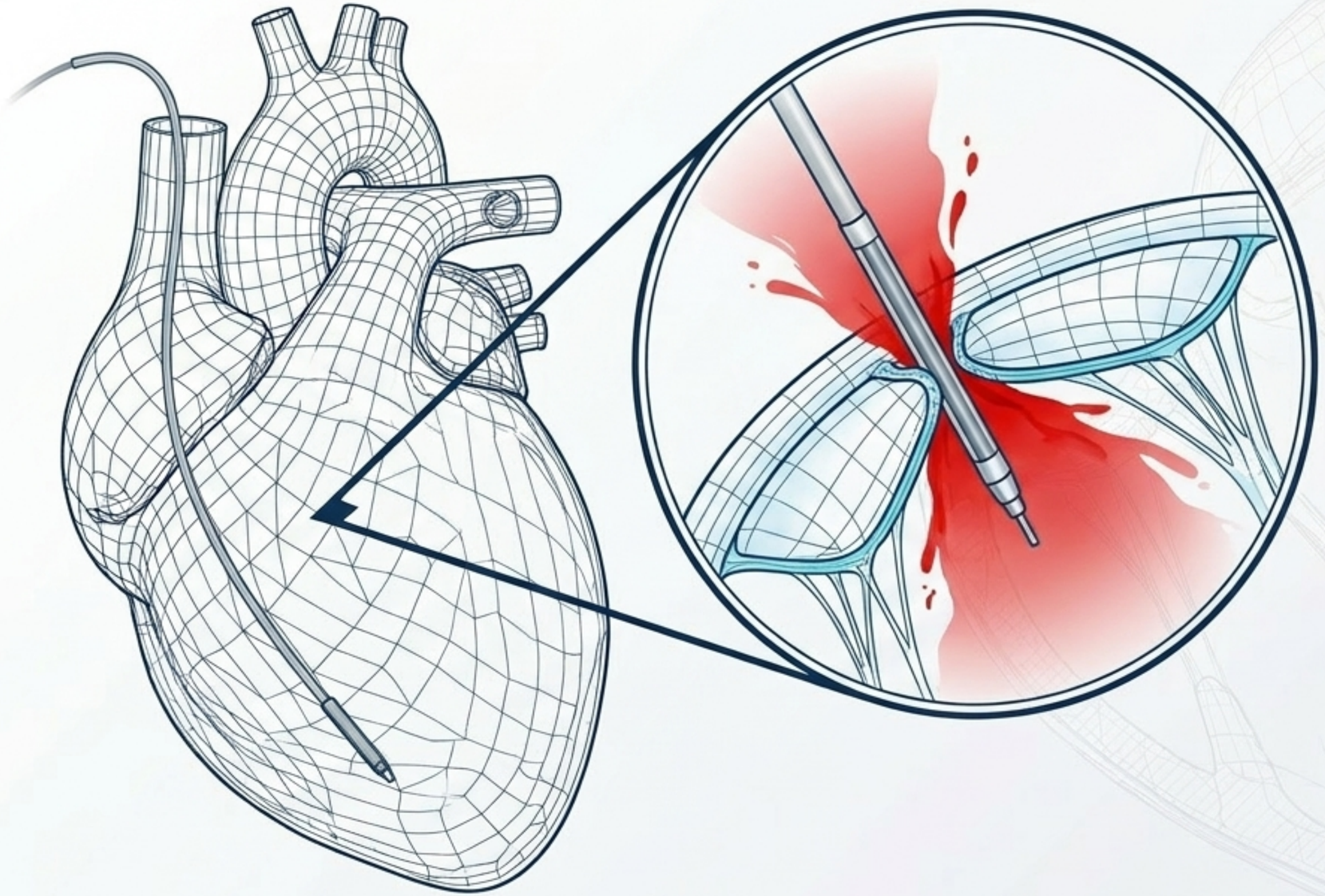
Leaflet Tethering

RV dilation pulls muscles outward, restricting leaflet motion.

Tenting height >8 mm;
Tenting area >1.6 cm2.

Takeaway: The leaflets are perfectly healthy; the underlying structural geometry is the pathology.

