Management of Valvular Heart Disease

The Task Force on the Management of Valvular Heart Disease

(Eur Heart J 2007;28:230-68)

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European Heart Journal (2007) 28, 230–268
doi:10.1093/eurheartj/ehl428

ESC Guidelines

Guidelines on the management of valvular heart disease

The Task Force on the Management of Valvular Heart Disease of the European Society of Cardiology

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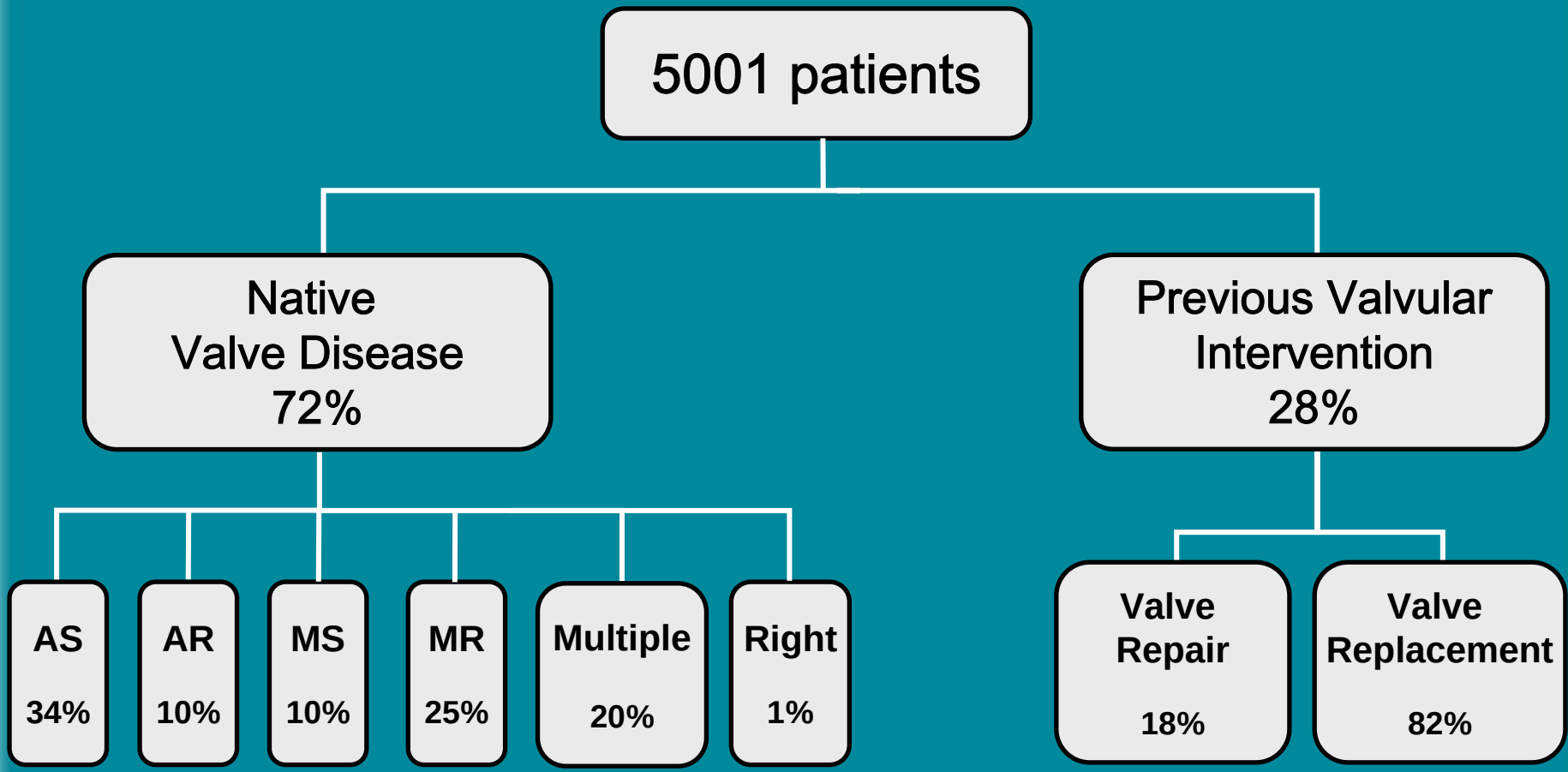
www.escardio.org

Background

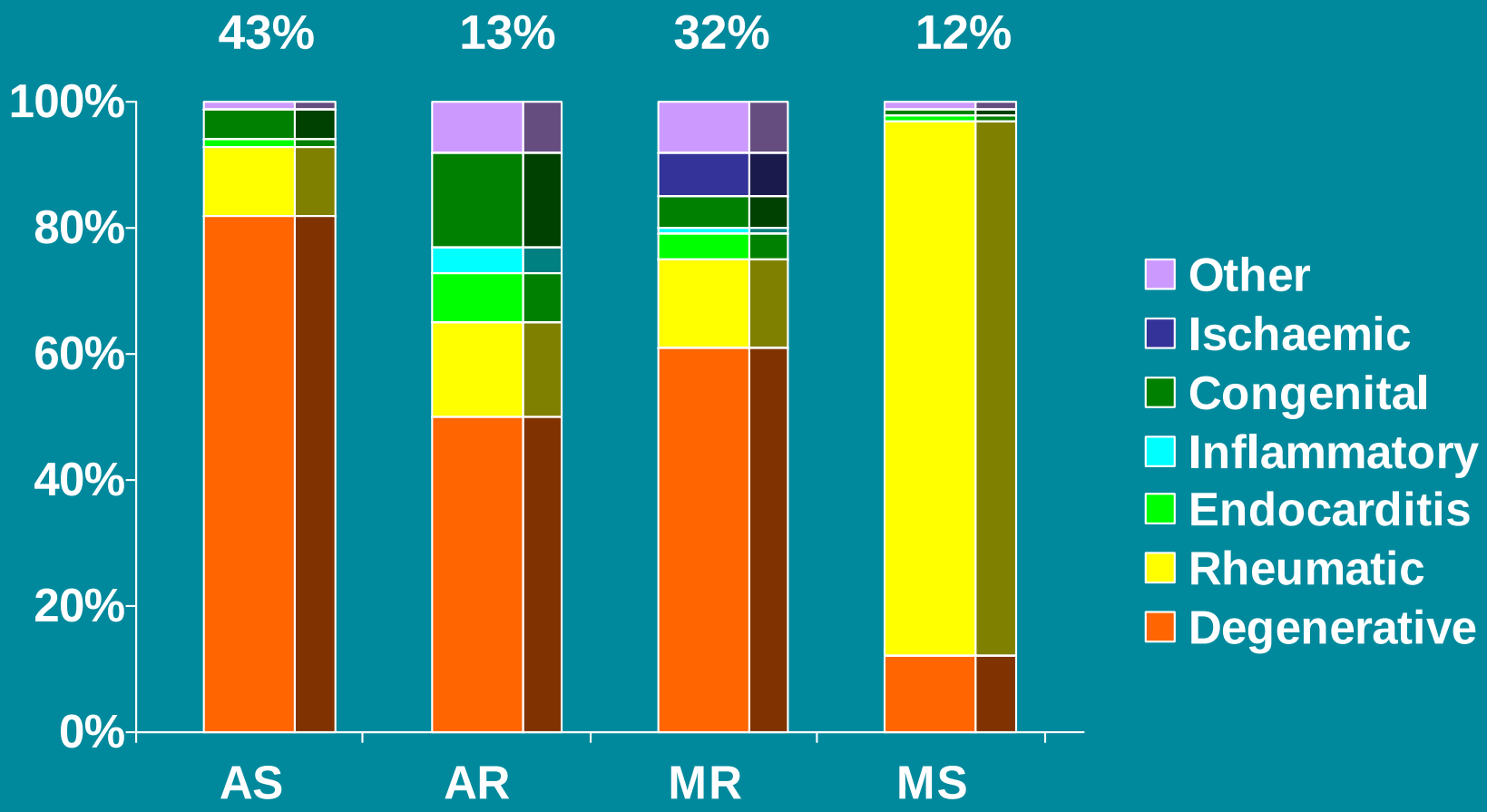
- Valvular heart disease remains common in industrialized countries and frequently requires intervention
- The decline of rheumatic fever and the increase in degenerative aetiologies have led to important changes in patient characteristics
- Investigations are dominated by echocardiography
- Conservative techniques have been developed, in particular in the treatment of mitral valve diseases
- Randomised trials are scarce

