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)

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Background—In patients with severe aortic stenosis who cannot have surgery, transcatheter aortic valve replacement (TAVR) has been shown to improve survival and quality of life compared with standard therapy, but the costs and cost-effectiveness of this strategy are not yet known.

Methods and Results—The PARTNER trial randomized patients with symptomatic, severe aortic stenosis who were not candidates for surgery to TAVR (n=11005) or standard therapy (n=11005). Empirical data regarding survival, quality of life, medical resource use, and hospital costs were collected during the trial and used to project life expectancy, quality-adjusted life expectancy, and lifetime medical care costs to estimate the incremental cost-effectiveness of TAVR from a US perspective. For patients treated with TAVR, mean costs for the initial procedure and hospitalization were $42 806 and $78 542, respectively. Follow-up costs through 12 months were lower with TAVR ($29 289 versus $53 621) because of reduced hospitalization rates, but cumulative 1-year costs remained higher ($106 076 versus $53 621). We projected that over a patient’s lifetime, TAVR would increase discounted life expectancy by 1.6 years (1.3 quality-adjusted life-years) at an incremental cost of $79 837. The incremental cost-effectiveness ratio for TAVR was thus estimated at $50 200 per year of life gained or $61 889 per quality-adjusted life-year gained. These results were stable across a broad range of uncertainty and sensitivity analyses.

Conclusions—For patients with severe aortic stenosis who are not candidates for surgery, TAVR increases life expectancy at an incremental cost per life-year gained well within accepted values for commonly used cardiovascular technologies.

Clinical Trial Registration—URL: http://www.clinicaltrials.gov. Unique identifier: NCT00530894.

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Key Words: aortic stenosis ♦ transcatheter valve therapy ♦ cost-effectiveness ♦ clinical trials

Valvular aortic stenosis occurs most commonly among the elderly and, in the absence of definitive treatment, leads to progressive symptoms, functional decline, and death.1,2 Nonetheless, many patients with severe aortic stenosis do not undergo surgical valve replacement because of both cardiovascular and noncardiovascular comorbidities that result in unacceptable surgical risk.3–5 Recently, the Placement of Aortic Transcatheter Valves (PARTNER) trial reported that in a cohort of patients who were unsuitable for surgical valve replacement (cohort B), transcatheter aortic valve replacement (TAVR), compared with standard nonsurgical care, resulted in a 20% reduction in mortality at 12 months, as well as improved functional status and a reduction in hospital admissions for aortic stenosis.6

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New technologies are often cited as a major contributor to increasing healthcare costs.7 Before a new technology or
clinical strategy is widely adopted, it is therefore important to understand the clinical and economic benefits that any increased up-front expenditures may yield. Given the advanced age and multiple comorbid conditions that characterize patients with high surgical risk for surgical valve replacement, the question of whether TAVR can provide meaningful health benefits to the population at an acceptable cost is particularly germane. To address these questions, we conducted a preplanned health economic study alongside the PARTNER trial, with the goal of understanding the incremental costs and cost-effectiveness of TAVR compared with standard therapy among inoperable patients with severe aortic stenosis.

Methods

Study Population

One-year clinical results from the PARTNER trial (cohort B) have been published previously. Briefly, the trial enrolled adults with severe aortic stenosis, New York Heart Association functional class ≥2, and high surgical risk based on the Society for Thoracic Surgeons risk score6 or other anatomic or technical factors. These patients were determined not to be suitable surgical candidates on the basis of evaluation by at least 2 surgical investigators and the trial’s executive committee. Patients were randomized to TAVR via the transfemoral route (n = 179) or standard nonsurgical therapy (n = 179), which could include balloon aortic valvuloplasty at the discretion of the treating physician. The study was approved by each enrolling center’s institutional review board, and all patients provided written informed consent. Of the 358 randomized patients, 234 (65%) enrolled at 17 US centers additionally consented to the collection of hospital billing data.

