



Understanding medical management of aortic stenosis

How to manage your AS patients who aren't eligible for surgery.

By Kelly Haight, MSN, APRN, ACNS-BC, PCCN

AORTIC STENOSIS (AS), which affects 2% to 3% of the U.S. population, is the most common type of valvular heart disease. Some patients can be successfully treated with surgery, while others may refuse surgery or are at high surgical risk. Although it can't prevent or delay the progression of AS, effective medical treatment and excellent nursing care that focus on managing symptoms and comorbid conditions, as well as minimizing exacerbations and optimizing cardiac function, can improve a patient's quality of life.

AS defined

The heart has four valves that direct blood from the atria to the ventricles and out into the lung vessels and the body. The aortic valve separates the left ventricle from the aorta; in most patients, this valve consists of three leaflets (tricuspid) that open and close

smoothly and completely in response to pressure changes during systole and diastole. When the aortic valve is stenosed, it forces the left ventricle to work harder to overcome both diastolic pressure and pressure caused by the stenosis. Increased contraction strength is a compensatory mechanism used to maintain stroke volume and cardiac output. (See *Healthy vs. unhealthy aortic valve.*)

Over time, the increased resistance leads to muscle thickening, or dilation, and left ventricular failure. The result of muscle thickening is decreased muscle elasticity, capacity, and coronary artery blood flow and increased myocardial workload and oxygen use. Dilation reduces the strength of muscle contractions, which results in less blood ejected with each beat, causing pressure to build in the atrium. The increased pressure in the pulmonary vascular system

along with left atrial dilation leads to right-sided heart failure (HF). (See *The impact of aortic stenosis.*)

Causes

Calcium deposits within the valve leaflets, the most common cause of AS, lead to bulging and restriction of leaflet motion. Because calcification of the valve is more common in the elderly, AS was originally thought to be a degenerative disease. However, it's now believed to be caused by an inflammatory process, similar to the progression of atherosclerosis. In addition, history of rheumatic fever and a congenital bicuspid valve can also lead to AS. (See *Bicuspid burden.*)

Clinical presentation

AS ranges from mild (Stage A) to very severe (Stage D). (See *Aortic stenosis staging and surgical intervention.*) In many patients, the symptoms caused by compensatory

Healthy vs. unhealthy aortic valve

changes in the heart aren't apparent until the disease has progressed to a severe state. For example, initial symptoms, such as exercise intolerance, may be overlooked or attributed to other causes. The classic clinical AS symptoms are:

- angina, brought on by exertion and relieved with rest, caused by increased oxygen demand and reduced coronary blood flow from the hypertrophied left ventricle.
- syncope with exertion caused by systemic vasodilation that leads to a drop in blood pressure and a decrease in cerebral perfusion.
- dyspnea with exertion caused by pulmonary congestion, leading to HF symptoms such as orthopnea.

Diagnosis and evaluation

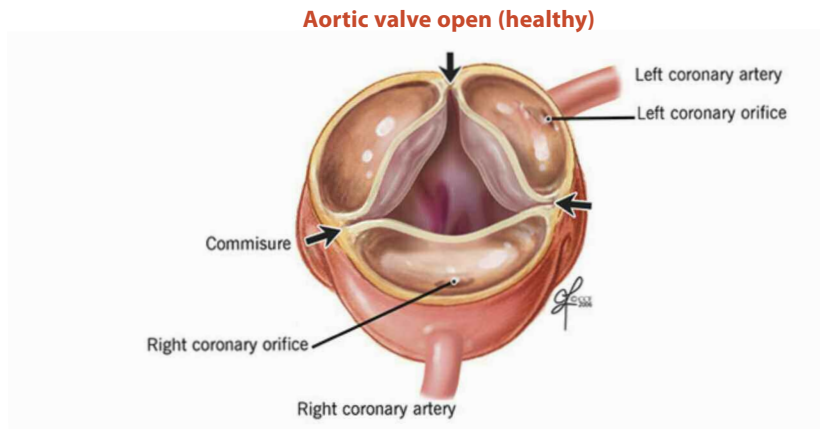
In addition to a thorough history, physical examination, and evaluation for surgical risk, several tools can aid in diagnosis and evaluation.