Distribution of Valvular Heart Diseases in the Euro Heart Survey



(Iung et al. Eur Heart J 2003;24:1244-53)

Aetiologies of Single Valvular Heart Diseases in the Euro Heart Survey



(Iung et al. Eur Heart J 2003;24:1244-53)

Patient Characteristics in the Euro Heart Survey

	Age (years)	≥ 70 years (%)	≥ 1 comorbidity (%)
AS	69±12	56	36
AR	58±16	25	26
MS	58±13	18	22
MR	65±14	44	42

(Iung et al. Eur Heart J 2003;24:1244-53)

Recommendation Classes

Class I	Evidence and/or general agreement that a given diagnostic procedure/treatment is beneficial, useful and effective
Class II	Conflicting evidence and/or a divergence of opinion about the usefulness /efficacy of the treatment
Class IIa	Weight of evidence/opinion is in favour of usefulness/efficacy
Class IIb	Usefulness/efficacy is less well established by evidence/opinion

Levels of Evidence

Level of Evidence A	Data derived from multiple randomized clinical trials or meta-analyses
Level of Evidence B	Data derived from a single randomized clinical trial or non-randomized studies
Level of Evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries

Patient Evaluation

- **Clinical assessment**
  - Symptoms, comorbidities, patient education
  - Auscultation
- **Echocardiography**
  - Key examination to confirm diagnosis and assess severity and prognosis
  - Need to check consistency between the different echocardiographic findings (severity, mechanism, anatomy of valvular disease) and with clinical assessment

Severity of Valvular Diseases According to Echocardiography

- Severity of stenotic valve diseases
  - The evaluation should combine the estimation of valve area and flow-dependent indices
  - AS is severe if valve area is < 1.0 cm^2 or < 0.6 cm^2/m^2

    Severe AS is unlikely if mean gradient is < 50 mmHg with normal cardiac output
  - MS is significant if valve area is < 1.5 cm^2, preferably using planimetry
- Severity of regurgitant valve diseases
  - The severity of AR and MR is based on an integrative approach including quantitative assessments

Definition of Severe Aortic Valve Regurgitation - An Integrative Approach

	Criteria Aortic Regurgitation
Specific signs of severe regurgitation	• Central jet, width ≥ 65% of LVOT • Vena contracta > 0.6 cm
Supportive signs	• Pressure half-time < 200 ms • Holodiastolic aortic flow reversal in descending aorta • Moderate or greater LV enlargement
Quantitative parameters	
Reg. Vol (ml/beat)	≥ 60
RF (%)	≥ 50
ERO (cm^2)	≥ 0.30

(Adapted from Zoghbi et al. J Am Soc Echocardiogr 2003;16:777-802)

Definition of Severe Mitral Valve Regurgitation - An Integrative Approach

	Criteria Mitral Regurgitation
Specific signs of severe regurgitation	• Vena contracta width ≥ 0.7 cm *with* large central MR jet (area > 40% of LA) or *with* a wall impinging jet of any size, swirling in LA • Large flow convergence • Systolic reversal in pulmonary veins • Prominent flail mitral valve or ruptured papillary muscle
Supportive signs	• Dense, triangular CW Doppler MR jet • E-wave dominant mitral inflow (E > 1.2m/s) • Enlarged LV and LA size (particularly when normal LV function is present)
Quantitative parameters	
Reg. Vol (ml/beat)	≥ 60
RF (%)	≥ 50
ERO (cm^2)	≥ 0.40

(Adapted from Zoghbi et al. J Am Soc Echocardiogr 2003;16:777-802)

Echocardiography: Comprehensive Assessment

- Anatomy and mechanisms of valvular disease
- Evaluation of all valves
- Measurements of ascending aorta
  - In particular of AR and/or bicuspid aortic valve
- Left ventricular dimensions and systolic function
  - Index dimensions to BSA
- Transoesophageal echocardiography
  - If suboptimal transthoracic examination
  - To search for left atrial thrombus
  - If suspected endocarditis or dysfunction of prosthesis
  - To monitor valve repair intra-operatively

Other Techniques

- Exercise testing
  - Objective assessment if equivocal or no symptoms
  - Prognosis in asymptomatic AS
- Stress echocardiography
  - Low dose dobutamine echocardiography in AS with low gradient and LV dysfunction
- Multislice CT / Magnetic resonance imaging
  - In particular for imaging of thoracic aorta
- Cardiac catheterization (to evaluate valve function)
  - Only if non-invasive findings inconsistent or discordant with clinical assessment

Indications for Coronary Angiography

	Class
Before valve surgery in patients with severe valvular heart disease and any of the following: – history of coronary artery disease – suspected myocardial ischaemia (Chest pain, abnormal non-invasive testing) – left ventricular systolic dysfunction – in men aged over 40 and post-menopausal women – ≥ 1 cardiovascular risk factor	**IC**
When coronary artery disease is suspected to be the cause of severe mitral regurgitation	**IC**

Risk-Benefit Assessment

- Decision-making for intervention is multifactorial:
  - Prognosis according to severity and consequences of valvular disease
  - Risks and late consequences of intervention
  - Patient life expectancy and quality of life
  - Patient wishes after information
  - Local resources, in particular results of surgery
- Validated multivariate scores, such as the Euroscore, are useful to limit the subjectivity of the assessment of operative risk

EuroSCORE

Patient-related factors			Cardiac-related factors		
Age (years)	0	0	Unstable angina[6]	No	0
Gender	Select	0	LV function	Select	0
Chronic pulmonary disease[1]	No	0	Recent MI[7]	No	0
Extracardiac arteriopathy[2]	No	0	Pulmonary hypertension[8]	No	0
Neurological dysfunction[3]	No	0	**Operation-related factors**		
Previous Cardiac Surgery	No	0	Emergency[9]	No	0
Creatinine > 200 µmol/ L	No	0	Other than isolated CABG	No	0
Active endocarditis[4]	No	0	Surgery on thoracic aorta	No	0
Critical preoperative state[5]	No	0	Post infarct septal rupture	No	0

Standard EuroSCORE 0

http://www.euroscore.org/calc.html

(Roques et al. Eur J Cardiothorac Surg 1999;15:816-23)

Indications for Surgery in Aortic Regurgitation

Severe AR

	Class
Symptomatic patients (dyspnoea NYHA class II, III, IV or angina)	IB
Asymptomatic patients with resting LV EF ≤ 50%	IB
Patients undergoing CABG or surgery of ascending aorta, or on another valve	IC
Asymptomatic patients with resting LV EF > 50% with severe LV dilatation:	
End diastolic dimension > 70 mm	IIaC
or	
End systolic dimension > 50 mm (or > 25 mm/m² BSA)*	IIaC

* Changes in sequential measurements should be taken into account.