Analytic Overview

All randomized subjects were included in the present study and analyzed according to intention to treat. Our analysis was performed from the perspective of the US healthcare system (ie, a modified societal perspective) and consisted of 2 main components: Data on survival, quality of life, healthcare resource use, and hospital charges were collected through the first 12 months of follow-up (the minimum follow-up duration for the trial) for all patients and were used to calculate survival, quality-adjusted survival, and costs for the trial period. The empirical 12-month data for costs and quality of life, along with all of the available data on survival (up to a maximum of 30 months), were then used to project outcomes beyond the trial, from which estimates of life-years, quality-adjusted life-years (QALYs), and lifetime costs were developed for each patient who survived the trial period. These estimates were then aggregated to calculate average costs and benefits (and their associated distributions) at the treatment-group level.

Determination of Medical Care Costs

Medical care costs were assessed from the perspective of the US healthcare system by use of a combination of resource-based accounting and hospital billing data, as described previously, and are reported in 2010 US dollars. Costs from years before 2010 were converted to 2010 dollars with the medical care component of the Consumer Price Index.

TAVR Procedure Costs

For the initial TAVR procedure, study sites recorded procedure duration and counts of major items consumed, such as support wires, guiding catheters, valvuloplasty balloons, Edwards SAPIEN valve systems, temporary pacing catheters, and vascular closure devices. Costs for each procedure were calculated by multiplying item counts by their respective unit prices, determined by the average acquisition costs at a sample of US hospitals. An estimated US commercial price for the Edwards SAPIEN valve system of $30 000 was used for the primary analysis.

Other Index Hospital Costs

Costs for the remainder of each initial hospital stay for TAVR were derived from hospital bills, which were available for 121 of the 175 patients who underwent an attempted TAVR procedure (97% of patients who agreed to participate in billing data collection from 16 US study hospitals). After the exclusion of charges for care received before randomization and charges for the index TAVR procedure itself, all remaining hospital charges were converted to costs by use of costcenterspecific cost-to-charge ratios obtained from each enrolling hospital’s Medicare cost report. When bills were unavailable, the costs of hospital care were estimated with a linear regression model derived from the patients with complete billing data (model R² = 0.84). Covariates included in the model included total intensive care unit (ICU) and non-ICU length of stay, in-hospital death, in-hospital acute renal failure, and major vascular complication. Use of alternative models, including linear regression of log-transformed costs (with retransformation to natural units), yielded results that were virtually identical.

Follow-Up Hospital Care

Sites collected information on follow-up hospital admissions for any cause at scheduled follow-up visits (1, 6, and 12 months) and on learning of adverse events. Costs for subsequent hospital admissions were calculated from billing data with hospital and cost-center-specific cost-to-charge ratios when bills were available (54% of admissions). When bills were not available (generally because of admission to nonstudy hospitals or to hospitals that do not produce standard billing data), diagnosis, procedure, and adverse event information from the study database were used to assign each admission to a unique Medicare Severity-Adjusted Diagnosis Related Group (MS-DRG). Average reimbursements for each respective MS-DRG, based on 2008 Medicare Provider Analysis and Review (MedPAR) data, were used as the proxy for admission costs in these cases.

Physician Fees

Estimated physician fees for the index TAVR procedure were taken from the Medicare fee schedule and included a primary operator (current fees for surgical aortic valve replacement were used for this unknown value), plus fees for a surgical assistant, cardiac anesthesia (based on measured procedure duration), and intraoperative transesophageal echocardiography. Physician fees for initial consultation and daily care during the remainder of the initial hospital stay and for any additional cardiovascular procedures performed during the index hospitalization (eg, vascular surgery, endovascular stenting) were also taken from the Medicare fee schedule. For follow-up admissions, physician fees were estimated based on the DRG for each admission as described previously.

Other Costs

Data on rehabilitation facility stays, nursing home stays, and outpatient resource use (emergency room visits, physician office visits, outpatient cardiac testing) were collected by the enrolling sites at each study follow-up visit. These measures of resource use were converted to costs using national average per diem rates for residential care and Medicare reimbursement rates for outpatient care based on the Medicare Fee Schedule.

Cost-Effectiveness Analysis

We evaluated cost-effectiveness over a lifetime horizon in terms of both cost per year of life gained (primary analysis) and cost per QALY gained (secondary analysis). These analyses required the projection of life expectancy, quality-adjusted life expectancy, and costs over the anticipated life expectancy of each patient who remained alive at the completion of the trial.

