

Cost-effectiveness Should Go Together

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Sztejfmán et al. present in this issue of the Argentine Journal of Cardiology (1) the experience of an evaluation program in candidates for a new technology: transcatheter aortic valve implantation, (TAVI). Their work describes the procedure and administrative difficulties for the application of the technique in clinical practice.

The introduction of new diagnostic and therapeutic technologies is one of the most important factors of health cost increase. It is for this reason that this incorporation cannot be based solely on effectiveness criteria, but is obliged to take into account the costs involved. Although this has always been the case, this aspect has now acquired radical importance as the steady increase in health care costs has not been accompanied by a parallel increase in resources, forcing funders, both public and private, to make difficult decisions on how to allocate the always scarce available resources. In the following lines we will analyze these two aspects: cost and effectiveness.

EFFECTIVENESS

The PARTNER study compares TAVI with standard treatment in inoperable patients (PARTNER B) (2) and TAVI with aortic valve replacement (AVR) in patients at high surgical risk (PARTNER A). (3) The valve used in these studies was Sapien® (Edwards). The PARTNER B study demonstrates that TAVI reduces patient mortality by 50% at 3 years, improving life quality compared to standard treatment. The PARTNER A study shows that there is no difference in mortality between patients treated with TAVI and those submitted to AVR and that life quality is better with percutaneous treatment than with AVR, although this difference disappears after one year. Following these results, TAVI stands as the treatment of choice for patients with inoperable symptomatic severe aortic stenosis and as an alternative to surgery in high risk patients, having been approved for these cases by various regulatory agencies worldwide. Regarding the most used valve in Argentina, the Core Valve® (Medtronic), various registries as UK TAVI,

(4) FRANCE 2 (5) and German TAVI (6) analyze its effectiveness. The procedural success rate is over 90% and mortality ranges from 4.5% to 9.7%, 20.2% to 24% and 26% at 30 days, 1 and 2 years, respectively. We await the results of randomized trials that assess this valve model. Thus, TAVI effectiveness is clear.

COSTS

It is necessary to know the increase in cost that TAVI will entail compared with the treatment used so far. Simply put, besides knowing how much the clinical outcome improves, we must also know how much the new treatment, in contrast to the standard one, costs. A simplistic analysis, by only comparing the prosthesis cost, in the case of TAVI, may give the wrong impression that leads to wrong decision-making, not exempt of negative consequences for the patients.

When costs and clinical effects of two therapeutic alternatives are related, four situations can result (7) (Figure 1). The new treatment is: 1) more effective and less costly (dominant position), 2) less effective and more costly (dominated position), 3) more effective and more costly, and 4) less effective and less costly. In the first two situations, decision-making is easy, as one alternative clearly dominates the other. However, in the following two, decision-making is problematic and will be determined by how much the financier is willing to pay for each additional unit of benefit gained or lost. This relationship between cost and benefit is expressed by the incremental cost-effectiveness ratio (ICER).

Cost-effectiveness studies measure the clinical effect of life years gained (LYG) as a unit, whereas, the cost-utility studies use quality adjusted life years (QALY) as a unit that assesses, not only the number of years of life gained but also their life quality. In both cases, the clinical effect is related to cost, expressed in currency units.

Finally, it remains to be established how much one is willing to pay for the clinical effect gained. According to some authors (8) the spectrum would cover from a very attractive situation, when the cost

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is less than \$20000 per LYG, to a completely unfavorable one when the cost is over \$100000 per LYG. Another approach is that adopted by Medicare in the United States, which sets the threshold derived from the cost of renal dialysis, at \$75000 per QALY gained (Figure 2). In the United Kingdom, the National Institute for Health and Clinical Excellence (NICE) has set the limit at £30000 per QALY gained. Finally, the World Health Organization proposes a different approach, where the threshold would be three times the country's per capita gross domestic product.

Several studies have addressed TAVI cost-effectiveness aspects. The PARTNER B study demon-

strates that TAVI increases life expectancy of inoperable patients over standard treatment, with an incremental cost of \$50200 per LYG and \$61900 per QALY gained. (9) The PARTNER A study shows an incremental overall cost of \$76877 per QALY gained at 12 months, but, surprisingly, the result greatly differs when the comparison is made according to the approach. Thus, with a femoral approach, TAVI was more effective and less costly (dominant position) than surgery in 55.7% of patients and in 70.9% it was less than \$50000/QALY gained. By contrast, with an apical approach, TAVI was more costly and less effective (dominated position) than surgery in 86.6% of