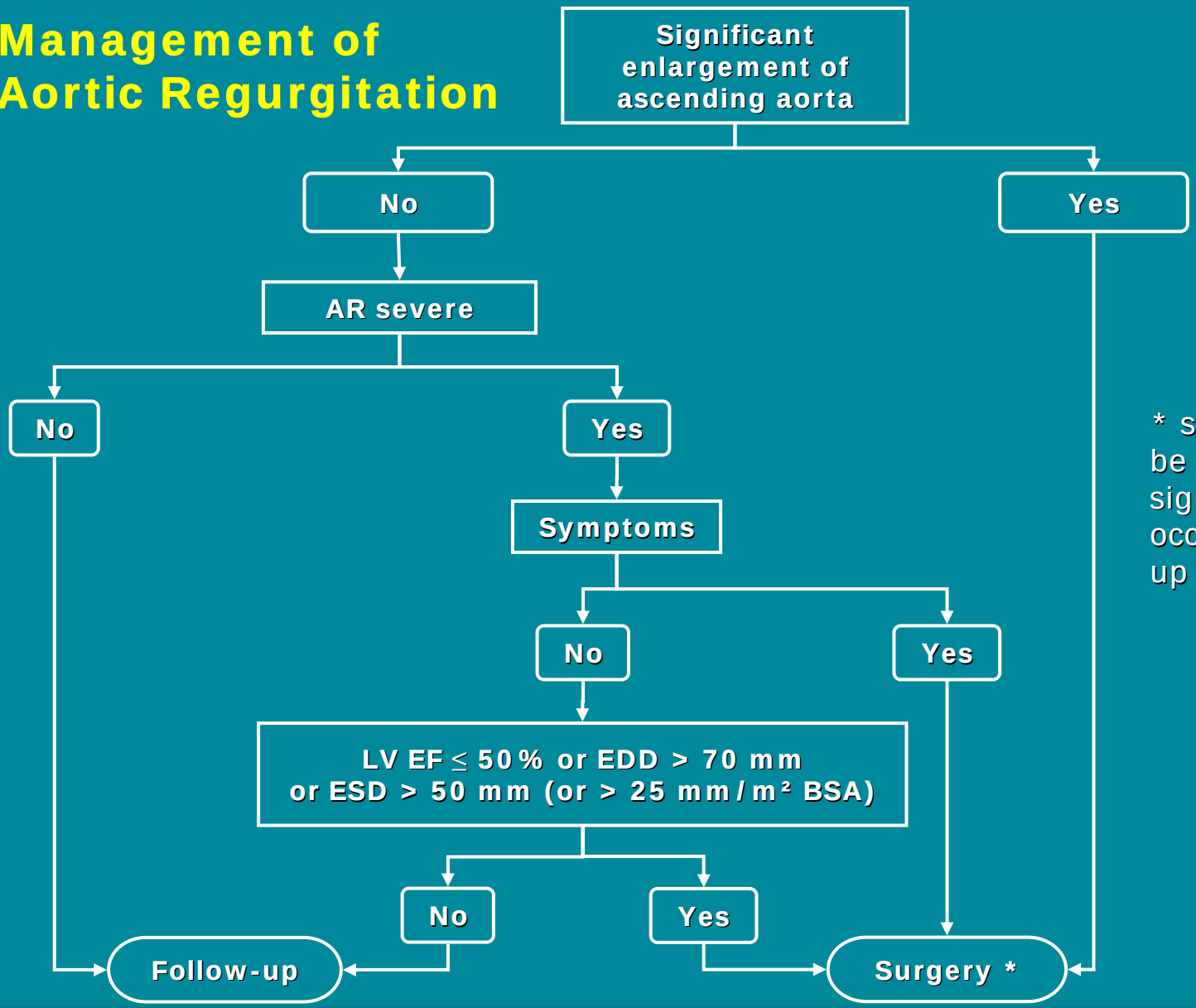
Indications for Surgery in Aortic Regurgitation

Whatever the Severity of AR

	Class
Patients who have aortic root disease with maximal aortic diameter*:	
≥ 45 mm for patients with Marfan's syndrome	IC
≥ 50 mm for patients with bicuspid valves	IIaC
≥ 55 mm for other patients	IIaC

* Decision should also take into account the shape and thickness of ascending aorta as well as the shape of the other parts of aorta.
For patients who have an indication for surgery on the aortic valve, lower thresholds can be used for combining surgery on the ascending aorta.

Management of Aortic Regurgitation



* surgery must also be considered if significant changes occur during follow-up

Indications for Surgery in Symptomatic Aortic Stenosis

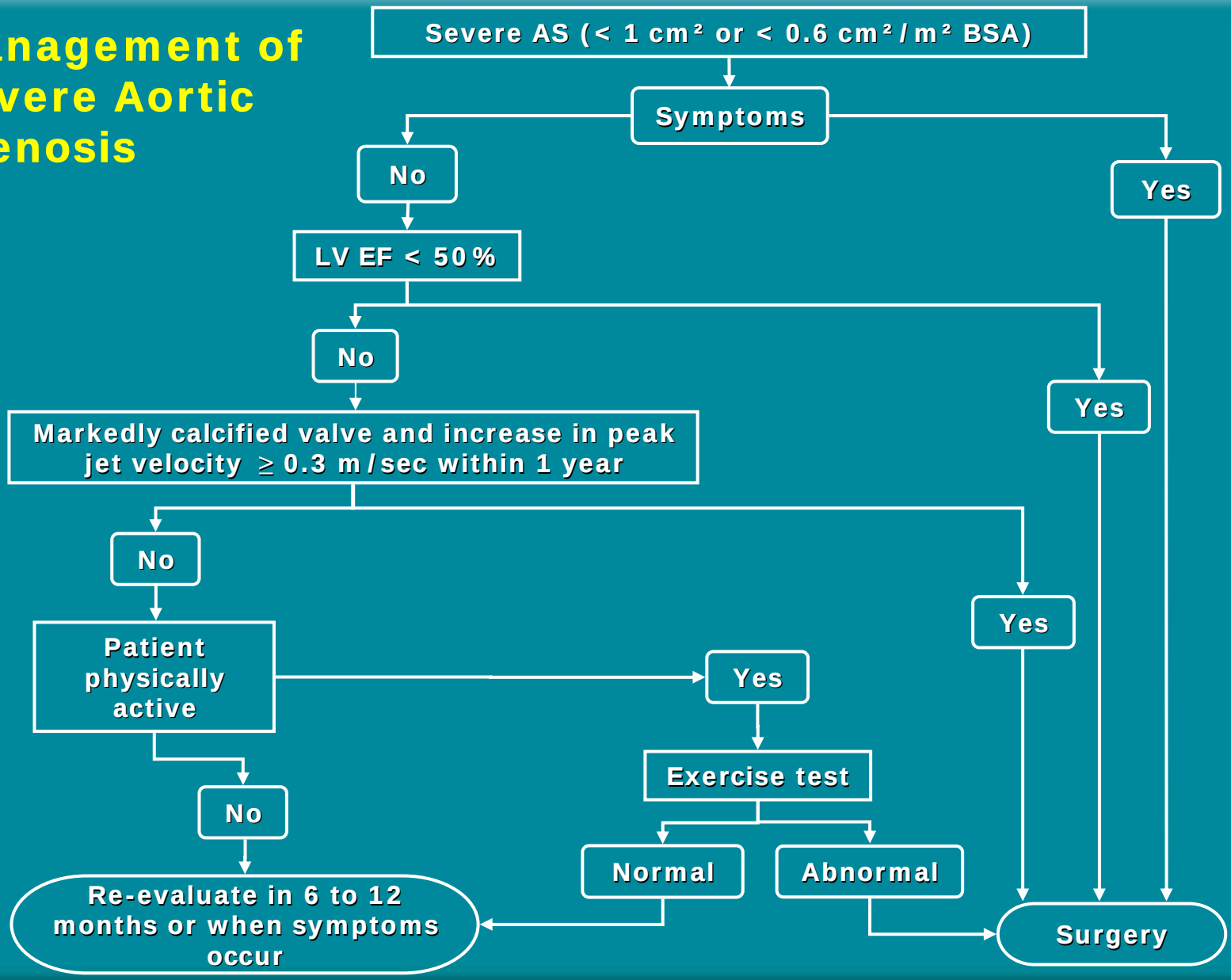
	Class
Patients with severe AS and any symptoms	**IB**
Patients with severe AS undergoing coronary artery bypass surgery, surgery of the ascending aorta, or on another valve	**IC**
Patients with moderate AS* undergoing CABG, surgery of the ascending aorta or another valve	**IIaC**
AS with low gradient (< 40 mmHg) and LV dysfunction with contractile reserve	**IIaC**
AS with low gradient (< 40 mmHg) and LV dysfunction without contractile reserve	**IIbC**