The iatrogenic culprit: CIED lead-induced regurgitation

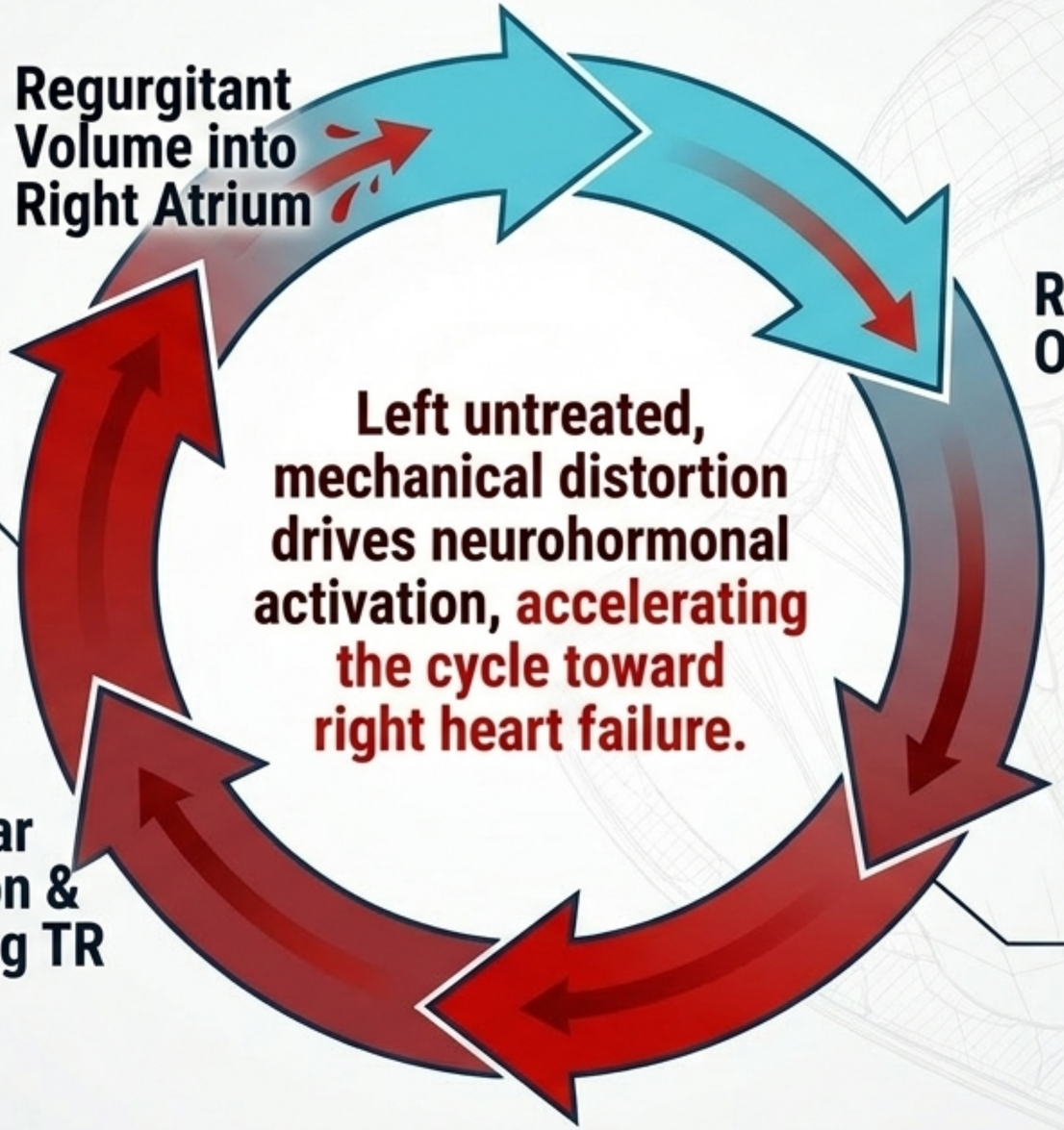


Up to **10-20%** of patients with trans-tricuspid leads develop moderate or greater TR.

