2017 Appropriate Use Criteria for the Treatment of Patients with Severe Aortic Stenosis:

Guideline Mapping and References

The Guideline Mapping and References document is meant to be used as a resource during the Rating Panel process. While not all-encompassing, it includes the most relevant references that impact clinical practice, including Guideline recommendations and pivotal randomized controlled trials, which the Rating Panelists are asked to consider before scoring each indication.

While an effort has been made to include specific references directly within each table, many of the key references apply to more than one table and therefore are being listed at the start of this document:

1) Nishimura, R. A., et al. "2014 AHA/ACC guideline for the management of patients with valvular heart disease: a report of the American College of Cardiology/ American Heart Association Task Force on Practice Guidelines." J Am Coll Cardiol 63.22 (2014): e57-185.

Especially see Tables 9 and 10:

Table 9. Summary of Recommendations for AS: Timing of Intervention

Recommendations	COR	LOE	References
AVR is recommended for symptomatic patients with severe high-gradient AS who have symptoms by history or on exercise testing (stage D1)	I	B	9,91,134,135
AVR is recommended for asymptomatic patients with severe AS (stage C2) and LVEF <50%	I	B	136,137
AVR is indicated for patients with severe AS (stage C or D) when undergoing other cardiac surgery	I	B	108,138
AVR is reasonable for asymptomatic patients with very severe AS (stage C1, aortic velocity ≥5.0 m/s) and low surgical risk	IIa	B	139,140
AVR is reasonable in asymptomatic patients (stage C1) with severe AS and decreased exercise tolerance or an exercise fall in BP	IIa	B	25,47
AVR is reasonable in symptomatic patients with low-flow/low-gradient severe AS with reduced LVEF (stage D2) with a low-dose dobutamine stress study that shows an aortic velocity ≥4.0 m/s (or mean pressure gradient ≥40 mm Hg) with a valve area ≤1.0 cm^2 at any dobutamine dose	IIa	B	43,141,142
AVR is reasonable in symptomatic patients who have low-flow/low-gradient severe AS (stage D3) who are normotensive and have an LVEF ≥50% if clinical, hemodynamic, and anatomic data support valve obstruction as the most likely cause of symptoms	IIa	C	N/A
AVR is reasonable for patients with moderate AS (stage B) (aortic velocity 3.0–3.9 m/s) who are undergoing other cardiac surgery	IIa	C	N/A
AVR may be considered for asymptomatic patients with severe AS (stage C1) and rapid disease progression and low surgical risk	IIb	C	N/A

AS indicates aortic stenosis; AVR, aortic valve replacement by either surgical or transcatheter approach; BP, blood pressure; COR, Class of Recommendation; LOE, Level of Evidence; LVEF, left ventricular ejection fraction; and N/A, not applicable.

Table 10. Summary of Recommendations for AS: Choice of Surgical or Transcatheter Intervention

Recommendations	COR	LOE	References
Surgical AVR is recommended in patients who meet an indication for AVR (Section 3.2.3) with low or intermediate surgical risk	I	A	74,148
For patients in whom TAVR or high-risk surgical AVR is being considered, members of a Heart Valve Team should collaborate to provide optimal patient care	I	C	N/A
TAVR is recommended in patients who meet an indication for AVR for AS who have a prohibitive surgical risk and a predicted post-TAVR survival >12 mo	I	B	169,170
TAVR is a reasonable alternative to surgical AVR in patients who meet an indication for AVR (Section 3.2.3) and who have high surgical risk (Section 2.5)	IIa	B	171,172
Percutaneous aortic balloon dilation may be considered as a bridge to surgical or transcatheter AVR in severely symptomatic patients with severe AS	IIb	C	N/A
TAVR is not recommended in patients in whom existing comorbidities would preclude the expected benefit from correction of AS	III: No Benefit	B	169

AS indicates aortic stenosis; AVR, aortic valve replacement; COR, Class of Recommendation; LOE, Level of Evidence; N/A, not applicable; and TAVR, transcatheter aortic valve replacement.