* Moderate AS is defined as valve area 1.0 to 1.5 cm^2 (0.6 cm^2/m^2 to 0.9 cm^2/m^2 BSA) or mean aortic gradient 30 to 50 mmHg in the presence of normal flow conditions.

Indications for Surgery in Asymptomatic Aortic Stenosis

	Class
Asymptomatic patients with severe AS and systolic LV dysfunction (LV EF < 50%) unless due to other cause	IC
Asymptomatic patients with severe AS and abnormal exercise test showing symptoms on exercise	IC
Asymptomatic patients with severe AS and moderate to severe valve calcification, and a rate of peak velocity progression ≥ 0.3 m/sec. per year	IIaC
Asymptomatic patients with severe AS and abnormal exercise test showing fall in blood pressure below baseline	IIaC
Asymptomatic patients with severe AS and abnormal exercise test showing complex ventricular arrhythmias	IIbC
Asymptomatic patients with severe AS and excessive LV hypertrophy (≥ 15mm) unless this is due to hypertension	IIbC

Management of Severe Aortic Stenosis

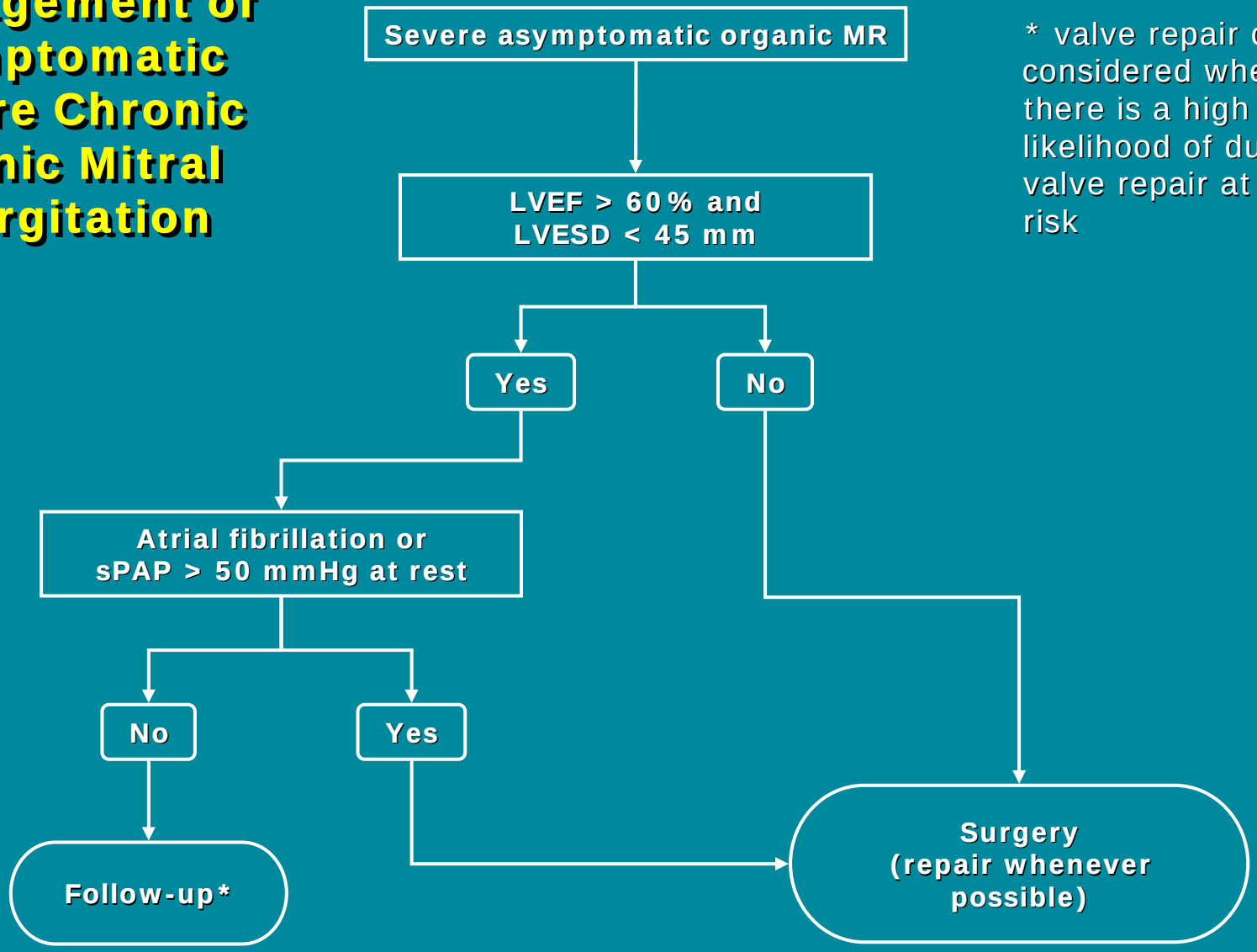


Indications for Surgery in Severe Chronic Organic Mitral Regurgitation

	Class
Symptomatic patients with LV EF >30% and ESD < 55 mm*	IB
Asymptomatic patients with LV dysfunction (ESD > 45 mm* and /or LV EF ≤ 60%)	IC
Asymptomatic patients with preserved LV function and AF or pulmonary hypertension (sPAP >50 mmHg at rest)	IIaC
Patients with severe LV dysfunction (LV EF < 30% and/or ESD > 55 mm*) refractory to medical therapy with high likelihood of durable repair and low comorbidity	IIaC
Asymptomatic patients with preserved LV function, high likelihood of durable repair, and low risk for surgery	IIbB
Patients with severe LV dysfunction (LV EF < 30% and/or ESD > 55 mm*) refractory to medical therapy with low likelihood of repair and low comorbidity	IIbC