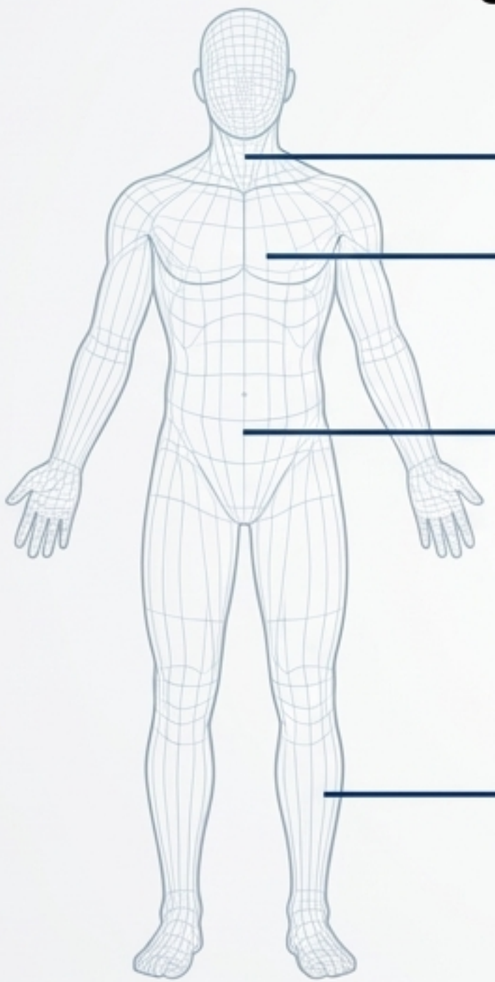
Mechanisms:
Direct leaflet impingement, lead-induced fibrosis/adhesion, annular distortion.

Actionable Advice:
Suspect lead involvement when new/worsening TR follows device implantation. Discuss transvenous extraction and alternative pacing (epicardial, His-bundle, leadless) with EP.

The self-perpetuating cycle of chronic severe TR



Recognizing the clinical manifestations of right heart failure



Neck
Elevated JVP with prominent systolic ‘c-v’ waves (Lancisi sign) - **Pathognomonic of severe TR.**

Chest
Pansystolic murmur at left lower sternal border, increasing with inspiration (Carvallo sign). Right-sided S3 gallop.

Abdomen/Liver
Hepatomegaly with a tender, pulsatile liver; early satiety and nausea from gut congestion.

Lower Body
Ascites and dependent peripheral edema (ankles/sacral).

Mild/Moderate TR is frequently asymptomatic. Symptoms develop insidiously and are often misattributed to left-sided disease or deconditioning.

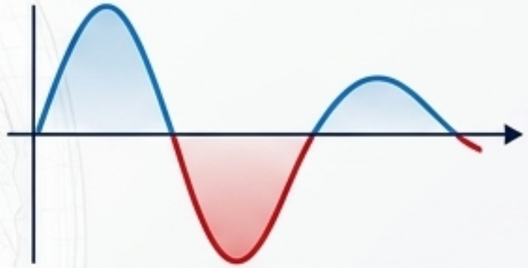
Echo-Lab Dashboard: The integrative grading approach

Vena Contracta

≥ 7 mm (2D), ≥ 0.75 cm² (3D)

EROA (PISA)