2) Adams DH, Popma JJ, Reardon MJ, Yakubov SJ, Coselli JS, Deeb GM, et al. Transcatheter aortic-valve replacement with a self-expanding prosthesis. N Engl J Med. 2014; 370(19): 1790-8.
3) Arnold SV, Lei Y, Reynolds MR, Magnuson EA, Suri RM, Tuzcu EM, et al. Costs of periprocedural complications in patients treated with transcatheter aortic valve replacement: results from the Placement of Aortic Transcatheter Valve trial. Circ Cardiovasc Interv. 2014; 7(6): 829-36.
4) Blackstone EH, Suri RM, Rajeswaran J, Babaliaros V, Douglas PS, Fearon WF, et al. Propensity-matched comparisons of clinical outcomes after transapical or transfemoral transcatheter aortic valve replacement: a placement of aortic transcatheter valves (PARTNER)-I trial substudy. Circulation. 2015; 131(22): 1989-2000.
5) Herrmann, H. C., et al. "One-Year Clinical Outcomes With SAPIEN 3 Transcatheter Aortic Valve Replacement in High-Risk and Inoperable Patients With Severe Aortic Stenosis." Circulation 134.2 (2016): 130-40.
6) Herrmann HC, Pibarot P, Hueter I, Gertz ZM, Stewart WJ, Kapadia S, et al. Predictors of mortality and outcomes of therapy in low-flow severe aortic stenosis: a Placement of Aortic Transcatheter Valves (PARTNER) trial analysis. Circulation. 2013; 127(23): 2316-26.
7) Kapadia SR, Leon MB, Makkar RR, Tuzcu EM, Svensson LG, Kodali S, et al. 5-year outcomes of transcatheter aortic valve replacement compared with standard treatment for patients with inoperable aortic stenosis (PARTNER 1): a randomised controlled trial. Lancet. 2015; 385(9986): 2485-91.
8) Kodali SK, Williams MR, Smith CR, Svensson LG, Webb JG, Makkar RR, et al. Two-year outcomes after transcatheter or surgical aortic-valve replacement. N Engl J Med. 2012; 366(18): 1686-95.
9) Kodali S, Pibarot P, Douglas PS, Williams M, Xu K, Thourani V, et al. Paravalvular regurgitation after transcatheter aortic valve replacement with the Edwards sapien valve in the PARTNER trial: characterizing patients and impact on outcomes. Eur Heart J. 2015; 36(7): 449-56.
10) Leon, M. B., et al. "Transcatheter or Surgical Aortic-Valve Replacement in Intermediate-Risk Patients." N.Engl.J Med. 374.17 (2016): 1609-20.
11) Leon MB, Smith CR, Mack M, Miller DC, Moses JW, Svensson LG, et al. Transcatheter aortic-valve implantation for aortic stenosis in patients who cannot undergo surgery. N Engl J Med. 2010; 363(17): 1597-607.
12) Lindman BR, Pibarot P, Arnold SV, Suri RM, McAndrew TC, Maniar HS, et al. Transcatheter versus surgical aortic valve replacement in patients with diabetes and severe aortic stenosis at high risk for surgery: an analysis of the PARTNER Trial (Placement of Aortic Transcatheter Valve). J Am Coll Cardiol. 2014; 63(11): 1090-9.