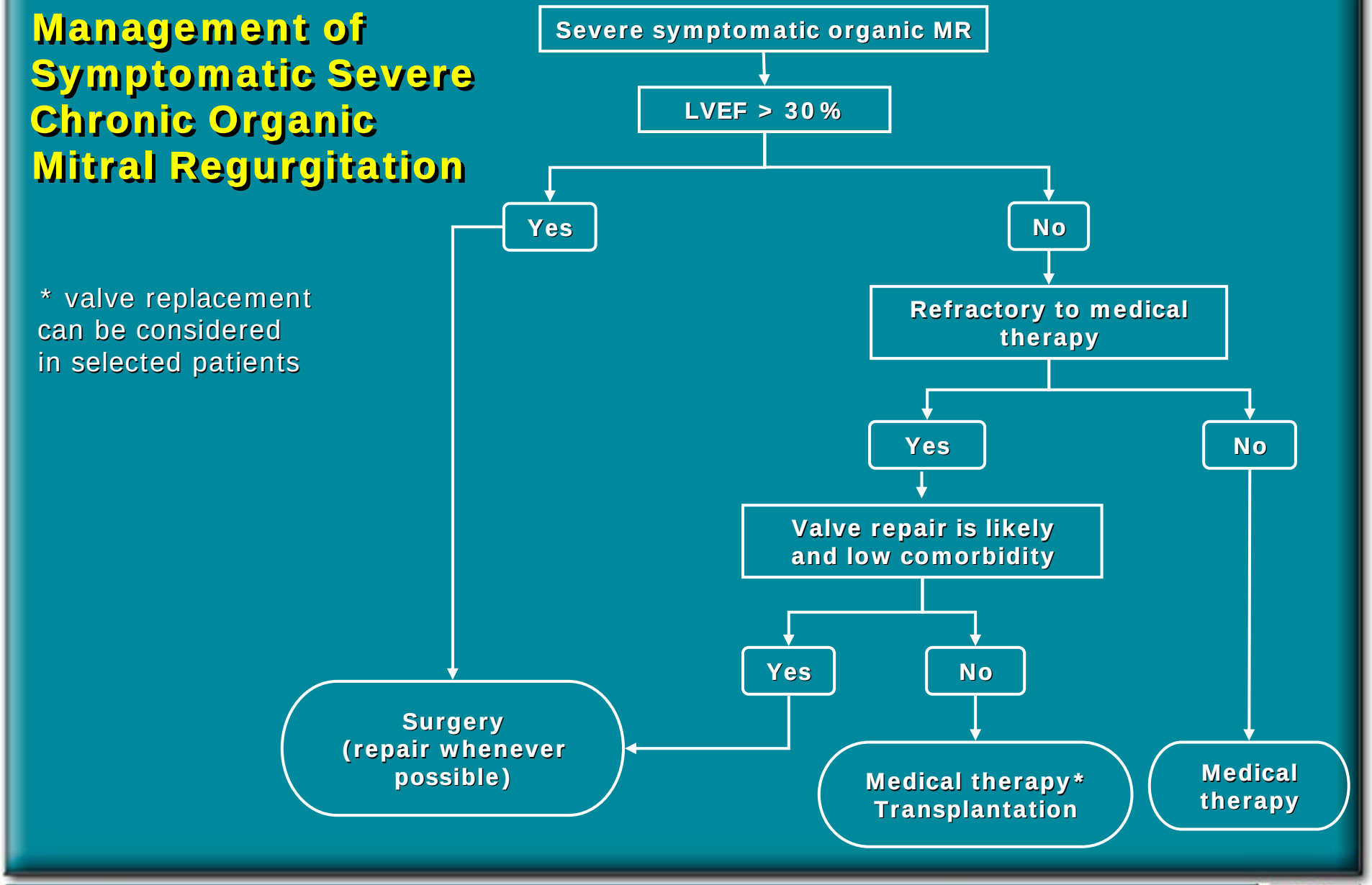
* Lower values can be considered for patients of small stature.

Management of Asymptomatic Severe Chronic Organic Mitral Regurgitation



* valve repair can be considered when there is a high likelihood of durable valve repair at a low risk

Management of Symptomatic Severe Chronic Organic Mitral Regurgitation



* valve replacement can be considered in selected patients

Indications for Surgery in Chronic Ischaemic Mitral Regurgitation

	Class
Patients with severe MR, LV EF > 30% undergoing CABG	**IC**
Patients with moderate MR undergoing CABG if repair is feasible	**IIaC**
Symptomatic patients with severe MR, LV EF <30% and option for revascularization	**IIaC**
Patients with severe MR, LVEF > 30%, no option for revascularization, refractory to medical therapy, and low comorbidity	**IIbC**

Indications for Percutaneous Mitral Commissurotomy in Symptomatic Mitral Stenosis with Valve Area < 1.5 Cm^2

	Class
Symptomatic patients with favourable characteristics for percutaneous mitral commissurotomy	**IB**
Symptomatic patients with contra-indication or high risk for surgery	**IC**
As initial treatment in symptomatic patients with unfavourable anatomy but otherwise favourable clinical characteristics	**IIaC**

Indications for Percutaneous Mitral Commissurotomy in Asymptomatic Mitral Stenosis with Valve Area < 1.5 Cm^2

Asymptomatic patients with favourable characteristics and high thromboembolic risk or high risk of haemodynamic decompensation:	
- previous history of embolism	**IIaC**
- dense spontaneous contrast in the left atrium	**IIaC**
- recent or paroxysmal atrial fibrillation	**IIaC**
- systolic pulmonary pressure > 50 mmHg at rest	**IIaC**
- need for major non-cardiac surgery	**IIaC**
- desire of pregnancy	**IIaC**