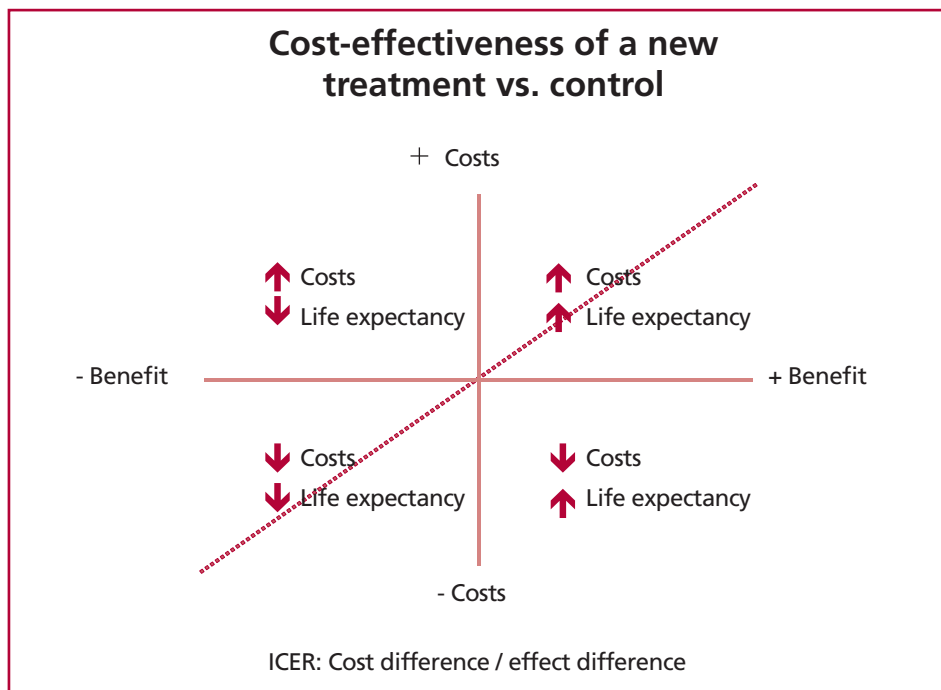


Fig. 1. Cost-effectiveness surface with its four quadrants.

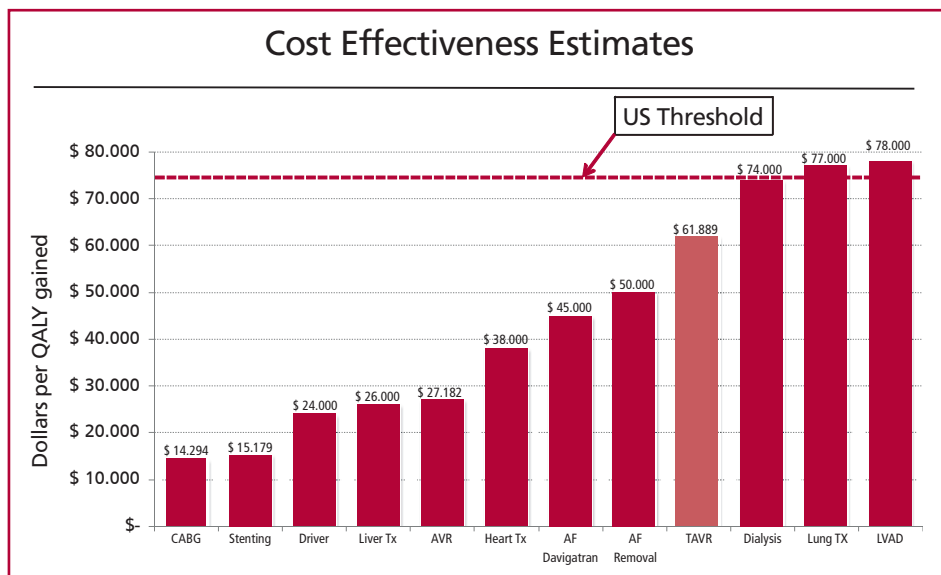


Fig. 2. CABG: Coronary Artery Bypass Grafting, Tx: Transplantation AVR: Aortic Valve Replacement, AF: Atrial Fibrillation, TAVR: Transcatheter Aortic Valve Replacement LVAD: Left Ventricular Assist Device

patients and only 7.1% of patients fell below \$50000/QALY gained. But not all analyzes agree. A study in Belgium (11) showed different results. In the group of inoperable patients, TAVI calculated an ICER of €44900 per QALY gained, while in the high risk group the ICER remained above €750000 per QALY gained. The authors conclude that it is inappropriate to consider TAVI expenses in high-risk surgical patients.