13) Mack MJ, Leon MB, Smith CR, Miller DC, Moses JW, Tuzcu EM, et al. 5-year outcomes of transcatheter aortic valve replacement or surgical aortic valve replacement for high surgical risk patients with aortic stenosis (PARTNER 1): a randomised controlled trial. Lancet. 2015; 385(9986): 2477-84.
14) Makkar RR, Fontana GP, Jilaihawi H, Kapadia S, Pichard AD, Douglas PS, et al. Transcatheter aortic-valve replacement for inoperable severe aortic stenosis. N Engl J Med. 2012; 366(18): 1696-704.
15) Miller DC, Blackstone EH, Mack MJ, Svensson LG, Kodali SK, Kapadia S, et al. Transcatheter (TAVR) versus surgical (AVR) aortic valve replacement: occurrence, hazard, risk factors, and consequences of neurologic events in the PARTNER trial. J Thorac Cardiovasc Surg. 2012; 143(4): 832-43 e13.
16) Pibarot P, Weissman NJ, Stewart WJ, Hahn RT, Lindman BR, McAndrew T, et al. Incidence and sequelae of prosthesis-patient mismatch in transcatheter versus surgical valve replacement in high-risk patients with severe aortic stenosis: a PARTNER trial cohort--a analysis. J Am Coll Cardiol. 2014; 64(13): 1323-34.
17) Reardon MJ, Adams DH, Kleiman NS, Yakubov SJ, Coselli JS, Deeb GM, et al. 2-Year Outcomes in Patients Undergoing Surgical or Self-Expanding Transcatheter Aortic Valve Replacement. J Am Coll Cardiol. 2015; 66(2): 113-21.
18) Smith CR, Leon MB, Mack MJ, Miller DC, Moses JW, Svensson LG, et al. Transcatheter versus surgical aortic-valve replacement in high-risk patients. N Engl J Med. 2011; 364(23): 2187-98.
19) Thourani, V. H., et al. "Transcatheter aortic valve replacement versus surgical valve replacement in intermediate-risk patients: a propensity score analysis." Lancet 387.10034 (2016): 2218-25.
20) Thyregod HG, Steinbruchel DA, Ihlemann N, Nissen H, Kjeldsen BJ, Petursson P, et al. Transcatheter Versus Surgical Aortic Valve Replacement in Patients With Severe Aortic Valve Stenosis: 1-Year Results From the All-Comers NOTION Randomized Clinical Trial. J Am Coll Cardiol. 2015; 65(20): 2184-94.
21) Webb, J. G., et al. "A Randomized Evaluation of the SAPIEN XT Transcatheter Heart Valve System in Patients With Aortic Stenosis Who Are Not Candidates for Surgery." JACC.Cardiovasc.Interv. 8.14 (2015): 1797-806.

Severe Aortic Stenosis Indications

Table 1: Asymptomatic, High Gradient, Severe AS

Appropriate Use Score (1-9)			
Indication		**No Intervention**	**AVR (TAVR or SAVR)**
1.	• LVEF ≥50% • V_{max} 4.0 to 4.9 m/sec • Negative exercise stress test • No predictors of symptom onset or of rapid progression (e.g., ΔV_{max} >0.3 m/s/yr, severe valve calcification, elevated BNP, or excessive LV hypertrophy in the absence of hypertension) • High or intermediate surgical risk	See Tables 9 and 10 of AHA/ACC Valvular Heart Disease Guidelines (2014)	
2.	• LVEF ≥50% • V_{max} 4.0 to 4.9 m/sec • Negative exercise stress test • No predictors of symptom onset or of rapid progression (e.g., ΔV_{max} >0.3 m/s/yr, severe valve calcification, elevated BNP, or excessive LV hypertrophy in the absence of hypertension) • Low surgical risk	Same as above	
3.	• LVEF ≥50% • V_{max} 4.0 to 4.9 m/sec • High risk profession (e.g. airline pilot) or lifestyle (e.g. competitive athlete) or anticipated prolonged time away from close medical supervision • Low surgical risk	Same as above	
4.	• LVEF ≥50% • V_{max} 4.0 to 4.9 m/sec • Negative exercise stress test • One or more predictors of symptom onset or of rapid progression (e.g., ΔV_{max} >0.3 m/s/yr, severe valve calcification, elevated BNP, or excessive LV hypertrophy in the absence of hypertension) • High or intermediate surgical risk	Same as above	

5.	• LVEF ≥50% • V_{max} 4.0 to 4.9 m/sec • Negative exercise stress test • One or more predictors of symptom onset or of rapid progression (e.g., ΔV_{max} >0.3 m/s/yr, severe valve calcification, elevated BNP, or excessive LV hypertrophy in the absence of hypertension) • Low surgical risk	Same as above
6.	• LVEF ≥50% • V_{max} 4.0 to 4.9 m/sec • Abnormal exercise stress test • High or intermediate surgical risk	Same as above
7.	• LVEF ≥50% • V_{max} 4.0 to 4.9 m/sec • Abnormal exercise stress test • Low surgical risk	Same as above
8.	• LVEF ≥50% • Very severe AS (V_{max} ≥5 m/sec or mean gradient ≥60 mmHg) • High or intermediate surgical risk	Same as above
9.	• LVEF ≥50% • Very severe AS (V_{max} ≥5 m/sec or mean gradient ≥60 mmHg) • Low surgical risk	Same as above
10.	• LVEF <50% • V_{max} ≥4 m/sec or mean gradient ≥40 mmHg • High or intermediate surgical risk	Same as above
11.	• LVEF <50% • V_{max} ≥4 m/sec or mean gradient ≥40 mmHg • Low surgical risk	Same as above
12.	• Undergoing another cardiac surgery or ascending aortic surgery	Same as above