Transthoracic echocardiogram, the gold standard for both diagnosing and assessing AS severity, evaluates structure, function, and chamber size by measuring ejection fraction and pulmonary pressures, as well as determining the presence of stenosis and regurgitation.

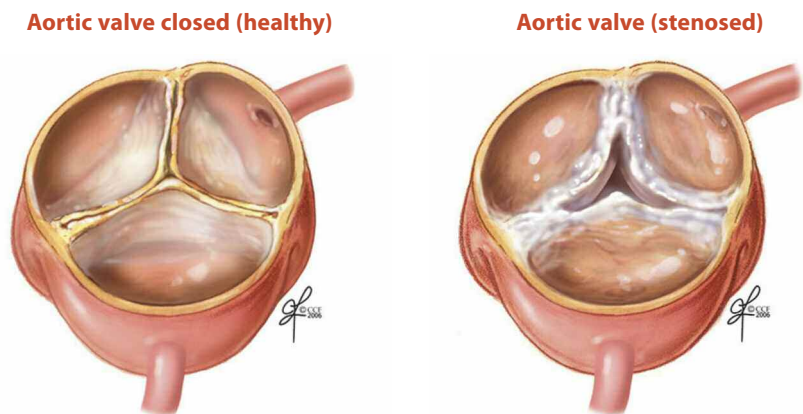
Other diagnostic tools include:

- transesophageal echocardiogram and 3D echocardiogram for more precise images
- chest x-rays to identify heart size, alterations in pulmonary circulation, and valvular calcification
- 12-lead electrocardiogram to evaluate arrhythmias, ventricular hypertrophy, and ischemia
- cardiac catheterization to determine pressures and differences within and across chambers and valves as well as valve opening sizes.
- biomarkers (such as B-type natriuretic peptide, a hormone released from the left ventricle in response to increased pressure) to evaluate severity, reflected as HF.

As a healthy tricuspid aortic valve opens during systole, blood is pushed through the valve into the aorta. Closure of the valve inhibits blood from flowing back into the ventricle.



The narrowing of the aortic valve through stenosis, caused by fusion, fibrosis, or calcification of leaflet edges, inhibits leaflet movement and subsequent forward flow of blood.



Reprinted with permission, Cleveland Clinic Center for Medical Art & Photography ©2006-2016. All Rights Reserved.

Surgical management

Aortic valve replacement (AVR), which requires cardiopulmonary bypass to repair or replace the valve, is the gold standard for symptomatic AS. But some patients aren't good candidates for surgery because of comorbidities or high surgical risk based on frailty and major organ disease. Chest malformation or excessive calcifications of the ascending aorta also may prohibit surgical intervention.

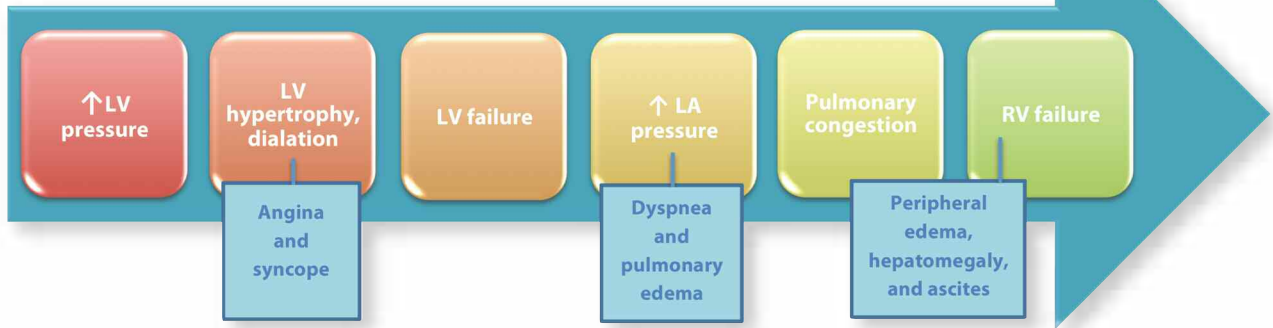
Patients with intermediate or high surgical risk may have the option of transcatheter AVR or implantation (TAVR/I). During TAVR/I, common approaches in-

clude catheter insertion through the femoral artery, through a small incision in the apex of the heart (transapical approach), or through the ascending aorta (transaortic). A prosthetic valve is placed over the native diseased valve, which is pressed aside by the expanded prosthetic valve.