≥ 40 mm²



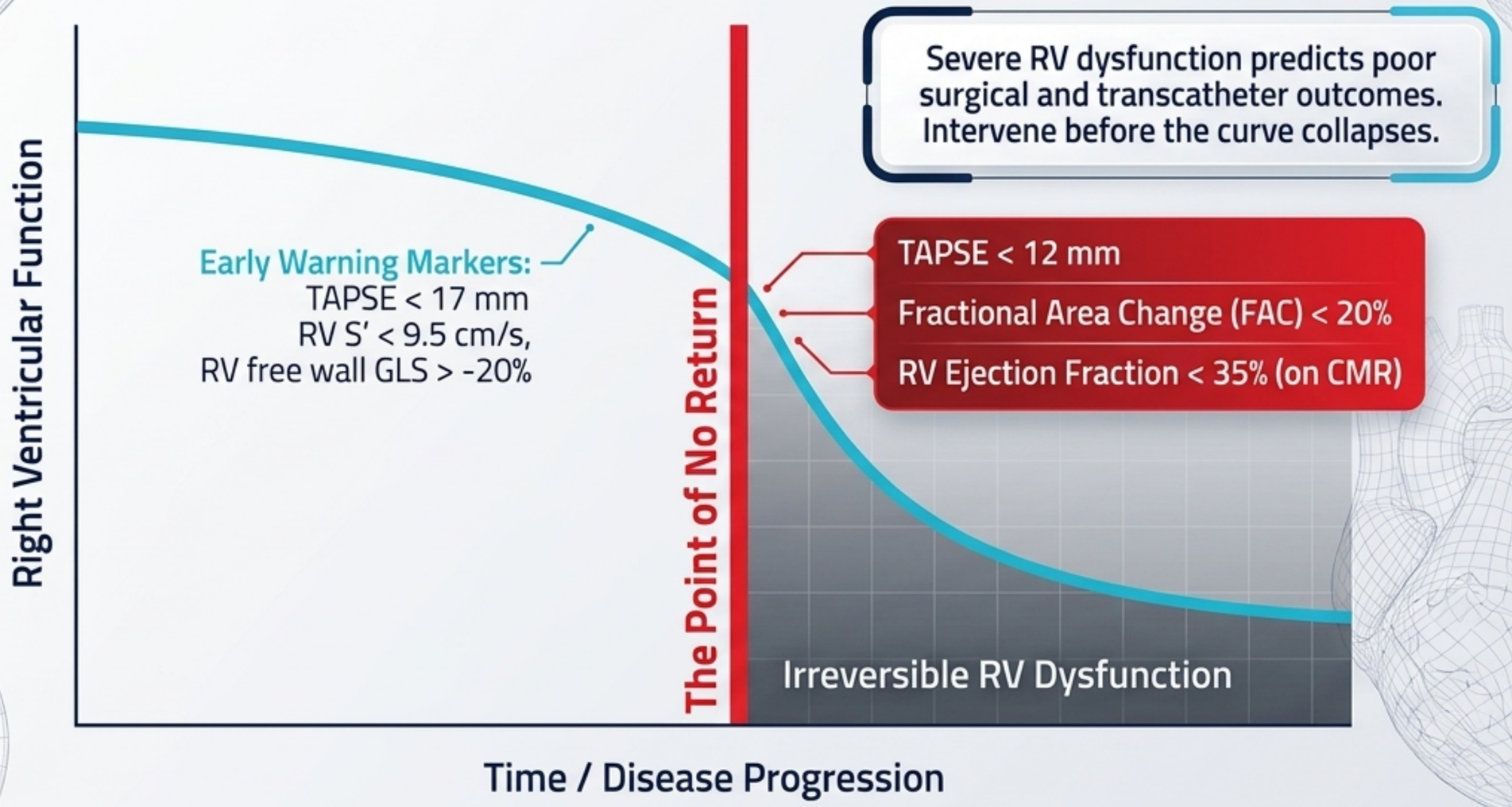
Hepatic Flow

Systolic Flow Reversal (**S < D**)