Table 2: Flow, Gradient, and Ejection Fraction

Appropriate Use Score (1-9)				
Indication		**No Intervention**	**BAV (bridge to decision)**	**AVR (TAVR or SAVR)**
Reduced Ejection Fraction (<50%)				
13.	• AVA ≤1.0 cm^2 (or indexed AVA ≤0.6 cm^2/m^2) on resting echo • LVEF 20% to <49% • Low flow • Low gradient • Flow reserve on low dose dobutamine echo • Truly severe AS • High or intermediate surgical risk	See Tables 9 and 10 of AHA/ACC Valvular Heart Disease Guidelines (2014)		
14.	• AVA ≤1.0 cm^2 (or indexed AVA ≤0.6 cm^2/m^2) on resting echo • LVEF 20% to <49% • Low flow • Low gradient • Flow reserve on low dose dobutamine echo • Truly severe AS • Low surgical risk	Same as above		
15.	• AVA ≤1.0 cm^2 (or indexed AVA ≤0.6 cm^2/m^2) on resting echo • LVEF 20% to <49% • Low flow • Low gradient • Flow reserve on low dose dobutamine echo • Pseudo severe AS	Same as above		
16.	• AVA ≤1.0 cm^2 (or indexed AVA ≤0.6 cm^2/m^2) on resting echo • LVEF 20% to <49% • Low flow • Low gradient • No flow reserve on low dose dobutamine echo • Very calcified aortic valve on echo and/or CT suggesting truly severe AS, or calculation of a projected valve area that remains severely reduced • High or intermediate surgical risk	Same as above		

17.	• AVA ≤1.0 cm^2 (or indexed AVA ≤0.6 cm^2/m^2) on resting echo • LVEF 20% to <49% • Low flow • Low gradient • No flow reserve on low dose dobutamine echo • Minimal calcification on aortic valve on echo and/or CT • High or intermediate surgical risk	Same as above
18.	• AVA ≤1.0 cm^2 (or indexed AVA ≤0.6 cm^2/m^2) • LVEF <20% • V_{max} ≥4 m/sec or mean gradient ≥40 mmHg on resting echo • High or intermediate surgical risk	Same as above
19.	• AVA ≤1.0 cm^2 (or indexed AVA ≤0.6 cm^2/m^2) • LVEF <20% • Mean gradient <20 mmHg on resting echo • No flow reserve on low dose dobutamine echo • High or intermediate surgical risk	Same as above
20.	• AVA ≤1.0 cm^2 (or indexed AVA ≤0.6 cm^2/m^2) on resting echo • LVEF <20% • Low flow • Low gradient • Flow reserve on low dose dobutamine echo • Truly severe AS • High or intermediate surgical risk	Same as above
21.	• AVA ≤1.0 cm^2 (or indexed AVA ≤0.6 cm^2/m^2) on resting echo • LVEF <20% • Low flow • Low gradient • Flow reserve on low dose dobutamine echo • Pseudo severe AS • High or intermediate surgical risk	Same as above
Preserved Ejection Fraction (≥50%)		
22.	• AVA ≤1.0 cm^2 (or indexed AVA ≤0.6 cm^2/m^2) • V_{max} ≥4 m/sec or mean gradient ≥40 mmHg on resting echo • Symptomatic • High or intermediate surgical risk	Same as above
23.	• AVA ≤1.0 cm^2 (or indexed AVA ≤0.6 cm^2/m^2) • V_{max} ≥4 m/sec or mean gradient ≥40 mmHg on resting echo • Symptomatic • Low surgical risk	Same as above