TAVR/I has been shown to improve survival and reduce hospitalizations in patients with severe symptomatic AS. Complications include leakage around the newly placed valve and damage to the conduction system, requiring a permanent pacemaker. To ensure optimal treatment, patients with

The impact of aortic stenosis

By obstructing blood flow from the heart into the aorta and then into the rest of the body, aortic stenosis results in a cascade of consequences that may eventually lead to heart failure.



LV = left ventricular, LA = left atrial, RV = right ventricular

Cary T, Pearce J. Aortic stenosis: Pathophysiology, diagnosis, and medical management of nonsurgical patients. *Crit Care Nurse*. 2013;33(2):58-72.
Nishimura RA, Otto CM, Bonow RO, et al; ACC/AHA Task Force Members. 2014 AHA/ACC guideline for the management of patients with valvular heart disease: Executive summary: A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation*. 2014;129(23):2440-92.

severe AS should be evaluated by a multidisciplinary heart valve team that includes cardiologists, cardiac surgeons, interventional cardiologists, imaging experts, anesthesiologists, and other specialists such as nurse coordinators, advanced practice nurses, physical therapists, and clinical researchers.

Medical management

When patients aren't eligible for surgery or TAVR/I, or refuse these procedures, clinicians must turn to medical management. Unfortunately, prognosis for medically managed patients with severe AS is poor, with a life expectancy of 2 to 5 years.

Medical management can be divided into two categories, depending on the presence of symptoms.

Asymptomatic patients

For patients diagnosed while still asymptomatic and in Stages A-C, focus treatment on disease monitoring, including routine follow-up appointments, echocardiographic monitoring, and modifying cardiovascular risk factors such as smoking, diabetes, obesity, hyperlipidemia, and hypertension. Encourage patients to remain ac-

Bicuspid burden

Patients born with a bicuspid aortic valve have two leaflets instead of the typical three-leaflet anatomy. Two leaflets must bear the burden of left ventricular blood flow, which is believed to contribute to wear-and-tear changes in the valve.



Reprinted with permission, Cleveland Clinic Center for Medical Art & Photography ©2006-2016. All Rights Reserved.

tive and exercise regularly and to take medications as prescribed for comorbid conditions.

If your asymptomatic patient has hypertension, common in those with AS, treatment should follow evidence-based guidelines. Angiotensin-converting enzyme (ACE) inhibitors, beta blockers, calcium channel blockers, or thiazide-type diuretics may be pre-

scribed. To avoid hypotensive episodes that can cause symptoms, such as dizziness or lightheadedness, and worsen the patient's condition, antihypertensive medications should be started at low doses and titrated with care.

Symptomatic patients

For symptomatic AS, medical management is complex and will depend on severity of symptoms. In addition to risk factor modification, care should focus on maximizing cardiac function and minimizing symptoms and complications, including angina, syncope, and HF.

Treatment options to relieve your patient's angina may include careful use of beta blockers and nitrates to reduce myocardial oxygen consumption and dilate the coronary arteries. Symptoms of angina may resolve with cautious use of low-dose nitroglycerine (for example, 0.3 mg sublingual tablets), as prescribed. If related to activity, physical restrictions may be necessary, with planned periods of rest to reduce oxygen consumption and conserve energy.

