- 1976 to 1983; impact of preoperative left ventricular function. *Circulation*. 1985; 72:1244-56.
13. Boodhwani M, de Kerchove L, Glineur D, Poncelet A, Rubay J, Astarci P, et al. Repair-oriented classification of aortic insufficiency: impact on surgical techniques and clinical outcomes. *J Thorac Cardiovasc Surg*. 2009;137:286-94.
 14. de Kerchove L, Boodhwani M, Glineur D, Vandyck M, Vanoverschelde JL, Noirhomme P, et al. Valve sparing-root replacement with the reimplantation technique to increase the durability of bicuspid aortic valve repair. *J Thorac Cardiovasc Surg*. 2011;142:1430-8.
 15. de Meester C, Pasquet A, Gerber BL, Vancraeynest D, Noirhomme P, El Khoury G, et al. Valve repair improves the outcome of surgery for chronic severe aortic regurgitation: a propensity score analysis. *J Thorac Cardiovasc Surg*. 2014;148:1913-20.
 16. Sharma V, Suri RM, Dearani JA, Burkhart HM, Park SJ, Joyce LD, et al. Expanding relevance of aortic valve repair—is earlier operation indicated? *J Thorac Cardiovasc Surg*. 2014;147:100-7.
 17. Zoghbi WA, Enriquez-Sarano M, Foster E, Grayburn PA, Kraft CD, Levine RA, et al. Recommendations for evaluation of the severity of native valvular regurgitation with two-dimensional and Doppler echocardiography. *J Am Soc Echocardiogr*. 2003;16:777-802.
 18. le Polain de Waroux JB, Pouleur AC, Goffinet C, Vancraeynest D, Van Dyck M, Robert A, et al. Functional anatomy of aortic regurgitation: accuracy, prediction of surgical reparability, and outcome implications of transesophageal echocardiography. *Circulation*. 2007;116:1264-9.
 19. Austin PC. Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples. *Stat Med*. 2009;28:3083-107.
 20. Hernán MA, Brumback B, Robins JM. Marginal structural models to estimate the joint causal effect of non randomized treatments. *J Am Stat Assoc*. 2001;96:440-8.
 21. Robins JM, Hernán MA, Brumback B. Marginal structural models and causal inference in epidemiology. *Epidemiology*. 2000;11:550-60.
 22. Detaint D, Messika-Zeitoun D, Maalouf J, Tribouilloy C, Mahoney DW, Tajik AJ, et al. Quantitative echocardiographic determinants of clinical outcome in asymptomatic patients with aortic regurgitation: a prospective study. *JACC Cardiovasc Imaging*. 2008;1:1-11.
 23. Montant P, Chenot F, Robert A, Vancraeynest D, Pasquet A, Gerber BL, et al. Long-term survival in asymptomatic patients with severe degenerative mitral regurgitation. A propensity score based comparison between an “early surgical” and a “conservative” treatment approach. *J Thorac Cardiovasc Surg*. 2009;138:1339-48.
 24. Enriquez-Sarano M, Avierinos JF, Messika-Zeitoun D, Detaint D, Capps M, Nkomo V, et al. Quantitative determinants of the outcome of asymptomatic mitral regurgitation. *N Engl J Med*. 2005;352:875-83.

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EDITORIAL COMMENTARY

Gospel of the guidelines

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Consensus statements are the modern method of summarizing best-evidence guidelines in the practice of medicine. They are a framework that synthesizes the existing literature into bullet points of *do's* and *don'ts* that are based on specific levels of evidence. One perspective is that clinical practice guidelines are a set of rules to follow, and that these rules maintain order in the management of common diseases. After all, medicine is a science, and as such, certain methods and treatments have been validated (or disproved) through observational studies and clinical trials. The committees tasked with creating guidelines comb through the literature and put together a summation based on critical and exhaustive review of primary data, and their conclusions can be far-reaching in the practice of medicine.

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Central Message

In the era of evidence-based medicine, there remains a need for research and innovation, even in areas where guidelines exist.

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A different perspective is that guidelines fail to capture nuances of individual cases, leaving the practitioner to decide how to balance patient-specific needs with population-based solutions. Finally, guidelines can stifle creativity and innovation, and for surgeons in particular,

who find as much value in the art of medicine as they do in the science, this can be challenging.

Let's focus on the specific area of asymptomatic chronic severe aortic insufficiency. There are numerous pathologies that can result in chronic severe aortic insufficiency, including congenital disorders of the valve cusps (for example, bicuspid aortic valve disease), acquired processes (rheumatic or inflammatory valvular disease or healed endocarditis), or primary disorders of the aorta that result in annuloaortic ectasia, aortic root enlargement, or expansion of the sinotubular junction. Asymptomatic chronic severe aortic insufficiency results in left ventricular volume overload, but unlike asymptomatic severe mitral regurgitation, the natural history can be quite indolent. The 2014 Guidelines of the American Heart Association (AHA) and the American College of Cardiology (ACC)¹ recommend aortic valve replacement (AVR) for asymptomatic chronic severe aortic insufficiency when left ventricular systolic dysfunction is present (left ventricular ejection fraction <50% at rest with no other cause for systolic dysfunction, class I recommendation, level of evidence B) or left ventricular dilatation is present (left ventricular end-systolic dimension >50 mm or indexed left ventricular end-systolic dimension >25 mm/m², class IIa, level of evidence B; or left ventricular end-diastolic diameter >65 mm, class IIb, level of evidence C). Serial echocardiographic imaging is recommended (class D) for patients with asymptomatic severe aortic insufficiency who do not meet the criteria for AVR. In addition, the development of symptoms in patients with chronic aortic insufficiency, regardless of left ventricular systolic function or dimensions, is a class I indication for AVR.