24.	• AVA ≤1.0 cm^2 (and indexed AVA ≤0.6 cm^2/m^2) • Low flow • Low gradient • Symptomatic • Evidence of a severely calcified valve • Clinical, hemodynamic, and anatomic data support valve obstruction as the most likely cause of symptoms • High or intermediate surgical risk	Same as above
25.	• AVA ≤1.0 cm^2 (and indexed AVA ≤0.6 cm^2/m^2) • Low flow • Low gradient • Symptomatic • Evidence of a severely calcified valve • Clinical, hemodynamic, and anatomic data support valve obstruction as the most likely cause of symptoms • Low surgical risk	Same as above
26.	• AVA ≤1.0 cm^2 (and indexed AVA ≤0.6 cm^2/m^2) • Low flow • Low gradient • Evidence of a severely calcified valve • Asymptomatic • High or intermediate surgical risk	Same as above
27.	• AVA ≤1.0 cm^2 (and indexed AVA ≤0.6 cm^2/m^2) • Low flow • Low gradient • Evidence of a severely calcified valve • Asymptomatic • Low surgical risk	Same as above
28.	• AVA ≤1.0 cm^2 (and indexed AVA ≤0.6 cm^2/m^2) • Normal flow • Low gradient • Confirmation of internal consistency of the AVA, flow, and gradient measurements • Evidence of a severely calcified valve • Symptoms believed to be due to AS • High or intermediate surgical risk	See Tables 9 and 10 of AHA/ACC Valvular Heart Disease Guidelines (2014) Also: Dayan V, Vignolo G, Magne J, et al. Outcome and Impact of Aortic Valve Replacement in Patients With Preserved LVEF and Low-Gradient Aortic Stenosis. J Am Coll Cardiol. 2015; 66:2594-603.

29.	• AVA ≤1.0 cm^2 (and indexed AVA ≤0.6 cm^2/m^2) • Normal flow • Low gradient • Confirmation of internal consistency of the AVA, flow, and gradient measurements • Evidence of a severely calcified valve • Symptoms believed to be due to AS • Low surgical risk	See Tables 9 and 10 of AHA/ACC Valvular Heart Disease Guidelines (2014)

Table 3: Severe AS: High or Extreme Risk Patients

Appropriate Use Score (1-9)					
Indication		**No Intervention**	**BAV (as bridge or palliative care)**	**TAVR**	**SAVR**
Due to multiple comorbidities					
30.	• Severe symptomatic AS • STS PROM 8-15% • Health status seems to be influenced more by comorbidities than AS • Anticipated life expectancy >1 year	See Table 10 of AHA/ACC Valvular Heart Disease Guidelines (2014)			
31.	• Severe symptomatic AS • STS PROM 8-15% • Health status seems to be influenced more by AS than comorbidities • Anticipated life expectancy >1 year	Same as above			
32.	• Severe symptomatic AS • STS PROM 8-15% • Health status seems to be influenced more by comorbidities than AS • Anticipated life expectancy <1 year	Same as above			
33.	• Severe symptomatic AS • STS PROM 8-15% • Health status seems to be influenced more by AS than comorbidities • Anticipated life expectancy <1 year	Same as above			

34.	• Severe symptomatic AS • STS PROM >15% • Health status seems to be influenced more by comorbidities than AS • Anticipated life expectancy >1 year	Same as above
35.	• Severe symptomatic AS • STS PROM >15% • Health status seems to be influenced more by AS than comorbidities • Anticipated life expectancy >1 year	Same as above
36.	• Severe symptomatic AS • STS PROM >15% • Health status seems to be influenced more by comorbidities than AS • Anticipated life expectancy <1 year	Same as above
37.	• Severe symptomatic AS • STS PROM >15% • Health status seems to be influenced more by AS than comorbidities • Anticipated life expectancy <1 year	Same as above
With frailty or disability		
38.	• Severe AS (V_{max} 4-4.9 m/s) • STS PROM 8-15% • Frail • No chest pain or syncope • Fatigue, but no shortness of breath • Normal BNP	Same as above
39.	• Severe AS (V_{max} 4-4.9 m/s) • STS PROM 8-15% • Frail • No chest pain or syncope • Fatigue, but no shortness of breath • BNP elevated	Same as above
40.	• Very severe AS (V_{max} ≥5 m/s) • STS PROM 8-15% • Frail • No chest pain or syncope • Fatigue, but no shortness of breath • Normal BNP	Same as above