Syncope may require an antiarrhythmic medication, pacemaker, or internal cardiac defibrillator. If

Aortic stenosis staging and surgical intervention

Stage	Valve anatomy	Symptoms	Intervention	Qualifying criteria
A—At risk	Bicuspid valve or presence of sclerosis	None	Manage comorbid conditions to limit effects of risk factors and make lifestyle changes, such as smoking cessation, to prevent cardiovascular disease	N/A
B—Progressive aortic stenosis (AS)	Mild/moderate leaflet calcification, bicuspid or rheumatic valve with changes	None	Aortic valve replacement (AVR). Diseased valve is replaced with prosthetic valve over native annulus	Valve changes Undergoing other cardiac surgery
C—Asymptomatic severe AS	Severely reduced leaflet opening due to calcification or congenital stenosis	None Exercise intolerance	AVR	Low surgical risk with rapid disease progression Left ventricle ejection fraction <50% Undergoing other cardiac surgery
D—Symptomatic severe AS	Severely reduced leaflet opening or motion due to calcification or congenital stenosis	Exertional dyspnea Decreased exercise tolerance Angina Syncope Heart failure	AVR Balloon aortic valvuloplasty Percutaneous catheter inserted in femoral artery. Balloon inflated multiple times over stenosed lesion, forcing valve open and improving leaflet mobility. Recommended as a bridge to AVR in unstable patients or as a palliative measure in patients with high symptom burden and inability to perform AVR or TAVR/I TAVR/I. Using transcatheter, transapical, or transaortic approach, valve inside stent is placed across diseased valve	Symptomatic severe AS with adequate surgical risk Undergoing other cardiac surgery Palliative care to reduce symptoms Bridge to AVR or transcatheter AVR or implantation (TARV/I) in critically ill patients Meet indication for AVR with intermediate or high surgical risk with post TAVR/I expected survival >12 months

Cary T, Pearce J. Aortic stenosis: Pathophysiology, diagnosis, and medical management of nonsurgical patients. *Crit Care Nurse*. 2013;33(2):58-72.
 Nishimura RA, Otto CM, Bonow RO, et al; ACC/AHA Task Force Members. 2014 AHA/ACC guideline for the management of patients with valvular heart disease: Executive summary: A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation*. 2014;129(23):2440-92.

syncope is related to an arrhythmia, such as new-onset atrial fibrillation, cardioversion may be required. If the event is related to exertion, advise the patient to minimize stressful activities.

Symptoms of HF, such as pulmonary congestion, should be

treated with diuretics or positive inotropes such as digoxin. However, be careful to avoid aggressive reduction of preload, which can lead to insufficient cardiac output and hemodynamic compromise. Because patients with HF are at high risk for decompensation,

which can lead to critical instability, help them maintain a healthy fluid and electrolyte balance.

Critically ill patients with decompensated HF may require I.V. medications such as nitroprusside, invasive hemodynamic monitoring, and assistive devices such as an intra-

aortic balloon pump to improve cardiac output. ACE inhibitors or angiotensin receptor blockers may be used to manage hypertension; however, be careful to avoid hypotension. Low blood pressure can affect the heart's pumping ability.

Nursing considerations

When caring for patients with AS, you'll need to tailor your care to meet individual needs. Incorporate these considerations into your care plan:

- **Hemodynamic instability**—Evaluate your patient for shortness of breath, angina, hypoxia, and changes in blood pressure, pulmonary artery pressure, and heart rate or rhythm.
- **Cardiac assessment**—Note the presence of a strong apical beat, weak or delayed carotid pulse, displacement of the apex of the heart inferiorly and laterally, presence of an ejection click,

Effective medical treatment and excellent nursing care that focus on managing symptoms and comorbid conditions, as well as minimizing exacerbations and optimizing cardiac function, can improve a patient's quality of life.

or a low-pitched harsh, systolic murmur that radiates to the neck.

- **Oxygen therapy**—Monitor your patient's oxygen saturation via pulse oximetry, arterial blood gases, and mixed venous oxygen saturation.
- **Fluid status**—Assess your patient

for the presence of pulmonary congestion and peripheral edema, avoid extended periods of nothing by mouth before tests or procedures so your patient doesn't become dehydrated, and check fluid volume status via daily weights and by monitoring intake and output.

