The Society of Thoracic Surgeons (STS)

Statement before the Food and Drug Administration
Circulatory System Devices Panel
of the Medical Devices Advisory Committee

July 20, 2011
The Society of Thoracic Surgeons (STS) appreciates the opportunity to provide comments to the Circulatory System Devices Panel of the Medical Devices Advisory Committee as it considers approval of the Edwards Life Sciences SAPIEN™ Transcatheter Heart Valve. STS is a not-for-profit organization representing more than 6,200 surgeons, researchers, and allied health care professionals worldwide who are dedicated to ensuring the best possible outcomes for surgeries of the heart, lung, and esophagus, as well as other surgical procedures within the chest.

STS and the American College of Cardiology (ACC) jointly published a paper titled “Transcatheter Valve Therapy: A Professional Society Overview from the American College of Cardiology Foundation and The Society of Thoracic Surgeons.”1 The paper outlines what we believe are the necessary components for the successful introduction of Transcatheter Aortic Valve Replacement (TAVR) as a safe and effective medical therapy. As discussed in the paper, catheter-based therapies present new and potentially transformational technology for valvular and structural heart disease. The issues associated with this therapy are complex and affect multiple stakeholders, including patients, clinicians, industry, regulatory agencies, payers, and professional societies.

Our statement today addresses the core elements of TAVR and aligns the interests of all expert physicians, including cardiothoracic surgeons and cardiologists, as well as other relevant stakeholders who share a goal of delivering the best possible patient-centered care. The role of professional societies in particular is to contribute to this goal through ongoing development of expert consensus statements, guidelines, credentialing criteria, and training paradigms, thereby ensuring responsible diffusion of this technology.

**Necessary Components for the Successful Introduction of Transcatheter Heart Valve Therapy**

TAVR is a procedure that allows deployment of a bioprosthetic aortic valve utilizing one of two minimally invasive techniques: either transfemoral or transapical implantation. There are a number of transcatheter devices for aortic valve implantation procedures that are in development, including the Edwards Life Sciences SAPIEN device under consideration by the Panel today.

In order to ensure safe and effective practices for TAVR implantation it is important to implement guidelines that ensure the procedures are performed in specialized heart centers with experience in the management of patients with valvular heart disease and have specialized equipment, sufficient volume, and properly trained and credentialed multidisciplinary heart teams. These teams should have agreed upon joint decision making and co-management principles involving the selection and technical aspects of treatment of patients at risk. In addition, continued review of data and outcomes, with necessary refinements to guidelines and protocols, utilizing a joint STS/ACC registry is essential. We believe that the following components are necessary for a safe and effective commercial introduction of TAVR therapy:

**Establishment of regional centers of excellence for heart valve diseases**

Criteria for centers performing interventional therapy in valvular and structural heart disease will be established through consensus building among STS, ACC and other interested parties. There are currently over 1,100 centers in the U.S. performing open heart surgery. Many studies clearly have demonstrated a direct relationship between procedural volume and quality outcomes. With approximately 25,000 surgical aortic valve replacements (AVR) performed annually, compared with approximately 190,000 CABG procedures, it is anticipated that not all centers will have the necessary
procedural volume, experience, or expertise to justify becoming a TAVR center. Analysis of the STS Adult Cardiac Database shows that the busiest 200 surgical sites perform more than 93 surgical AVRs annually and the top 400 sites perform more than 53 surgical AVRs each year. It is the STS position that the availability of devices and reimbursement for those procedures should be limited to centers meeting criteria for volume and experience as agreed upon by the professional societies in conjunction with the appropriate regulatory and reimbursement bodies and the trial sponsor.

In the case of TAVR, the specialized expertise, experience, imaging equipment, and facilities equipped to optimize outcomes are not available in all programs. Because of the myriad of specialists, imaging equipment, procedural facilities, and support infrastructures necessary to build a valve center, it is recommended that access to TAVR should not be universal and immediate, but should be implemented in a controlled and regulated fashion. In the United States, many cardiac surgical centers and catheterization laboratories have a very low volume of structural heart disease cases. Outcomes for patients undergoing surgery for valvular heart disease have clearly been demonstrated to be related to center procedural volume. The complexities of the management of valvular heart disease will require an infrastructure available only in regional referral centers with acceptable patient volume in valvular heart disease as established by the ACC and STS.