41.	• Very severe AS (V_{max} ≥5 m/s) • STS PROM 8-15% • Frail • No chest pain or syncope • Fatigue, but no shortness of breath • BNP elevated	Same as above
42.	• Severe AS (V_{max} ≥4 m/s) • STS PROM 8-15% • Dependent in more than 3 activities of daily living (bathing, dressing, eating, ambulating, toileting, transferring) • Shortness of breath	Same as above
43.	• Severe AS (V_{max} ≥4 m/s) • STS PROM 8-15% • Dependent in more than 3 activities of daily living (bathing, dressing, eating, ambulating, toileting, transferring) • Fatigued, but not short of breath	Same as above
Due to anatomy		
44.	• Severe symptomatic AS • Porcelain aorta or hostile chest • Otherwise high or intermediate surgical risk due to comorbidities	Same as above
45.	• Severe symptomatic AS • Porcelain aorta or hostile chest • Otherwise low surgical risk due to comorbidities	Same as above
Due to specific comorbidities		
46.	• Severe AS • STS PROM 8-15% • Oxygen dependent lung disease • Shortness of breath • BNP normal	Same as above
47.	• Severe AS • STS PROM 8-15% • Oxygen dependent lung disease • Shortness of breath • BNP elevated	Same as above
48.	• Severe symptomatic AS • End-stage renal disease • Longstanding dialysis, not a renal transplant candidate • Multiple co-morbidities • STS PROM >15%	Same as above

49.	• Severe symptomatic AS • STS PROM 8-15% • End-stage renal disease • Short time on dialysis • Renal transplant candidate • Non-diabetic, non-hypertensive etiology	Same as above
50.	• Severe symptomatic AS • STS PROM 8-15% • Cirrhosis with MELD >14	Same as above
51.	• Severe symptomatic AS • STS PROM 8-15% • Cirrhosis with MELD <10	Same as above
52.	• Severe symptomatic AS • STS PROM 8-15% • Moderate to severe dementia (minimally oriented) • Symptoms described by family but not verbalized by the patient	Same as above
53.	• Severe symptomatic AS • STS PROM 8-15% • Malignancy • Life expectancy >1 year	Same as above
54.	• Severe symptomatic AS • STS PROM 8-15% • Malignancy • Life expectancy <1 year	Same as above

Table 4: Symptomatic, High Gradient, Severe AS* with associated Coronary Artery Disease

Appropriate Use Score (1-9)						
Indication		**TAVR**	**TAVR + PCI**	**SAVR**	**SAVR + PCI**	**SAVR + CABG**
55.	• 1 or 2 vessel CAD, no proximal LAD involvement • High or intermediate surgical risk	See Table 10 of AHA/ACC Valvular Heart Disease Guidelines (2014)				
56.	• 1 or 2 vessel CAD, no proximal LAD involvement • Low surgical risk	Same as above				
57.	• 1 or 2 vessel CAD, including proximal LAD • High or intermediate surgical risk	Same as above				

58.	• 1 or 2 vessel CAD, including proximal LAD • Low surgical risk	Same as above
59.	• 3 vessel disease; SYNTAX < 22 • High or intermediate surgical risk	Same as above
60.	• 3 vessel disease; SYNTAX < 22 • Low surgical risk	Same as above
61.	• 3 vessel disease; SYNTAX ≥ 22 • High or intermediate surgical risk	Same as above
62.	• 3 vessel disease; SYNTAX ≥ 22 • Low surgical risk	Same as above
63.	• Left main; SYNTAX < 33 • High or intermediate surgical risk	Same as above
64.	• Left main; SYNTAX < 33 • Low surgical risk	Same as above
65.	• Left main; SYNTAX ≥ 33 • High or intermediate surgical risk	Same as above
66.	• Left main; SYNTAX ≥ 33 • Low surgical risk	Same as above

*__High gradient, severe AS__ = V_{max} ≥4 m/sec or mean gradient ≥40 mmHg, usually accompanied by AVA ≤1.0 cm^2 (or indexed AVA ≤0.6 cm^2/m^2).