- **Thromboembolic events**—Monitor your patient with atrial fibrillation or severely compromised left ventricular function for therapeutic anticoagulation. Anticoagulation therapy will be lifelong for patients after a mechanical valve replacement. Pneumatic sleeves should be used to avoid deep vein thrombosis during hospitalization.

The overall goals of care should focus on maintaining vital signs within ordered parameters, balancing rest and activity, and keeping fluid status within appropriate ranges. Talk with your patient and

FREE • LIVE • INTERACTIVE

HOW TO THRIVE IN YOUR
FIRST YEAR AS AN RN
2017 | ANA WEBINAR SERIES

nursingworld.org/NewRNsWebinars



HOW TO BOUNCE BACK AFTER CHALLENGES AT THE BEDSIDE | APRIL 26, 2017
12 NOON, ET

his or her family about prescribed medications and the importance of taking them as ordered, and explain the rationale behind the medication, as well as its dosage, timing, and side effects. Discuss how to monitor for new or worsening symptoms, and clarify what should be reported to the healthcare provider.

Work with your patient to develop self-management strategies by providing education about sodium and fluid restrictions, a heart-healthy diet, and other lifestyle changes, such as weight loss and smoking cessation. To help prevent falls, instruct your patient to change positions slowly (lying to sitting or standing) to minimize orthostatic blood pressure changes.

Patients with advanced AS may experience anxiety and depression. Teach relaxation techniques such as deep breathing or guided imagery that the patient can use to deal with uncomfortable or stressful symptoms.

Patients with symptomatic severe AS who refuse AVR or TAVR/I or for whom these procedures would be futile may benefit from palliative therapy. Therapies range from nonpharmacologic options, such as Reiki, art, music, or animal-assisted therapy, to medical therapies that relieve symptoms of fatigue, dyspnea, angina, nausea, and palliative procedures, such as a percutaneous balloon valvuloplasty. The goal is to relieve the burden of symptoms to improve the patient's quality of life.

Managing the challenge

Patients with AS who are not eligible for or are unwilling to undergo AVR or TAVR/I can be challenging to manage, and, unfortunately, medical management doesn't cure or delay progression of the disease. Focus your care on optimizing cardiac function, preventing exacerbations, minimizing compli-

cations, and managing comorbid conditions. ★

Kelly Haight is a clinical nurse specialist at the Cleveland Clinic in Cleveland, Ohio.

Selected references

Aronow WS. A review of the pathophysiology, diagnosis, and treatment of aortic valve stenosis in elderly patients. *Hosp Pract.* 2013;41(4):66-77.

Bonow RO, Leon MB, Doshi D, et al. Management strategies and future challenges for aortic valve disease. *Lancet.* 2016;387(10025):1312-23.

Cary T, Pearce J. Aortic stenosis: Pathophysiology, diagnosis, and medical management of nonsurgical patients. *Crit Care Nurse.* 2013;33(2):58-72.

Nishimura RA, Otto CM, Bonow RO, et al; ACC/AHA Task Force Members. 2014 AHA/ACC guideline for the management of patients with valvular heart disease: Executive summary: A report of the American College of Cardiology/American Heart Association Task Force on Practice *Guidelines.* *Circulation.* 2014;129(23):2440-92.

Rashedi N, Otto CM. Aortic stenosis: Changing disease concepts. *J Cardiovasc Ultrasound.* 2015;23(2):59-69.

A Nursing Degree For Those Who Expect More

American Public University understands today's nursing environment. Accredited by the Commission on Collegiate Nursing Education (CCNE), the RN to BSN program helps you balance your busy schedule with respected, affordable nursing education that's 100% online.

Learn from a nationally recognized leader in online education.

Get started today at StudyatAPU.com/AN-BSN



We want you to make an informed decision about the university that's right for you. For more about our graduation rates, the median debt of students who completed each program, and other important information, visit www.apu.edu/disclosure.

The baccalaureate degree in nursing at American Public University System is accredited by the Commission on Collegiate Nursing Education, One DuPont Circle, NW, Suite 530, Washington, DC 20036, 202-687-6791.