Life Expectancy Estimation

Survival analyses were performed with a locked data set as of September 28, 2010, with a minimum follow-up duration of 12 months, a maximum follow-up duration of 30 months, and mean follow-up duration among survivors of 18 months. To estimate life expectancy for each surviving patient, we used parametric survival models to extrapolate survival probabilities beyond the follow-up time of the trial.
Survival curves were fitted separately for the TAVR and control groups by use of exponential, Weibull, log-normal, log-logistic, logistic, and normal models. Covariates included age, sex, and medical history such as diabetes mellitus, coronary artery disease, peripheral vein disease, myocardial infarction, stroke/transient ischemic attack, prior percutaneous coronary intervention, and prior coronary artery bypass graft. To improve the model fit for the TAVR group and to optimize the resulting survival projections, we conditioned the model on survival at 3 months to reduce the influence of periprocedural events not expected to affect long-term survival. Exponential models were identified as optimal for both treatment groups based on the Akaike Information Criterion and Schwarz’s Bayesian Criterion and were used for the primary cost-effectiveness analysis. Alternative models were used as the basis for sensitivity analyses (see Statistical Analysis).

From the final survival models, patient-level survival probabilities over time were generated until the estimated survival probability was <1%. Individual survival duration was then calculated as the integral of the survival probability versus time function.

Quality-Adjusted Life Expectancy
Quality of life was assessed directly from patients at baseline, 1, 6, and 12 months with the EuroQOL (EQ-5D) health status instrument and converted to population-level utility weights with a published algorithm developed for the US population. Utility weights are measures of a person’s strength of preference for his or her state of health on the basis of a scale from 0 to 1, where 0 represents the worst possible health state (usually death) and 1 represents ideal health. Quality-adjusted life expectancy was calculated for each patient as the time-weighted average of his or her utility values, with the midpoint between assessments used as the transition between health states. Missing utility values were estimated by multiple imputation techniques, taking into account baseline patient characteristics, clinical events, number of hospitalizations, and previous utility values. Quality-adjusted life expectancy beyond the first year of follow-up was calculated as the product of projected life expectancy multiplied by the last available utility value for that individual.

Long-Term Costs
Monthly healthcare costs (including hospital costs, physician fees, outpatient services, and chronic care/rehabilitation costs) beyond the trial period were estimated on the basis of the last 6 months of observed costs for each surviving patient by multiplying these cost estimates by each patient’s projected survival duration beyond the trial.

Statistical Analysis
Categorical data are reported as frequencies, and continuous data are reported as mean±SD. Discrete variables were compared by Fisher exact test. Normally distributed continuous variables were compared by Student t test, and nonnormally distributed data were compared by the Wilcoxon rank-sum test. Cost data are reported as both mean and median values and were compared by t tests, which are appropriate given the large sample size and our focus on comparing mean costs between groups (rather than the underlying distributions). All probability values were 2-sided.

For the purposes of the cost-effectiveness analyses, future costs, life expectancy, and quality-adjusted life expectancy were discounted at 3% per year, consistent with current guidelines. Incremental cost-effectiveness ratios were calculated as the difference in mean discounted lifetime costs divided by the difference in mean discounted life expectancy or quality-adjusted life expectancy. Bootstrap resampling (5000 replications) was used to assess the joint distribution of lifetime cost and survival differences and to generate cost-effectiveness acceptability curves to explore the probability that TAVR would be economically attractive at any given cost-effectiveness threshold.

In addition to the primary analysis, we performed a number of sensitivity analyses to explore the impact of key analytic and structural assumptions on the results of our study. These analyses included plausible variations in the discount rate and the acquisition cost of the transcatheter valve; exclusion of all noncardiovascular care costs; exclusion of the costs of balloon valvuloplasty proce-