Table 5: Severe Symptomatic AS and Other Valve or Ascending Aortic Pathology

Appropriate Use Score (1-9)							
Indication		**BAV as bridge to decision**	**TAVR alone**	**TAVR + PBMV**	**TAVR + MitraClip™**	**SAVR alone**	**SAVR + other valve or ascending aortic surgery or myectomy**
Symptomatic AS and Mitral Valve Disease							
67.	• Severe symptomatic AS • Severe primary MR • High surgical risk	See Tables 9, 10, and 17 (Summary of Recommendations for Chronic Primary MR) of AHA/ACC Valvular Heart Disease Guidelines (2014) Table 17: Summary of Recommendations for Chronic Primary MR Concomitant mitral valve repair or replacement is indicated in patients with chronic severe primary MR undergoing cardiac surgery for other indications Transcatheter MV repair may be considered for severely symptomatic patients (NYHA class III/IV) with chronic severe primary MR (stage D) who have a reasonable life expectancy but a prohibitive surgical risk because of severe comorbidities					
68.	• Severe symptomatic AS • Severe primary MR • Intermediate surgical risk	Same as above					
69.	• Severe symptomatic AS • Severe primary MR • Low surgical risk	Same as above					
70.	• Severe symptomatic AS • Severe secondary MR • High surgical risk	See Tables 9, 10, and 18 (Summary of Recommendations for Chronic Severe Secondary MR) of AHA/ACC Valvular Heart Disease Guidelines (2014) Table 18: Summary of Recommendations for Chronic Severe Secondary MR MV surgery is reasonable for patients with chronic severe secondary MR (stages C and D) who are undergoing CABG or AVR MV repair may be considered for patients with chronic moderate secondary MR (stage B) who are undergoing other cardiac surgery					
71.	• Severe symptomatic AS • Severe secondary MR • Intermediate surgical risk	Same as above					

72.	• Severe symptomatic AS • Severe secondary MR • Low surgical risk	Same as above
73.	• Severe symptomatic AS • Severe rheumatic MS (no absolute contraindications to mitral balloon valvuloplasty) • High surgical risk	See Tables 9, 10, and 14 (Summary of Recommendations for MS Intervention) of AHA/ACC Valvular Heart Disease Guidelines (2014) Table 14: Summary of Recommendations for MS Intervention Concomitant mitral valve surgery is indicated for patients with severe MS (MVA ≤1.5 cm2, stage C or D) undergoing other cardiac surgery PMBV is recommended for symptomatic patients with severe MS (MVA ≤1.5 cm2, stage D) and favorable valve morphology in the absence of contraindications PMBV may be considered for severely symptomatic patients (NYHA class III/IV) with severe MS (MVA ≤1.5 cm2, stage D) who have suboptimal valve anatomy and are not candidates for surgery or at high risk for surgery Mitral valve surgery is reasonable for severely symptomatic patients (NYHA class III/IV) with severe MS (MVA ≤1.5 cm2, stage D), provided there are other operative indications
74.	• Severe symptomatic AS • Severe calcific MS or severe rheumatic MS (with absolute contraindications to mitral balloon valvuloplasty) with extensive mitral annular calcification • High surgical risk	Same as above
Symptomatic AS and Tricuspid Valve Disease		
75.	• Severe symptomatic AS • Severe secondary TR • Dilated right ventricle and/or tricuspid valve annulus ≥ 40mm • Minimal to no right ventricular dysfunction • Minimal pulmonary hypertension • Intermediate surgical risk	See Tables 9 and 10 of AHA/ACC Valvular Heart Disease Guidelines (2014) Also from Valvular Heart Disease Guidelines (8.2.3.): Tricuspid valve surgery is recommended for patients with severe TR (stages C and D) undergoing left-sided valve surgery. (Class 1, Level of Evidence: C)