Recently, aortic valve repair has been described as an alternative to AVR for the treatment of chronic aortic insufficiency. The term "aortic valve repair" encompasses a wide array of techniques designed to address disparate pathologies. These include valve-sparing aortic root replacement for aortic insufficiency associated with aortic root aneurysms, subcommissural annuloplasty for annular dilation, and a myriad of leaflet resection, plication, and reconstruction techniques. Advocates for aortic valve repair tout the avoidance of certain adverse events common to prosthetic aortic valves, such as patient-prosthesis mismatch, risk of endocarditis and thromboembolism, need for anticoagulation, and structural valve degeneration. The Mayo group² recently reported their experience with 311 aortic valve repairs in the course of 25 years for symptomatic aortic insufficiency; their operative mortality was 0.6%, and their late survival was comparable to that of an age- and sex-matched population. The risks of aortic valve reoperation were 10% at 5 years and 21% at 10 years. Vohra and colleagues³ reported similar outcomes in their series of 274 aortic valve repairs in the course of 14 years for severe aortic insufficiency. Their operative mortality was 0%, and there was a trend toward improved 10-year

survival among the patients who underwent surgery without symptoms versus those who had symptoms (100% vs 77%; $P = .1$). Freedom from aortic valve reintervention at 10 years was 82% in the asymptomatic group and 89% in the symptomatic group. Extrapolating from these data, some have advocated for earlier intervention for aortic valve insufficiency with aortic valve repair.

With respect to surgical techniques for treatment of aortic insufficiency, the AHA and ACC guidelines state that most patients who require surgery for chronic severe aortic insufficiency will require AVR. The guideline authors acknowledge that valve-sparing root replacement is an option for patients with aortic insufficiency caused by aortic dilation with a trileaflet or bicuspid valve that is not thickened, deformed, or calcified. With respect to aortic valve repair, they state, "Despite advances in primary aortic valve repair, especially in young patients with bicuspid aortic valves, the experience at a few specialized centers has not yet been replicated at the general community level, and durability of aortic valve repair remains a major concern. Performance of aortic valve repair should be concentrated in those centers with proven expertise in the procedure."¹

In this issue of *The Journal of Thoracic and Cardiovascular Surgery*, de Meester and colleagues⁴ present an observational study with a design that challenges the guideline-driven algorithm for treatment of asymptomatic chronic aortic insufficiency in 2 ways: first, aortic valve repair is the preferred surgical treatment in this study, and second, surgery is offered to patients both with and without symptoms. In this study, de Meester and colleagues⁴ retrospectively compared outcomes of 160 consecutive patients with asymptomatic severe aortic insufficiency treated either with early surgical intervention or with watchful waiting. Patients in the watchful waiting group were only offered aortic valve surgery when guideline-driven indications developed (symptoms, left ventricular systolic dysfunction, or progressive left ventricular dilatation). They found that late survival was similar between the groups (10-year survival of 91% and 89% in the early surgery and watchful waiting groups, respectively) and that only age and male sex (not timing of surgery) were predictors of survival in multivariate analysis. In a subgroup analysis, de Meester and colleagues⁴ found that patients in the watchful waiting group with poor follow-up had worse survival than did those with regular follow-up with a cardiologist (10-year survival of 79% vs 95%; $P = .045$). This study fills an important gap in the existing literature that was highlighted in the 2014 AHA and ACC guidelines. Specifically, in the hands of an experienced center, early aortic valve repair in asymptomatic patients with severe aortic regurgitation does not improve late survival. Unless other downstream benefits can be identified, early intervention should thus be avoided.

Have we identified the optimal triggers for intervention for chronic aortic insufficiency? The answer is probably no, and that newer technology and diagnostic studies will better discriminate between those patients who can benefit from intervention and those who will not. Tissue Doppler imaging, speckle tracking, exercise testing, and systemic biomarkers may aid in this process, and more research is needed to determine their values in the clinical management of aortic regurgitation.

References

1. Nishimura RA, Otto CM, Bonnow RO, Carabello BA, Erwin JP III, Guyton RA, et al. American College of Cardiology; American College of Cardiology/American Heart Association; American Heart Association. 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 Thorac Cardiovasc Surg.* 2014;148:e1-132. Erratum in: *J Thorac Cardiovasc Surg.* 2014;64:1763.
2. Sharma V, Suri RM, Dearani JA, Burkhart HM, Park SJ, Joyce LD, et al. Expanding relevance of aortic valve repair—is earlier operation indicated? *J Thorac Cardiovasc Surg.* 2014;147:100-7.
3. Vohra HA, DeKerchove L, Whistance RN, Glineur D, Noirhomme P, El Khoury G. Effect of preoperative symptoms on outcomes after valve repair for degenerative aortic insufficiency. *Eur J Cardiothorac Surg.* 2014;45:739-45.
4. de Meester C, Gerber BL, Vancraeynest D, Pouleur A, Noirhomme P, Pasquet A, et al. Early surgical intervention versus watchful waiting and outcomes for asymptomatic severe aortic regurgitation. *J Thorac Cardiovasc Surg.* 2015;150:1100-8.