### Table 1. TAVR Procedural Resource Use and Cost

<table>
<thead>
<tr>
<th>Resource</th>
<th>Use</th>
<th>Unit Cost, $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedure duration, min</td>
<td>150±84</td>
<td>25.52/min</td>
</tr>
<tr>
<td>TAVR devices, n (%)</td>
<td>164 (93.7)</td>
<td>30 000</td>
</tr>
<tr>
<td>1</td>
<td>10 (5.7)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1 (0.6)</td>
<td></td>
</tr>
<tr>
<td>Valvuloplasty balloons, n</td>
<td>1.3±0.6</td>
<td>462</td>
</tr>
<tr>
<td>Guiding catheters, n</td>
<td>2.7±2.2</td>
<td>51</td>
</tr>
<tr>
<td>Radiographic contrast, mL</td>
<td>132±81</td>
<td>0.14/mL</td>
</tr>
<tr>
<td>Arterial site closure, n</td>
<td>146 (83)</td>
<td>N/A</td>
</tr>
<tr>
<td>Surgical</td>
<td>33 (19)</td>
<td>215</td>
</tr>
<tr>
<td>Procedural costs, $ (median)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Devices</td>
<td>35 400±14 572 (31 631)</td>
<td>...</td>
</tr>
<tr>
<td>Room/overhead/personnel</td>
<td>7406±2134 (7018)</td>
<td>...</td>
</tr>
<tr>
<td>Total</td>
<td>42 806±15 206 (38 706)</td>
<td>...</td>
</tr>
</tbody>
</table>

TAVR indicates transcatheter aortic valve replacement; N/A, not applicable.

Results
Between May 2007 and March 2009, a total of 358 patients with inoperable aortic stenosis were enrolled at 21 centers (17 US, 3 Canadian, 1 European) and randomized to either TAVR (n=179) or standard therapy (n=179). Of the 179 patients randomized to TAVR, 175 underwent a TAVR procedural attempt. Two patients died before their scheduled procedure, and in 2 other cases, the aortic annulus diameter was found to be unsuitable for TAVR by intraoperative transesophageal echocardiography, and the patients were instead treated with balloon aortic valvuloplasty.

TAVR Procedural Resource Use and Index Hospitalization Costs
Resource use and costs for the initial TAVR procedures and their associated hospital stays are summarized in Tables 1 and 2. With few exceptions, the initial procedures used a single valvuloplasty balloon and a single Edwards-Sapien valve. In 21 patients, 1 or more unplanned procedures were performed, most commonly a surgical or catheter-based peripheral arterial intervention. The mean TAVR procedural cost, excluding physician fees, was $42 806 (median $38 706), and the mean cost for the initial TAVR admission, including physician fees, was $78 542 (median $67 551). Mean length of stay was 10.1 days, of which 8.6 days were after the procedure.

Follow-Up Resource Use and Costs
Follow-up resource use and costs for the 2 treatment groups are summarized in Table 3. Over the first 12 months of follow-up,
Mean baseline EQ-5D utility scores were 0.59 in the TAVR group and 0.57 in the control group. Among surviving patients in the control group, EQ-5D scores also increased to 0.64 at 30 days, 0.66 at 6 months, and 0.62 at 1 year. The between-group differences in utility weights were statistically significant ($P<0.05$) at each follow-up time point.

### Projections Beyond 12 Months
As reported previously, 12-month survival was 70% for the TAVR group versus 50% for the control group, an absolute survival advantage of 20% that was preserved through 2.5 years of follow-up.\textsuperscript{6} Observed survival duration through a maximum of 30 months was 1.25 years with TAVR (95% CI, 1.15–1.36) and 0.88 years (95% CI, 0.78–0.97) with standard therapy, a difference of 0.36 years (95% CI 0.23–0.50). An exponential hazard function best approximated observed survival data for each treatment group based on model goodness-of-fit statistics. Projected survival based on several different hazard functions is displayed along with observed survival in Figure 1.

On the basis of the exponential survival models, total life expectancy for the TAVR group was estimated to be 3.1 years compared with 1.2 years for the control group, a difference of 1.9 years (95% CI, 1.5–2.3 years). This difference decreased to 1.6 years (95% CI, 1.3–1.9 years) after the 3% discount rate was applied. On the basis of these life expectancy projections and the empirical cost data from the last 6 months of follow-up (TAVR $22 429/year; control $35 343/year), lifetime medical care costs beyond the trial were estimated at $43 664 per patient for the TAVR group and $16 282 per patient for the control group.