Suitability for Percutaneous Mitral Commissurotomy

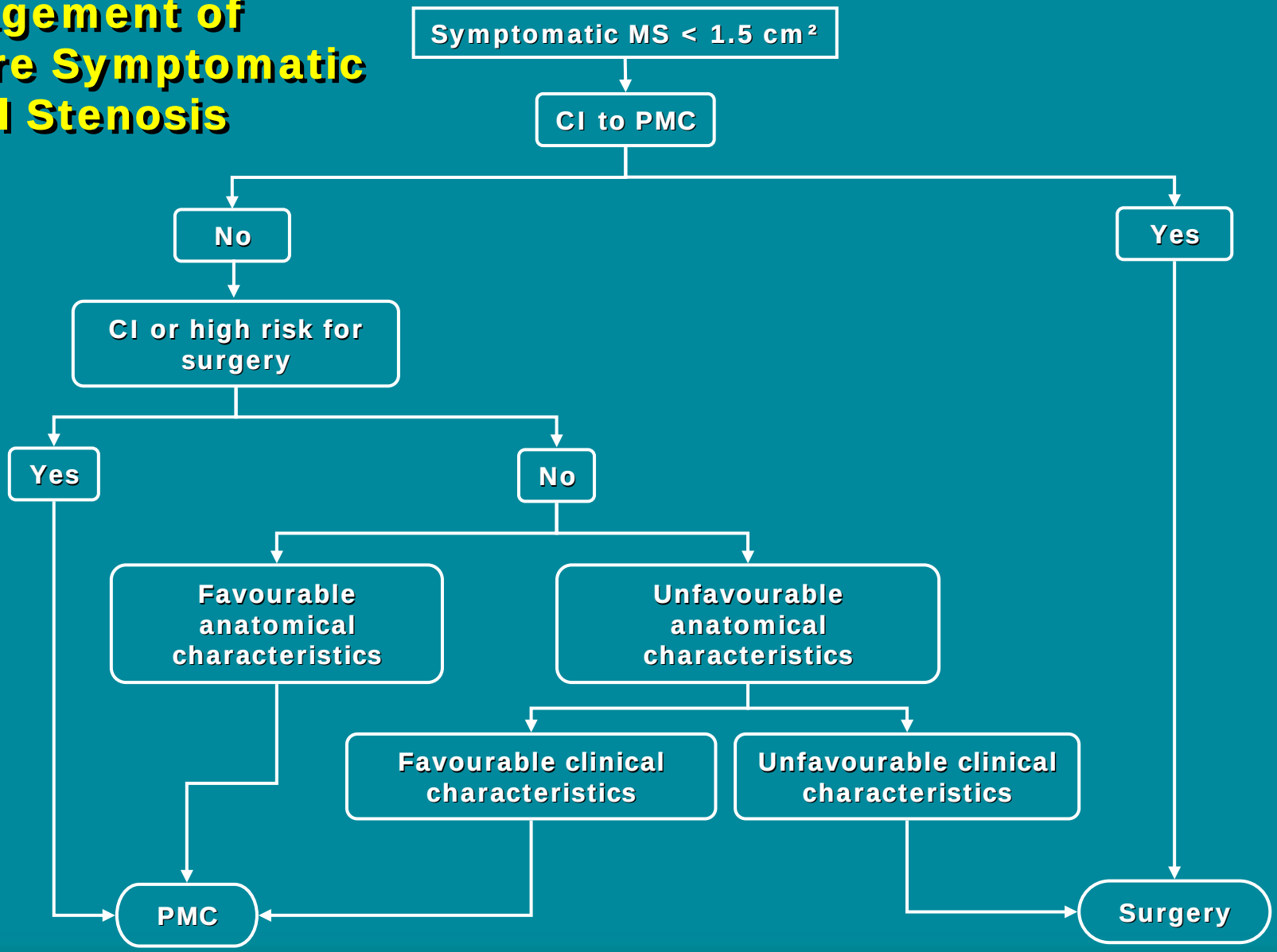
Favourable characteristics can be defined by the absence of several of the following unfavourable characteristics:

- *Clinical characteristics:* old age, history of commissurotomy, NYHA class IV, atrial fibrillation, severe pulmonary hypertension,
- *Anatomic characteristics:* echo score >8, Cormier score 3 (Calcification of mitral valve of any extent, as assessed by fluoroscopy), very small mitral valve area, severe tricuspid regurgitation.

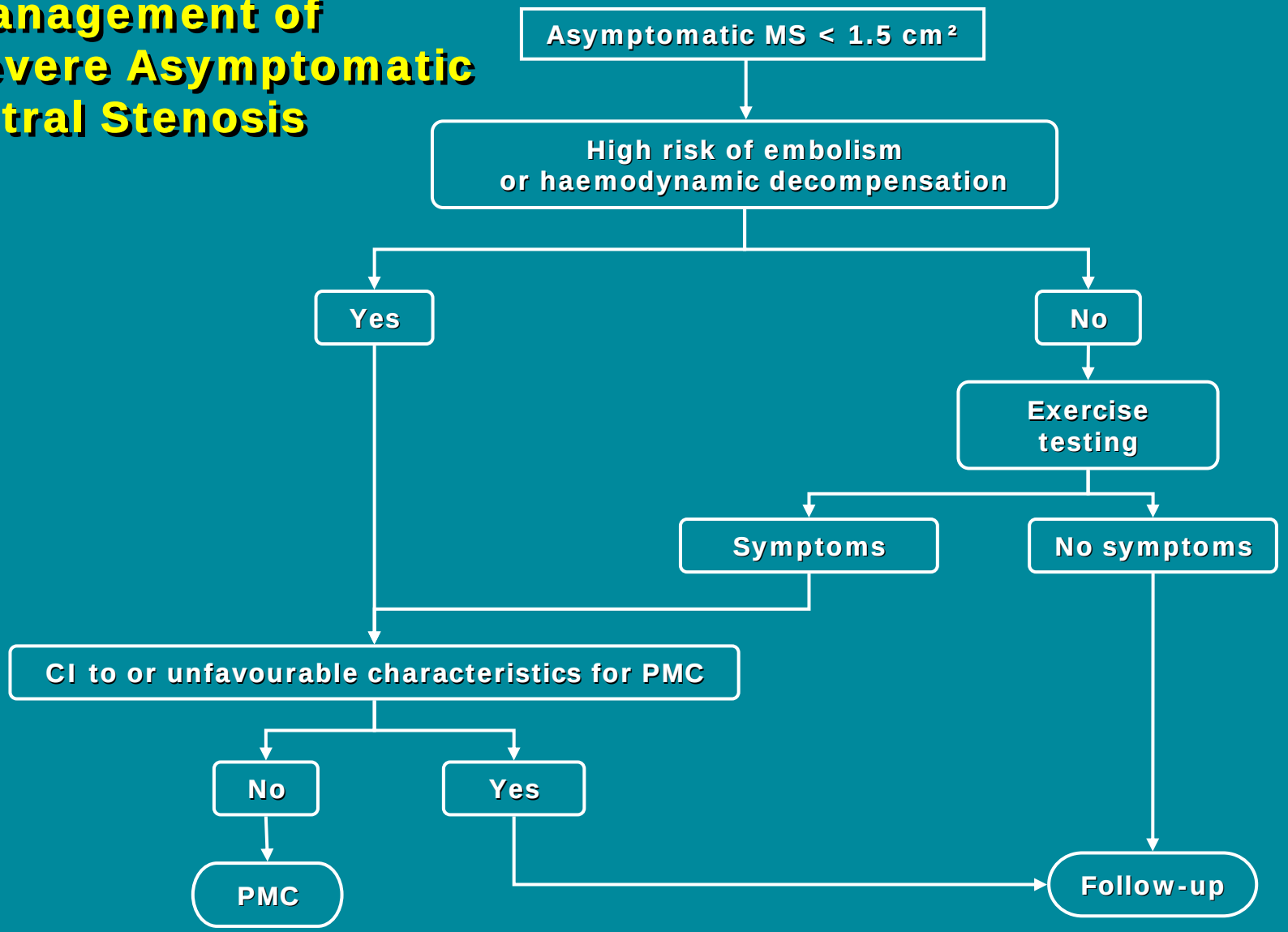
Contraindications to Percutaneous Mitral Commissurotomy

- Mitral valve area > 1.5 cm^2
- Left atrial thrombus
- More than mild mitral regurgitation
- Severe- or bicommissural calcification
- Absence of commissural fusion
- Severe concomitant aortic valve disease, or severe combined tricuspid stenosis and regurgitation
- Concomitant coronary artery disease requiring bypass surgery