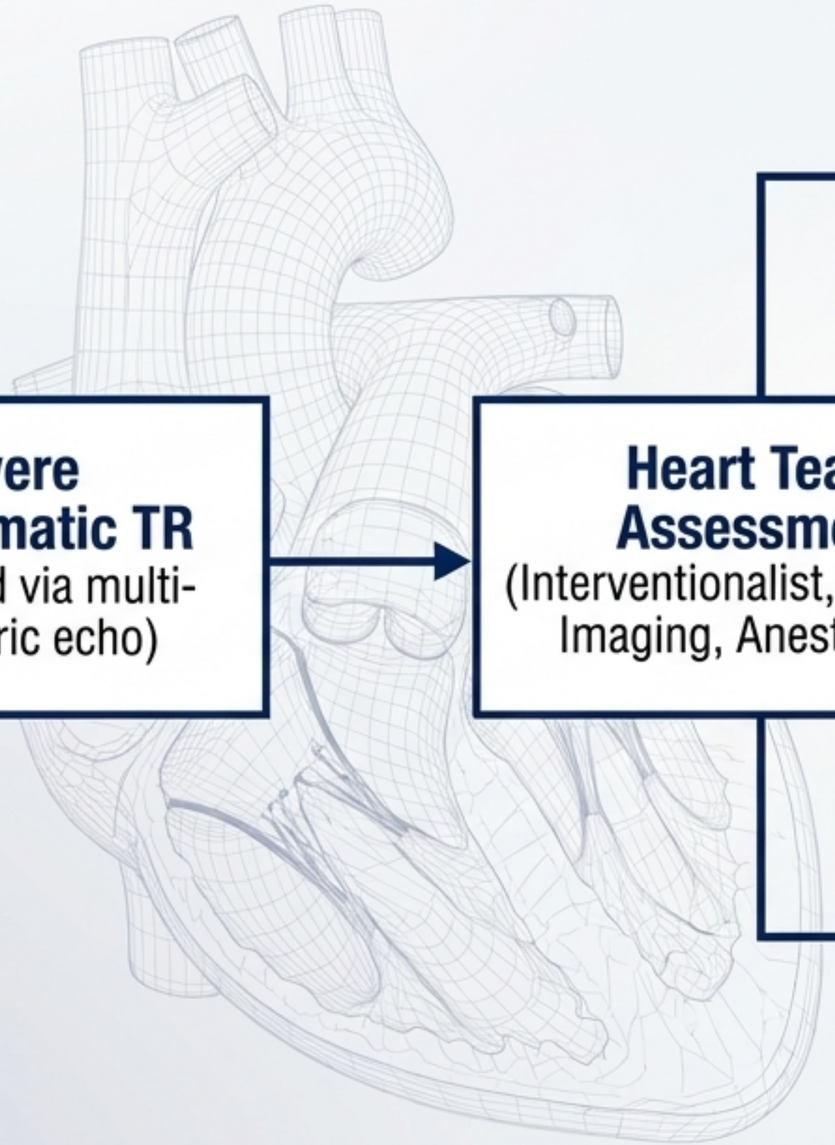
CMR Regurgitant Fraction

No single parameter should be used in isolation. **Concordance of ≥2-3 parameters is required.** Utilize 3D Echo or Cardiac MRI (MBS 63018) for discordant data.

The Point of No Return: Identifying irreversible RV remodeling



The multidisciplinary intervention algorithm



Severe Symptomatic TR
(confirmed via multi-parametric echo)

Heart Team Assessment
(Interventionalist, Surgeon, Imaging, Anesthetist)

Surgery

Low Surgical Risk -> Surgery.
Primary TR, or concomitant left-sided valve surgery.
(5-10% isolated operative mortality).

Transcatheter Therapy

High/Prohibitive Surgical Risk -> Transcatheter Therapy.
Advanced imaging to select device (**TEER**, **Annuloplasty**, **TTVR**).

Medical Bailout

Irreversible RV Failure-> Medical Bailout.
End-stage disease. ⚠ Palliative diuresis, sequential nephron blockade.

Surgical standards and the operative risk threshold

Class I Indication
Severe TR at the time of left-sided surgery (accompanied by annuloplasty if ring >=40 mm).

Ring Annuloplasty
First-line for functional TR.

Bioprosthetic Replacement
Used when repair fails or severe primary/rheumatic disease. Mechanical valves rarely used due to low-flow thrombosis risk.

WARNING: HIGH RISK

Operative mortality for isolated tricuspid valve surgery ranges from 5-10%.

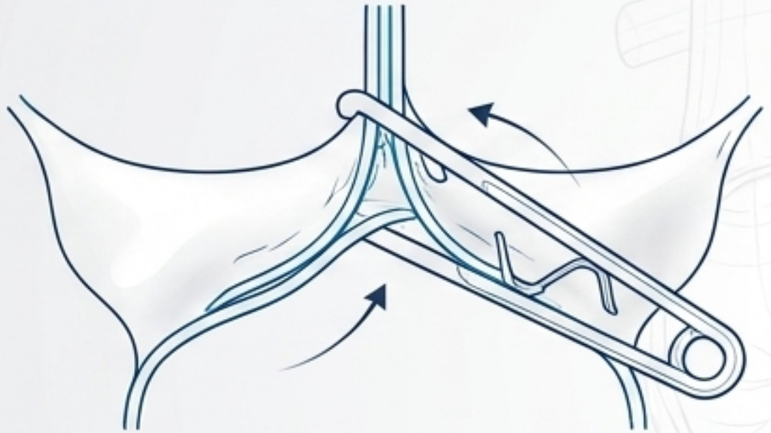
This is substantially higher than left-sided surgery, driven by advanced RV failure and hepatic congestion/cirrhosis.