In order to create specialized regional centers, detailed lists of facilities and personnel experience, pre- and post-procedural care protocols, and management strategies for complications must be developed and then implemented.

Regional centers should require one of the procedural settings and specialized equipment outlined below:

**Modified/ Hybrid Catheterization Laboratory**
For TAVR procedures, the catheterization laboratory should incorporate the following:
- Size and space large enough to hold the recommended equipment,
- Anesthesia equipment,
- Transesophageal echocardiography machines,
- 3-dimensional intravascular ultrasound images,
- Intraaortic balloon pumps,
- Cardiopulmonary bypass machines, and
- Surgical sterility standards including airflow exchanges.

**Hybrid Operating Room**
For TAVR procedures, the hybrid operating room should include the following:
- Size should be around 800 to 900 square feet,
- Catheterization laboratory-quality X-ray imaging is a requisite,
- Transesophageal echocardiography,
- 3-dimensional intravascular ultrasound images,
- Intraaortic balloon pumps,
- Cardiopulmonary bypass machines, and
- Rotational angiography.
**Multidisciplinary heart teams**

The concept of a multidisciplinary professional heart team has received increasing interest, beginning particularly with the SYNTAX (SYNTAX Study: TAXUS Drug-Eluting Stent Versus Coronary Artery Bypass Surgery for the Treatment of Narrowed Arteries) trial of patients with advanced coronary artery disease. In the SYNTAX trial, the interventional cardiologist and cardiovascular surgeon reviewed the angiographic films together following angiography in the context of the clinical setting. If the patient was deemed to be an acceptable candidate for either procedure, both cardiologist and surgeon—ideally together—would interview both patient and family to formulate an optimal plan. This “heart team” concept has been endorsed and recommended in the recent European Society of Cardiology/European Association for Cardio-Thoracic Surgery Guidelines on Myocardial Revascularization and should become the standard of care.

The heart team concept now has been extended to treatment of valvular heart disease. In the PARTNER (Placement of AoRTic TraNscathetER Valve) clinical trial, the pivotal U.S. trial of a new device for TAVR, patients are routinely evaluated by “partners” of cardiologists and surgeons together to determine patient eligibility and optimal treatment strategy. This requires pre-procedural evaluation in valvular heart disease clinics, multidisciplinary team conferences, joint performance of the procedure, as well as joint postoperative care. Such a heart team will be even more critical as the issues with structural heart disease become more complex, the treatment expands to more centers, and new technology is applied outside of the constraints of randomized clinical trials. The success of this team concept has been demonstrated in heart transplant centers in which patient treatment decisions and care are managed by heart failure cardiologists, transplant and ventricular assist device surgeons, experts in immunosuppression, as well as specialists in echocardiography and in anesthesia—all of whom collaborate as a multidisciplinary team. Key members of the multidisciplinary team for structural heart valve disease management include primary cardiologists, interventional cardiologists, cardiac surgeons, noninvasive and heart failure cardiologists, echocardiographers and cardiac imaging specialists, cardiac anesthesiologists, nurse practitioners, physician assistants, research coordinators, administrators, dietary and rehabilitation specialists, and social workers. Each component will need to develop and implement specific protocols depending on the individual patient and specific technical procedure.

The multidisciplinary team will be central in applying a standardized scoring system to evaluate risk-benefit profiles in this diverse group of patients. The patient’s values and goals need to be central in risk-benefit assessment and treatment decisions.

*Primary cardiologists*

The primary cardiologists typically have seen these patients longitudinally over the course of their diseases and have a unique perspective of patient and family dynamics. These physicians coordinate care, ensure complete evaluation, order and evaluate diagnostic studies, implement medical care, and ensure involvement of patients and families in the decision-making process. Primary cardiologists also resume care of the patient after the procedure and need to be cognizant of the follow-up needs and protocols; accordingly, these individuals are an essential component of the heart team to enhance patient-centered care. The patient’s values and goals need to be central in benefit-risk assessment and treatment decisions.