76.	• Severe symptomatic AS • Severe secondary TR • Dilated right ventricle and/or tricuspid valve annulus ≥ 40mm • Moderate to severe right ventricular dysfunction • Minimal pulmonary hypertension • Intermediate surgical risk	Same as above
77.	• Severe symptomatic AS • Severe secondary TR • Dilated right ventricle and/or tricuspid valve annulus ≥ 40mm • Moderate to severe right ventricular dysfunction • Severe pulmonary hypertension • High surgical risk	Same as above
Symptomatic AS, Bicuspid Aortic Valve, and Ascending Aorta		
78.	• Severe symptomatic AS • Bicuspid aortic valve • High surgical risk • Ascending aorta < 4.5cm	Hiratzka LF, Creager MA, Isselbacher EM, et al. Surgery for Aortic Dilatation in Patients With Bicuspid Aortic Valves: A Statement of Clarification From the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. J Am Coll Cardiol. 2016; 67:724-31. Jilaihawi H, Chen M, Webb J, et al. A Bicuspid Aortic Valve Imaging Classification for the TAVR Era. JACC Cardiovasc Imaging. 2016.
79.	• Severe symptomatic AS • Bicuspid aortic valve • High surgical risk • Ascending aorta ≥ 4.5cm	Same as above
80.	• Severe symptomatic AS • Bicuspid aortic valve • Intermediate surgical risk • Ascending aorta < 4.5cm	Same as above
81.	• Severe symptomatic AS • Bicuspid aortic valve • Intermediate surgical risk • Ascending aorta ≥ 4.5cm	Same as above

82.	• Severe symptomatic AS • Bicuspid aortic valve • Low surgical risk • Ascending aorta < 4.5cm	Same as above
83.	• Severe symptomatic AS • Bicuspid aortic valve • Low surgical risk • Ascending aorta ≥ 4.5cm	Same as above
Symptomatic AS and Basal Septal Hypertrophy, Flow Acceleration, and Narrowed LVOT		
84.	• Symptomatic severe AS • Prominent basal septal hypertrophy with flow acceleration and narrowing in the LVOT • High or intermediate surgical risk	See Tables 9 and 10 of AHA/ACC Valvular Heart Disease Guidelines (2014)
85.	• Symptomatic severe AS • Prominent basal septal hypertrophy with flow acceleration and narrowing in the LVOT • Low surgical risk	Same as above

Table 6: Non-Cardiac Surgery

Appropriate Use Score (1-9)				
Indication		**No Intervention**	**BAV**	**AVR (TAVR or SAVR)**
86.	• Symptomatic severe/critical AS • Elective major surgery • Non obstructive CAD	See Tables 9 and 10 of AHA/ACC Valvular Heart Disease Guidelines (2014)		
87.	• Symptomatic severe/critical AS • Urgent major surgery • Non obstructive CAD	Same as above		
88.	• Asymptomatic severe/critical AS • Elective major surgery • Non obstructive CAD • No signs of cardiac decompensation	Same as above		
89.	• Asymptomatic severe/critical AS • Urgent major surgery • Non obstructive CAD • No signs of cardiac decompensation	Same as above		

Table 7: Failing Aortic Valve Bioprosthesis

Appropriate Use Score (1-9)				
Indication		**BAV**	**TAVR**	**SAVR**
90.	• Severe symptomatic AS or AR • Degenerative surgical bioprosthesis – size ≥23mm • High surgical risk	See Table 10 of AHA/ACC Valvular Heart Disease Guidelines (2014)		
91.	• Severe symptomatic AS or AR • Degenerative surgical bioprosthesis – size ≥23mm • Intermediate surgical risk	Same as above		
92.	• Severe symptomatic AS or AR • Degenerative surgical bioprosthesis – size 21 mm • High surgical risk	Same as above		
93.	• Severe symptomatic AS or AR • Degenerative surgical bioprosthesis – size 21 mm • Intermediate surgical risk	Same as above		
94.	• Severe symptomatic AS or AR • Degenerative surgical bioprosthesis – size ≤19 mm • High surgical risk	Same as above		
95.	• Severe symptomatic AS or AR • Degenerative surgical bioprosthesis – size ≤19 mm • Intermediate surgical risk	Same as above		

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