The rapidly expanding transcatheter landscape (TTVI)

	 **Edge-to-Edge Repair** (TriClip)	 **Direct Annuloplasty** (Cardioband)	 **Caval Valve** (TricValve/SAPIEN)	 **Replacement** (Evoque)
Mechanism	Leaflet approximation	Annular cinching	IVC systemic protection	Bioprosthetic replacement
Ideal Anatomy	Coaptation gap **<10mm**	Dilated annulus	Massive IVC dilation	Failed leaflet therapies
Australian Status	**TGA-approved 2024, no PBS**	Trials / Compassionate use	Compassionate use	TGA review ongoing / Trials

Landmark trials driving the structural intervention era

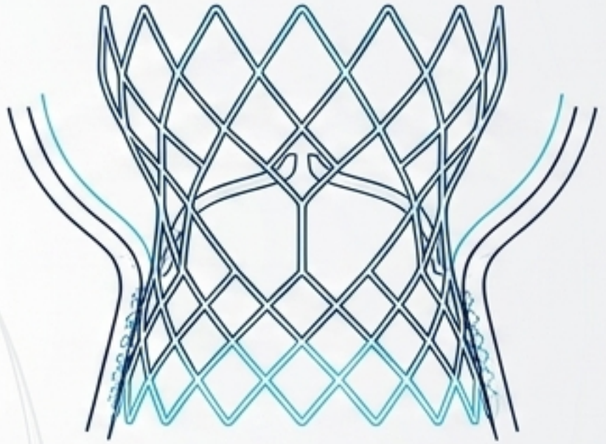
TEER (Abbott TriClip)



Trial: TRILUMINATE Pivotal (2023)

Outcome: Significant reduction in TR grade and massive improvement in Quality of Life at 1 year. Transfemoral delivery via 25 Fr guide.

TTVR (Edwards Evoque)

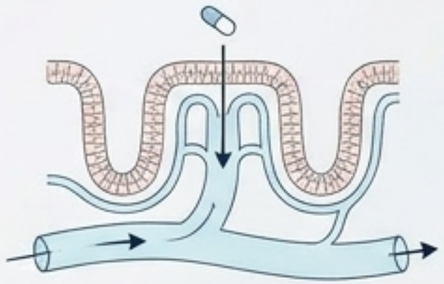


Trial: TRISCEND II (FDA Approved Feb 2024)

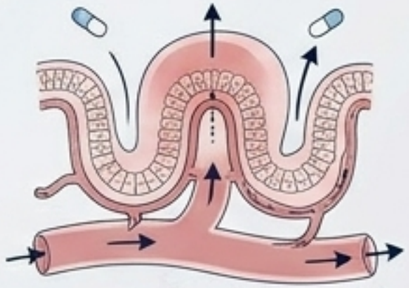
Outcome: **90%** achieved mild or less TR at 30 days. 1-year mortality reduced (**10%** device vs **16%** control). Massive NYHA improvements.

Medical Management: The unique challenge of right-sided decongestion

The Concept:
Right heart failure impairs renal venous drainage and causes gut edema, severely reducing oral drug bioavailability.



Normal Gut Absorption
(Left Heart Failure)