*Cardiac surgeons and interventional cardiologists*

Cardiac surgeons and interventional cardiologists who have had appropriate training and experience, as defined by a joint The Society of Thoracic Surgeons/American College of Cardiology/Society for...
Cardiovascular Angiography and Interventions/American Association for Thoracic Surgery consensus statement now being developed, will work together in the management of transcatheter valve insertions and related patient care. Both will have responsibility in the technical aspects of the procedure and will share in the decision making about which patients are appropriate for the use of this technology. The team will need to possess adequate catheter-based skills as well as surgical skills to accomplish the technical aspects of the device deployment, knowledge of the criteria for patient selection to assist in the decision making process, and adequate knowledge and support to provide post-operative patient management. Each will have a responsibility to the other to ensure that their decision making, technical ability, and expertise in using the device is done in an appropriate and safe manner for all patients, including Medicare beneficiaries. Minimum ongoing case volumes will be established by STS/ACC/SCAI/AATS and monitored to ensure that interventional cardiologists and surgeons continue to have the required skills to participate in the use of this technology.

_Echocardiographers and imaging specialists_
Echocardiography will be critical, with collection of standardized definition sets. Mandatory imaging modalities necessary for a structural heart disease program include 2- and 3-dimensional transthoracic and transesophageal echocardiography, vascular computerized tomography with 3-dimensional reconstruction, cardiac magnetic resonance imaging, diffusion weighted magnetic resonance imaging of the brain, and transcranial Doppler imaging. An important screening component for TAVR involves 3-dimensional reconstruction of the aortoiliac vasculature using multislice computerized tomography. The current aortic transvalvular device delivery sheaths are large, ranging from 18- to 24Fr in diameter. Although they are becoming smaller in diameter, access remains an issue. Accordingly, it is essential to identify absolute arterial diameters and specific abnormalities such as severe calcification or tortuosity of the aortoiliac vascular tree that may dictate an alternative access route.

_Hart failure specialists_
An increasing number of patients with advanced valvular heart disease have a component of left ventricular dysfunction. For patients with aortic stenosis, left ventricular dysfunction may render the assessment of the severity of the aortic stenosis difficult, thus complicating decision making about the need for or performance of a procedure. In addition, heart failure specialists will need to help assess the potential for reversibility of left ventricular dysfunction following TAVR. Identification of appropriate patients with aortic stenosis and heart failure who may benefit from a catheter-based approach is best accomplished by consultation with heart failure specialists.

_Cardiac anesthesiologists_
Cardiac anesthesiologists determine the most appropriate anesthesia and monitoring techniques for patients and provide technical expertise in advanced imaging. Like interventional cardiologists and cardiac surgeons, cardiac anesthesiologists will need to form dedicated teams to safely apply this technology to a high risk Medicare beneficiary population.

_Establishment of a national registry of valvular heart disease_
Mandatory reporting to the STS/ACC TAVR registry will facilitate post-market surveillance, long-term outcomes measurement, and comparative effectiveness research. The registry will be developed by STS and ACC in conjunction with the specialty societies and other relevant stakeholders.
Both STS and ACC maintain large clinical databases that collect and analyze outcomes of surgical and catheter-based procedures. An initial pilot project—the American College of Cardiology Foundation and Society of Thoracic Surgeons Collaboration on the Comparative Effectiveness of Revascularization Strategies (ASCERT)—which links two clinical databases to administrative databases, including the Social Security Death Master File (SSDMF) and CMS Medicare Provider and Analysis Review (MedPAR) data in patients with coronary artery disease, is currently under way. Results of another pilot project highlighting successful linkage of the STS National Database to the SSDMF and reporting 1-year survival after cardiac surgery were published in 2010. A similar linking of clinical and administrative databases to conduct post-market surveillance, assess long-term patient-centered outcomes research, and perform comparative effectiveness research and cost effectiveness for all patients with valvular heart disease is crucial. This linkage needs to involve shared modules to avoid duplicate data entry.