Management of Severe Symptomatic Mitral Stenosis



Management of Severe Asymptomatic Mitral Stenosis



Indications for Intervention in Tricuspid Valve Diseases

	Class
Severe TR in a patient undergoing left sided valve surgery	IC
Severe primary TR and symptoms despite medical therapy without severe right ventricular dysfunction	IC
Severe TS (± TR), with symptoms despite medical therapy	IC
Severe TS (± TR) in a patient undergoing left sided valve intervention	IC
Moderate organic TR in a patient undergoing left-sided valve surgery	IIaC
Moderate secondary TR with dilated annulus (> 40 mm) in a patient undergoing left sided valve surgery	IIaC
Severe TR and symptoms, after left-sided valve surgery, in the absence of left sided myocardial, valve, or right ventricular dysfunction and without severe pulmonary hypertension (sPAP > 60 mmHg)	IIaC
Severe isolated TR with mild or no symptoms and progessive dilation or deterioration of right ventricular function	IIbC

* Percutaneous technique can be attempted as a first approach if TS is isolated

Choice of the Prosthesis: In Favour of Mechanical Prosthesis

The decision is based on the integration of several of the following factors

	Class
Desire of the informed patient and absence of contraindication for long-term anticoagulation	IC
Patients at risk of accelerated structural valve deterioration*	IC
Patient already on anticoagulation because of other mechanical prosthesis	IC
Patients already on anticoagulation because at high risk for thromboembolism	IIaC
Age< 65-70 and long life expectancy **	IIaC
Patients for whom future redo valve surgery would be at high risk (LV dysfunction, previous CABG, multiple valve prosthesis)	IIaC

* young age, hyperparathyroidism

** according to age, gender, the presence of comorbidity, and country-specific life expectancy

Choice of the Prosthesis: In Favour of Bioprosthesis

The decision is based on the integration of several of the following factors

	Class
Desire of the informed patient	IC
Unavailability of good quality anticoagulation (contraindication or high risk, unwillingness, compliance problems, life style, occupation)	IC
Re-operation for mechanical valve thrombosis in a patient with proven poor anticoagulant control	IC
Patient for whom future redo valve surgery would be at low risk	IIaC
Limited life expectancy*, severe comorbidity, or age > 65-70	IIaC
Young woman contemplating pregnancy	IIbC

* according to age, gender, the presence of comorbidity, and country-specific life expectancy

Management after Valve Replacement

- **Complete baseline assessment**
  6 to 12 weeks after surgery
  (clinical assessment, chest X-ray, ECG, TTE, blood testing)

- **Antithrombotic therapy**
  - Adapted to prothesis- and patient-related risk factors
  - Lifelong for all mechanical prostheses
  - During the first 3 post-operative months for bioprostheses

- **Detection of complications**
  - Prosthetic thrombosis
  - Bioprosthetic failure
  - Haemolysis and paravalvular leak
  - Heart failure

Risk Factors for Thromboembolism

- **Prosthesis thrombogenicity**

  Low : Carbomedics (aortic position), Medtronic Hall, St. Jude Medical (without Silzone)

  Medium : Bjork-Shiley, other bileaflet valves

  High : Lillehei-Kaster, Omniscience, Starr-Edwards

- **Patient-related risk factors**
  - mitral, tricuspid, or pulmonary valve replacement
  - previous thromboembolism
  - atrial fibrillation
  - left atrial diameter > 50 mm
  - left atrial dense spontaneous contrast
  - mitral stenosis of any degree
  - left ventricular ejection fraction < 35%
  - hypercoagulable state

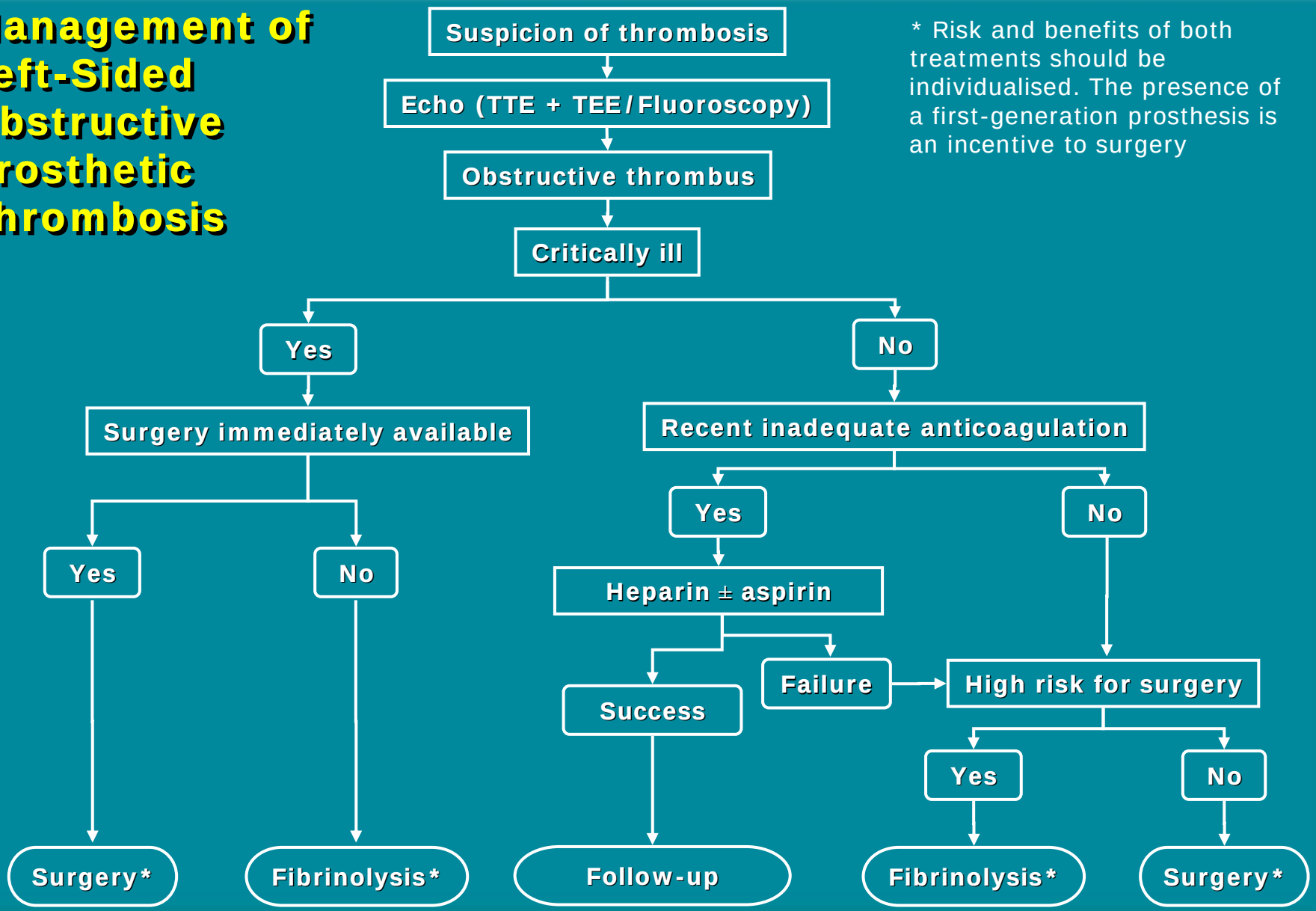
Antithrombotic Therapy of Mechanical Prostheses

- **Target INR**

Prosthesis thrombogenicity	Patient-related risk factors	
	No risk factor	≥ 1 risk factor
Low	2.5	3.0
Medium	3.0	3.5
High	3.5	4.0

- **Association of antiplatelet drugs**
  - Coronary artery disease or other atherosclerotic disease
  - Recurrent embolism despite adequate INR

Management of Left-Sided Obstructive Prosthetic Thrombosis



* Risk and benefits of both treatments should be individualised. The presence of a first-generation prosthesis is an incentive to surgery

Interruption of Anticoagulant Therapy

- The management is based on the assessment of patient and prosthesis-related risks for thromboembolism and procedure-related bleeding risk.
- Minor surgical procedures (including dental extraction) do not require anti-coagulation interruption. The INR should be lowered to a target of 2 (***Class IB***).
- For major surgical procedures, patients should be admitted to hospital in advance and transferred to intravenous unfractionated heparin (***Class IIaC***). Heparin is stopped 6 hours before surgery and resumed 6-12 hours after.
- Subcutaneous low-molecular weight heparin can be used at therapeutic doses adapted to body weight (***Class IIbC***).