### Cost-Effectiveness Analysis
On the basis of the empirical data for the first 12 months of follow-up and our trial-based survival and cost projections, we estimated a difference in discounted lifetime medical care costs of $79 837 per patient (95% CI, $67 463–$92 349) and a gain in discounted life expectancy of 1.6 years, which resulted in a lifetime incremental cost-effectiveness ratio (ICER) of $50 212 per life-year gained (95% CI, $41 392–$62 591 per life-year gained). Bootstrap simulation demonstrated that the ICER was fairly stable, with 95% of replicates <$60 000 per life-year gained and 100% < $100 000 per life-year gained (Figures 2 and 3).

### Sensitivity Analyses
Table 4 summarizes the results of key secondary and sensitivity analyses. Although utility scores were higher at each follow-up...
time point in the TAVR group, mean utility scores in this population remained lower than normal, even after successful TAVR. As a result, the gain in quality-adjusted survival was smaller than the gain in absolute survival, and the cost-utility analysis yielded an ICER of $61,889 per QALY gained (95% CI, $49,551–$78,361 per QALY gained).

These results were relatively insensitive to changes in the discount rate or the assumed acquisition cost of the study device or to the exclusion of costs associated with balloon valvuloplasty procedures from the control group. If the analysis were restricted to only costs related to cardiovascular care, then the lifetime incremental costs of TAVR decreased to ≈$53,000 per patient, with a resulting ICER of $33,860 per life-year and $41,700 per QALY gained. If effectiveness were measured in QALYs, but we assumed no improvement over time in the baseline utility scores for either group, then the ICER for TAVR became less favorable at ≈$83,000 per QALY gained.

Finally, our results were only modestly sensitive to alternative time horizons, alternative hazard functions for TAVR group life expectancy projections, or variations in our estimates of annual costs beyond the first year of follow-up (Figure 1; Table 4). Only an accelerated Gompertz hazard function that yielded 10-year survival of 1% in the TAVR group resulted in an ICER >$60,000 per life-year gained, and >99% of bootstrap simulations yielded ICER results <$100,000 per life-year gained in every scenario examined.

Discussion

In this trial-based analysis, we found that TAVR, performed in a population of patients unsuitable for surgical aortic valve replacement, was associated with procedural costs of ≈$43,000
and initial hospitalization costs of $78,000. Although follow-up costs through 12 months were significantly lower with TAVR, cumulative 1-year costs remained $55,000 higher per patient with TAVR than with standard, nonsurgical therapy, a difference that increased to $79,000 per patient when costs associated with added years of life were also considered. Over the observed follow-up period, TAVR was associated with a survival benefit of 0.5 years, which increased to 1.9 years (1.6 years after discounting) when the empirical survival data were projected over a lifetime horizon. On the basis of these data, the ICER for TAVR compared with standard care was estimated at $50,212 per life-year gained or $62,000 per QALY gained, results that remained relatively stable across a broad range of uncertainty and sensitivity analyses.

At the present time, there is no explicit cost-effectiveness threshold used for reimbursement policy in the United States, although formal economic assessments are often required in the evaluation of new health technologies in other national health systems. Outpatient hemodialysis has long been referenced as a benchmark for the cost-effectiveness of new medical interventions in the United States, because it has been mandated as a covered benefit under the Medicare program. Recent studies have estimated the cost-effectiveness of hemodialysis for end-stage renal disease or left ventricular assist devices for destination therapy. In addition to the main results, the present study provides several important insights into the cost-effectiveness of life-extending therapy among the very elderly. First, we found that despite providing substantial cost offsets during the first year of follow-up, among the highly complex, inoperable patients enrolled in this trial, TAVR did not result in long-term cost savings. In fact, our empirically derived projections suggest that the cost difference between TAVR and standard therapy actually increased beyond the first year of follow-up as a result of the greater life-expectancy for the TAVR group coupled with the high cost of ongoing medical care even after successful valve replacement in this uniquely challenging patient population.