In conclusion, as evidenced by Szejfman et al., the introduction of a new therapeutic intervention, in this case TAVI, entails numerous difficulties. This is because the final decision is the result of a complex equation comprising several factors. If clinical effectiveness is one of them and of paramount importance, it cannot be considered in isolation nowadays, but must be related to the costs involved. A very important aspect to take into account is that the results of cost-effectiveness studies must be interpreted in the context in which they are made, i.e., for a specific indication and type of patient and, clearly, in a specific country. This explains the different degree of penetration of the same treatment in different countries.

Conflicts of interest

Dr. Cesar Morís declares:

That he receives fees in his capacity as Proctor for Medtronic CoreValve.

That he receives fees for his participation in the Medtronic Advisory Board for Latin America.

Drs. Del Valle and Avanzas declare no conflicts of interest.

REFERENCES

- Szejfman M, Szejfman C, Albertal M, Gómez Márquez R, Goldsmit A et al. Problems and Solutions in the Implementation of a Transcatheter Aortic Valve Implantation Program. *Rev Argent Cardiol* 2013;81: 14-19.
- Leon MB, Smith CR, Mack M, Miller DC, Moses JW, Svensson LG, et al, PARTNER Trial Investigators. Transcatheter aortic-valve implantation for aortic stenosis in patients who cannot undergo surgery. *N Engl J Med* 2010;363:1597-607. <http://doi.org/dvzg9k>
- Smith CR, Leon MB, Mack MJ, Miller DC, Moses JW, Svensson LG, et al, PARTNER Trial Investigators. Transcatheter versus Surgical Aortic-Valve Replacement in High-Risk Patients. *N Engl J Med* 2011;364:2187-98. <http://doi.org/c54zng>
- Ludman PF, On behalf of the UK TAVI Steering Group and the National Institute for Cardiovascular Outcomes Research. The UK transcatheter aortic valve implantation registry; one of the suite of registries hosted by the National Institute for Cardiovascular Outcomes Research (NICOR). *Heart* 2012;98:1787-9. <http://doi.org/j4x>
- Gilard M, Eltchaninoff H, Iung B, Donzeau-Gouge P, Chevrel K, Fajadet J, et al, FRANCE 2 Investigators. Registry of Transcatheter Aortic-Valve Implantation in High-Risk Patients. *N Engl J Med* 2012;366:1705-15. <http://doi.org/j4z>
- Abdel-Wahab M, Zahn R, Horack M, Gerckens U, Schuler G, Sievert H, et al, German transcatheter aortic valve interventions registry investigators. Aortic regurgitation after transcatheter aortic valve implantation: incidence and early outcome. Results from the German transcatheter aortic valve interventions registry. *Heart* 2011;97:899-906. <http://doi.org/cns2qn>
- Maniadakis N, Vardas P, Mantovani LG, Fattore G, Boriani G. Economic evaluation in cardiology. *Europace* 2011;13(Suppl 2):ii3-ii8. <http://doi.org/bgwkdp>
- Owens DK, Qaseem A, Chou R, Shekelle P; Clinical Guidelines Committee of the American College of Physicians. High-value cost-conscious health care: concepts for clinicians to evaluate the benefits, harms, and costs of medical interventions. *Ann Intern Med* 2011;154:174-180.
- Reynolds MR, Magnuson EA, Wang K, Lei Y, Vilain K, Walczak J, et al, PARTNER Investigators. Cost-Effectiveness of Transcatheter Aortic Valve Replacement Compared With Standard Care Among Inoperable Patients With Severe Aortic Stenosis Results From the Placement of Aortic Transcatheter Valves (PARTNER) Trial (Cohort B). *Circulation* 2012;125:1102-9. <http://doi.org/j42>
- Reynolds MR, Magnuson EA, Lei Y, Wang K, Vilain K, Li H, et al, PARTNER Investigators. Cost-Effectiveness of Transcatheter Aortic Valve Replacement Compared With Surgical Aortic Valve Replacement in High-Risk Patients With Severe Aortic Stenosis Results of the PARTNER (Placement of Aortic Transcatheter Valves) Trial (Cohort A). *J Am Coll Cardiol* 2012;60:2683-92. <http://doi.org/j43>
- Neyt M, Van Brabant H, Devriese S, Van De Sande S. A cost-utility analysis of transcatheter aortic valve implantation in Belgium: focusing on a well-defined and identifiable population. *BMJ Open* 2012;2:e001032. <http://doi.org/j44>