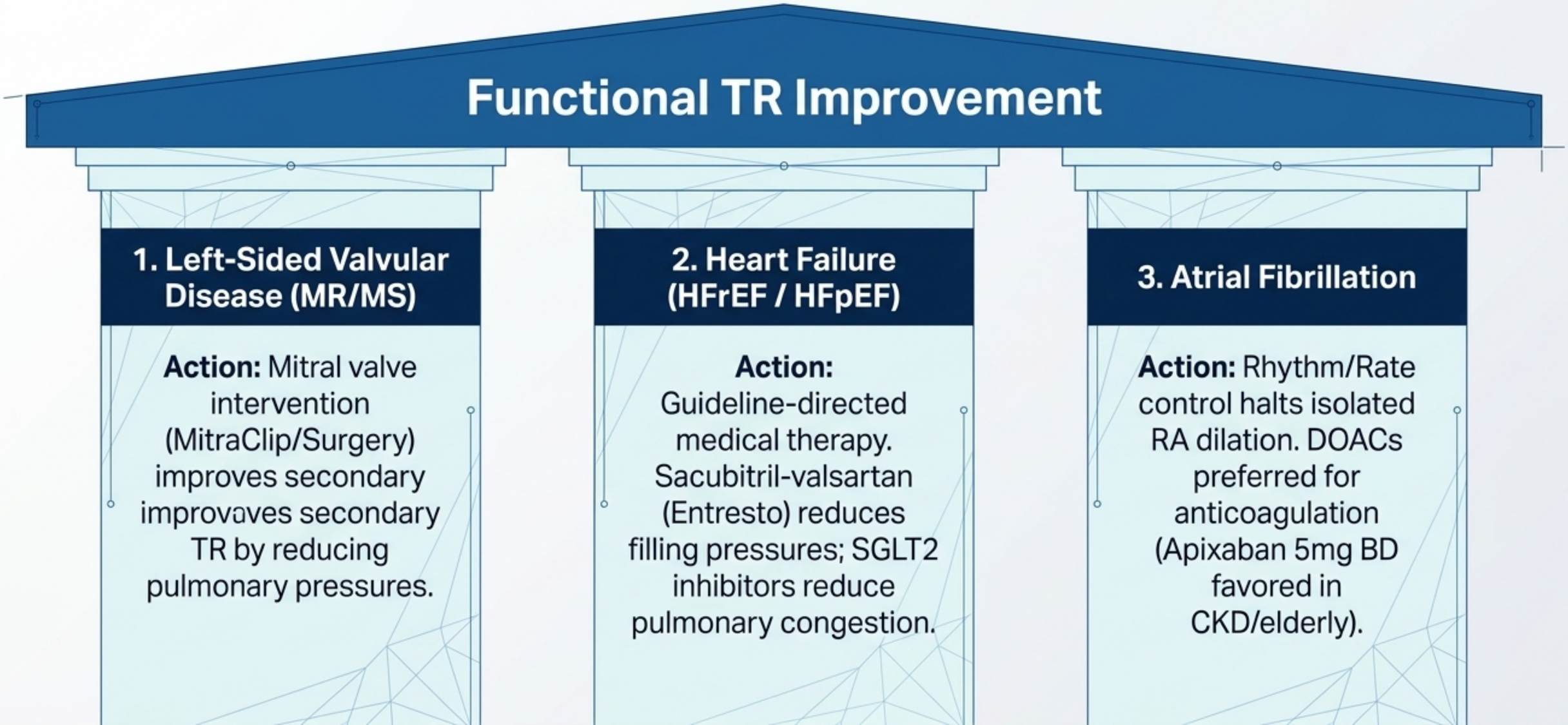


Impaired Absorption
(Right Heart Failure)

Loop Diuretics	Frusemide (40-240 mg). Requires significantly higher doses or continuous IV (0.5-1 mg/kg/hr) due to gut wall edema.
Sequential Nephron Blockade	Metolazone (2.5-10 mg) given 30 minutes before loop diuretics.
Neurohormonal Adjunct	Spironolactone (25-50 mg) for counter-regulatory blockade (avoid if eGFR <30).

⚠ **Warning:** Medical therapy provides symptom relief but does not prevent progressive RV failure or alter natural history.

Optimizing the upstream drivers of Functional TR



Surveillance schedules and critical triggers for reassessment

RED FLAGS REQUIRING IMMEDIATE REFERRAL

- **Declining TAPSE/FAC** or **progressive RV dilation**
- **Cardiorenal syndrome** (worsening eGFR despite decongestion)
- **Hepatic congestion pattern** ("shock liver" transaminases or rising bilirubin)
- **Loss of sinus rhythm / new AF**

The Modern Era of Tricuspid Care

1. Acknowledge the Danger

TR is not benign. **Severe TR carries mortality exceeding severe aortic stenosis** and requires proactive management.

2. Quantify Comprehensively

Discard single-metric reliance. Utilize integrative echo (**VC >=7mm, EROA >=40mm2, hepatic flow reversal**).

3. Protect the Right Ventricle

The window closes rapidly. Referral to an MDT must occur before irreversible RV remodeling (**TAPSE <12mm**).

4. Embrace Structural Innovation

High surgical risk is no longer an absolute barrier. TEER, annuloplasty, and TTVR technologies bridge the treatment gap.