The results of the present study were slightly less favorable when expressed as costs per QALY gained rather than costs per life-year gained, even though symptoms, quality of life, and functional status improved more with TAVR than in the control group. This is because the years of life added for the TAVR group were added at less than perfect quality, a finding that would be expected given the patient population under study. If quality of life had not improved with TAVR, the ICER would have been substantially higher. Although a 1996 expert panel recommended the use of QALYs as the standard effectiveness measure in health economic analysis, this guidance is not universally accepted both because of imprecision in the methods used to estimate QALYs and because there is both philosophical and political opposition to the notion that
life-years for one group might be valued differently than
life-years for another group (eg, because of age, disability, or
chronic health problems). Indeed, several recent economic
studies of life-prolonging cardiovascular therapies have used
life-years as the primary measure of effectiveness.23,29,30

Comparison With Previous Studies
To the best of our knowledge, this is the first study to estimate
the lifetime cost-effectiveness of TAVR for patients with inopera-
table aortic stenosis. Wu and colleagues31 used a combination
of single-center observational data on survival and quality of life
after aortic valve replacement and a computer simulation model
based on historical data on the natural history of untreated valve
disease to estimate the cost-effectiveness of surgical aortic valve
replacement as a function of patient age. They found that for
octogenarians, surgical aortic valve replacement resulted in a
gain in quality-adjusted life expectancy of $5 years and an
ICER of $20 000 per QALY.

The results of the present study differ from those of Wu and
colleagues31 in several important ways. First, the patient popu-
lations in the 2 studies were quite different and, in fact, mutually
exclusive. By definition, the patient population in the previous
study consisted of patients who were considered to be candidates
for valve replacement surgery, whereas the PARTNER cohort B
population was specifically selected to exclude such patients. It
is therefore not surprising that the projected gain in life expec-
tancy among operative candidates was substantially greater than
for nonoperative candidates in the present study. In addition, the
present study was based on empirical cost and survival data from
a randomized clinical that included a parallel control group of
comparable patients treated without valve replacement. Given
the very large survival benefit observed in the PARTNER trial
(cohort B), it appears unlikely that such a study will be repeated,
and the control group from our study will remain the benchmark
for future clinical and economic evaluations of this technique
among inoperable patients.

Study Limitations
Our results should be interpreted in the context of the following
limitations. First, the PARTNER trial was conducted with an
early-generation transcatheter aortic valve, and for the majority
of the enrolling centers, the trial was the investigators’ first
experience with TAVR. Outcomes of TAVR procedures and the
efficiency of caring for TAVR patients may improve with
 technological refinements and increased experience. In addition,
certain aspects of the care delivered in the PARTNER trial may
differ from typical community practice. For example, the
frequent performance of balloon valvuloplasty in the control
group of the present trial likely exceeds that used in recent
clinical practice. However, results from a sensitivity analysis
showed that removing the costs of balloon aortic valvuloplasty
procedures (but not their likely benefit on quality of life) had
little impact on our findings.

Our long-term projections of survival, quality-adjusted sur-
vival, and costs beyond the trial’s time frame are associated with
uncertainty. In the absence of external data from a comparable
patient population, we relied almost exclusively on observed
data from the first 12 to 30 months of follow-up to inform
our estimates of future outcomes. Nonetheless, the fact that nearly
50% of all enrolled patients had died by the completion of
follow-up renders our estimates of life expectancy quite plausible.
Indeed, a recent study32 of 5-year outcomes among Medicare
patients with medically managed aortic stenosis reported a life
expectancy of 1.4 years among high-risk patients and annual costs
of $30 000, results very similar to ours. Our projected life
expectancy of 3.1 years for the TAVR group is less certain but
probably not an overestimate given that the average life expectancy
of an 83-year-old in the United States is roughly 7 years.33

In conclusion, for patients with severe, symptomatic aortic
stenosis who are not considered candidates for surgical valve
replacement, the PARTNER trial demonstrates that TAVR
significantly increases life expectancy at an incremental cost per
life-year or QALY gained well within accepted values for
commonly used cardiovascular technologies. Further studies
will be necessary to evaluate the cost-effectiveness of TAVR for
other, lower-risk patient populations and compared with other
treatment strategies (eg, surgical aortic valve replacement).

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In the article by Reynolds et al, “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),” which appeared in the March 6, 2012 issue of the journal (Circulation. 2012;125:1102–1109), Dr William W. O’Neill failed to disclose a professional relationship with Edwards Lifesciences, Inc.

The current online version of the article has been corrected. The authors apologize for the omission.