Management During Non-Cardiac Surgery

- The decision should involve a full discussion between cardiologists, anaesthesiologists and surgeons.
- Non-cardiac surgery can be performed with a low risk:
  - In patients with AR and MR, even severe, provided LV function is preserved,
  - In asymptomatic patients with MS and systolic pulmonary artery pressure < 50 mmHg.
- The risk of peri-operative complication is highest in severe AS. Patient management should take into account the risk of non-cardiac surgery, the features of AS and the risk of cardiac surgery.

Non-Cardiac Surgery Related Risk

High Risk (> 5%)

- Emergent major operations, particularly in the elderly
- Aortic and other major vascular surgery
- Peripheral vascular surgery
- Anticipated prolonged surgical procedures associated with large fluid shifts and/or blood loss

Intermediate Risk (1 to 5%)

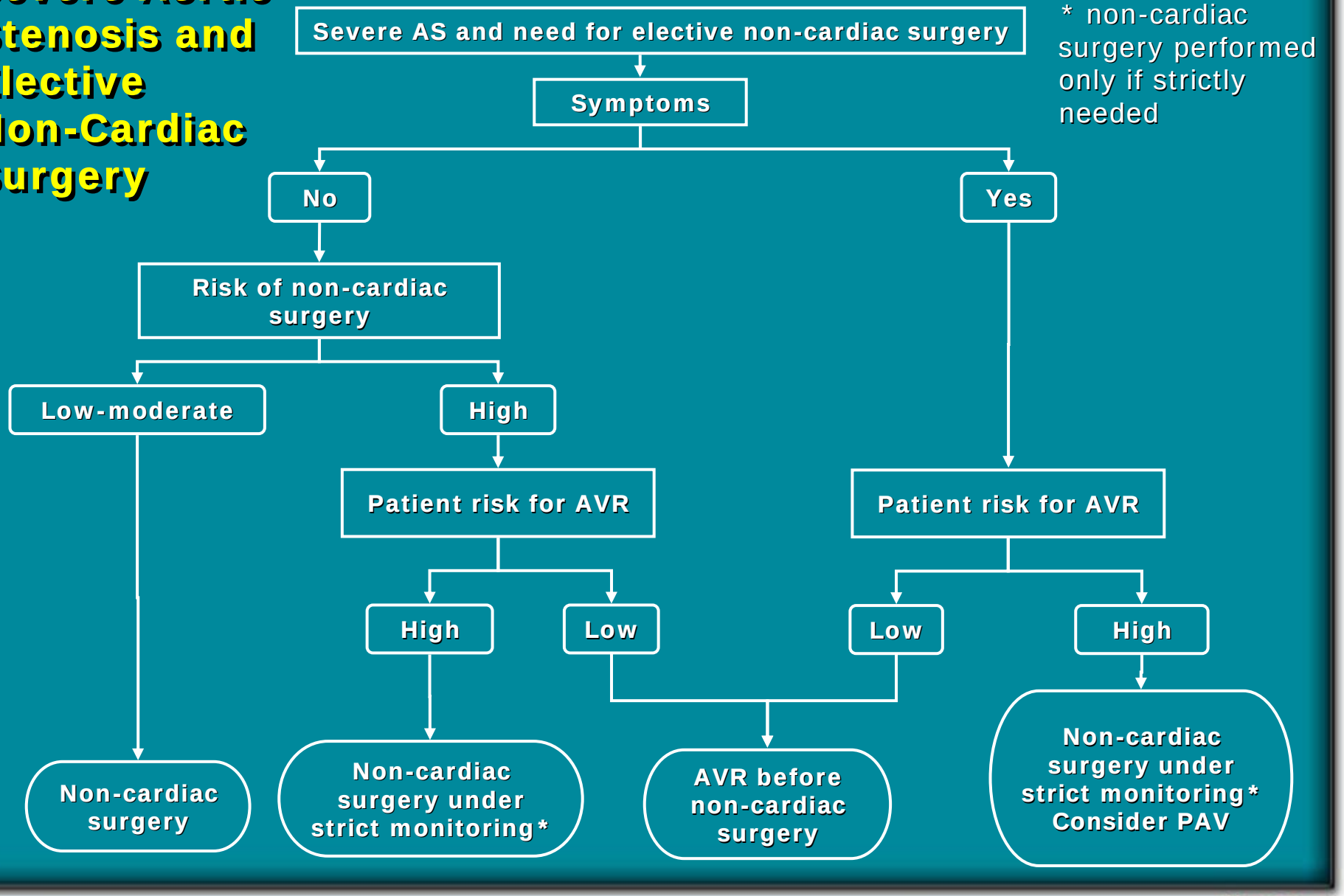
- Carotid endarterectomy
- Head and neck surgery
- Intraperitoneal and intrathoracic surgery
- Orthopedic surgery
- Prostate surgery

Low Risk (< 1%)

- Endoscopic procedures
- Superficial procedure
- Cataract surgery
- Breast surgery

(Eagle et al. J Am Coll Cardiol 2002;39:542-53)

Severe Aortic Stenosis and Elective Non-Cardiac Surgery



* non-cardiac surgery performed only if strictly needed

Management of Pregnant Women with Valvular Heart Disease (I)

	Class
Patients with severe stenotic heart valve disease should be treated before pregnancy, if possible using percutaneous techniques in mitral stenosis	IC
Patients with Marfan's syndrome and aortic diameter > 40 mm should be treated before pregnancy	IC
Echocardiographic examination should be performed in any pregnant patient with a murmur or unexplained dyspnoea	IC
Medical therapy is favoured in most patients with regurgitant heart valve disease, even in symptomatic patients	IC
Percutaneous mitral commissurotomy should be considered in pregnant patients who have severe symptoms or pulmonary artery pressure > 50 mmHg due to mitral stenosis despite medical therapy	IIaC

Management of Pregnant Women with Valvular Heart Disease (II)

	Class
Close monitoring of anticoagulation is advised when unfractionated heparin used	IC
Warfarin is the favoured anticoagulant therapy during the 2nd and 3rd trimesters until the 36th week	IIaC
Surgery under extracorporeal circulation should be performed during pregnancy only in situations that threaten the mother's life and are not amenable to percutaneous treatment	IC
Vaginal delivery can be performed safely in patients with heart valve disease who are in stable haemodynamic condition	IC