STS welcomes the opportunity to work closely with the FDA and device manufactures to help develop plans for appropriate post-market surveillance of TAVR technology. We hope to explore new innovative opportunities to build accountability and real-time outcomes feedback and improvement into the post-market surveillance process. One model currently being utilized for tracking outcomes of patients receiving left ventricular assist devices—the Interagency Registry for Mechanically Assisted Circulatory Support (INTERMACS) registry—should be considered for transcatheter valves. The construction of these linked outcomes databases is critical to adequately assess the impact of transcatheter valves on the clinical outcomes of patients with valvular heart disease. It is also important to consider the use of common data forms, definitions, and reporting processes in different countries. Initial discussions are underway to determine the feasibility of linking various national registries together to establish a truly global database. Transcatheter and surgical valve therapy provide an optimal initial platform to foster such a linkage, which will facilitate evaluation and interpretation of the results of ongoing and future planned studies. Additionally, it will enable regulatory trials for the FDA by allowing better utilization of global data when considering new device trial submissions and will enhance payer understanding of the best decision making for application of these technologies. This plan will require that the different international societies become more fully engaged and integrated. In the interim, while a national registry is being constructed by the aforementioned organizations, reporting of all TAVR procedures to the STS Adult Cardiac Database, Version 2.73 should be mandatory upon clinical approval of TAVR. This updated version, released July 1, 2011, contains data fields to capture TAVR procedures. More than 95 percent of current surgical sites performing AVR already participate in this database. Their continued participation will ensure immediate availability of early 30 day outcomes, including mortality, stroke, and major complications in all patients undergoing TAVR.

### Training and credentialing criteria

Operator training is a crucial component for treating structural valvular heart disease using a TAVR approach. Construction of a training curriculum is essential. Formation of criteria for fellowship training programs as well as postgraduate training with appropriate experience for adequate patient care leading to guidelines for credentialing will be established by the STS/ACC/SCAI/AATS in a consensus statement currently under development. There will be minimum case volume requirements for catheter-based and surgical-based approaches. Both the cardiologist and surgeon must have hybrid training involving catheter-based and surgical skills in order to establish a TAVR program. Following the establishment of a program, all members of the multidisciplinary team will need to maintain minimal volume requirements for continued participation and will be monitored on an ongoing basis to ensure acceptable outcomes as defined by ACC/STS/SCAI/AATS criteria. The institutional structural
requirements and cardiology/cardiac surgeon volume and outcomes criteria for TAVR will be developed using the CMS criteria for heart transplant centers as a template. The criteria will be based on retrospective analyses of outcomes.

**Interpretation of the current and developing evidence by expert consensus**

A complete review of the increasingly large data set for TAVR from the randomized clinical trials will be conducted by a committee of the involved societies and will publish an expert consensus statement in 2011. Continued evaluation of the data from mandatory TAVR registries will be ongoing with further recommendations for utilization of this technology based on the developing evidence.

**Summary**

In summary, TAVR represents an exciting innovation in the medical device field that, based upon current evidence, promises to provide lifesaving therapy to heretofore inoperable patients with aortic stenosis. The pivotal randomized trial data presented here today provide solid evidence of an absolute 20 percent improvement in survival in these inoperable patients. As with the results of any randomized clinical trial performed in high volume centers with significant procedure volume and expertise, translating those results to centers and operators outside of study sites is the issue. The STS and ACC believe that the reproducibility of these results upon commercialization is best achieved by a rational and reasoned dispersion of TAVR to new centers. Those centers should have expertise in the management of valvular heart disease and have sufficient procedural volume to attain and maintain the advanced skill set necessary to provide superior outcomes as were obtained in the pivotal trial. The additional necessary components to achieve optimal results include a multidisciplinary heart team, adequate infrastructure of personnel and facility, and appropriate post-procedure follow-up by mandatory participation in a national registry. With these guardrails in place, it is our position that rational dispersion of this exciting new technology with results commensurate with those of the PARTNER Cohort B Pivotal Trial can be achieved upon regulatory approval.

The STS appreciates the opportunity to provide our comments to the Panel. Please contact Phil Bongiorno, STS Director of Government Relations, at (202) 787-1221 or pbongiorno@sts.org, if you have any questions.

**References**