Venn diagrams in cardiovascular disease: the Heart Team concept

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Venn diagrams are illustrations composed of overlapping circles that demonstrate the relations between finite collections of things [1] and are most useful in defining areas of commonality among different aggregations. Originally described by John Venn in the 1880s to teach elementary set theory, these diagrams are most often used to illustrate set relationships in such fields as probability, statistics and computer science.

Venn diagrams can also be useful for understanding the roles of various stakeholders in the management of cardiovascular disease from its diagnosis through its treatment. As the field progresses, the area of overlap of the cardiovascular disease Venn diagram expands to continue. This is evident in many aspects of cardiovascular disease management, including individual diagnosticians and treatment specialists, diseases, technologies, institutions, payers and regulators. Despite a movement towards convergence in areas of disease management, however, professional societies remain in their individual silos. This article explores whether Venn diagrams of professional societies, which traditionally had little overlap or mutual engagement, should continue to converge until they merge into one.

The well-recognized concept of atherosclerosis as a disease that affects all vascular beds has focused therapeutic strategies on the co-existence, for example, of coronary artery disease and peripheral arterial disease in the same patient. Whereas in the past there was a tendency to treat an acute coronary syndrome as an isolated event in a patient, attention now focuses on the fact that other manifestations of the disease, such as peripheral arterial disease and cerebral vascular disease, are likely to be present in this patient as well, and the involvement of these other vascular beds may affect treatment strategies. Thus, the evolution of the understanding about atherosclerosis has stimulated physicians and surgeons who focus on these different vascular beds to strategize together about the treatment of this patient.

Another example of multi-stakeholder involvement, overlap and convergence involves the diagnosis of cardiovascular disease using non-invasive imaging. In the past, echocardiography, nuclear echocardiography and non-invasive radiographic techniques such as magnetic resonance imaging and computed tomography occupied separate silos, and the specific test ordered for a patient generally matched the expertise of the physician who ordered it. For example, echocardiographers were more apt to recommend echocardiographic imaging techniques for functional assessment. More recently, imaging specialists have converged for training, certification and practise, and more often than not, the choice of the imaging technique now focuses on obtaining the optimal imaging test, irrespective of the imaging specialists’ areas of expertise.

The overlap of the Venn diagrams for interventional cardiology and cardiovascular surgery has grown larger since the promulgation of the multidisciplinary Heart Team concept. Specialty team-based care is not a concept new to medicine; for example, Tumour Boards make multispecialty disease management decisions in oncology [2, 3]. The use of the specific term ‘Heart Team’ is more recent and was only incorporated in guidelines subsequent to the presentation of the results of the pivotal SYNTAX trial [4]. SYNTAX evaluated the two randomized strategies of coronary bypass graft surgery and percutaneous coronary intervention in patients with complex multivessel or left main coronary artery disease. Working together, a team composed of a surgeon, an interventional cardiologist a primary cardiologist, and the patient agreed upon the optimal revascularization strategy [5, 6].

This Heart Team approach has been codified in the European Society of Cardiology/European Association for Cardio-Thoracic Surgery (ESC/EACTS) guidelines on Myocardial Revascularization, which recommend that patients with complex coronary artery disease be seen by a Heart Team, which includes cardiovascular surgeons and interventional cardiologists [7]. Using a Heart Team approach is a Class I-C recommendation of the 2011 ACC/AHA guidelines for Coronary Artery Bypass Graft Surgery [8]. This concept has also been employed in the field of structural heart disease, specifically aortic stenosis and transcatheter aortic valve replacement (TAVR) [9, 10]. In this setting, the Venn diagrams of cardiovascular surgeons and interventional cardiologists coalesce to form the core of the team responsible for planning and implementing the chosen strategy for aortic valve replacement. This convergence has now been mandated for reimbursement.
by federal regulatory agencies. Although there are practical institutional implementation issues, increasingly collaboration will be demanded by societal imperatives to optimize patient care.

Yet another example of the convergence of distinct elements in cardiovascular disease is the development of common service lines or heart hospitals, wherein all cardiovascular specialists (surgeons, cardiologists, vascular radiologists, cardiac anaesthesiologists, cardiovascular nurses among others) are combined under one umbrella either physically or conceptually. The Heart and Vascular Institute at the Cleveland Clinic is a high-profile example of such a convergence. A European milestone example for such collaboration for many decades between surgeons and cardiologists under one roof is the Thoraxcenter Rotterdam. Meanwhile, several cardiac centres were established across the USA and Europe copying the initial models. There is a clear advantage to an organ-oriented medical approach that uses the collective wisdom of various specialties and, analogous to Tumour Boards in patients with cancer, identifies and recommends the optimal course of therapy for patients with heart disease.

This background of increasing convergence among cardiovascular disciplines contrasts starkly with our silo-bound professional societies: American College of Cardiology (ACC), American Heart Association (AHA), The Society of Thoracic Surgeons (STS), American Association for Thoracic Surgery (AATS), The Society for Cardiovascular Angiography and Interventions (SCAI), American Society of Echocardiography (ASE) and American Society of Nuclear Cardiology (ASNC), or respectively in Europe, the ESC and EACTS. Each silo touches the other competitively, sometimes antagonistically, and at other times, collaboratively. Each silo has many similar discrete components—executive committees; volunteer and paid staff; advocacy, scientific, educational and regulatory groups, to name but a few. In addition, the core mission of each silo may be very similar (Fig. 1). While each professional society serves its core constituency well, there are many disadvantages to such a situation, including overlapping efforts that are inefficient; conflicting aims that confuse patients, payers and regulators alike; and diffusion of efforts to obtain increasingly scarce industry and government funding. Other disadvantages specific to cardiology and cardiovascular surgery are these: competing outpatient registries (e.g. ACC and AHA); confusing messaging for procedural reimbursement (e.g. carotid stenting); redundant grants for disease-specific approaches (e.g. Heart Rhythm Society, ACC, STS for atrial fibrillation) and a plethora of requirements for credentialing and certification (e.g. ASE and ASNC).

The walls of silos can be broken through, however, and it is our position that it is in everyone’s best interest—most of all the patients we serve—to do so. STS and ACC have begun an unprecedented collaboration with federal regulatory and reimbursement agencies and industry around TAVR, addressing its optimal utilization and developing a national registry, educational programmes, requirements for credentialing and metrics for procedural performance [10, 11]. Such an effort should involve close collaboration and communication at all levels (Fig. 2). A similar collaboration was initiated in Germany in 2010 when both the German Society of Cardiology and the German Society for Thoracic and Cardiovascular Surgery started a registry that collects all procedural and follow-up data on conventional and catheter-based aortic valve replacements. The two societies also have written joint position papers on TAVR and are designing cross-professional training programmes and certifications.

There have been several examples of close relationships between surgery and cardiology: among others, these include the fact that the third president of the American College of Cardiology, Robert Glover (from 1953–54), was a surgeon from Philadelphia. The current convergence of ACC and STS represents a continued example of what could be obtained by very close collaboration among the professional societies. The similar collaboration between the German cardiology and cardiac surgery societies is a parallel example in Europe. One could imagine a single professional society, perhaps a global cardiovascular society, which would include all segments of the cardiovascular team: surgeons, cardiologists, vascular radiologists, anaesthesiologists, cardiovascular nurses, educational and scientific groups and advocacy under one administrative umbrella. Recent examples of how this collaboration might be initiated include integrating professional societies at the level of volunteer leadership; for example, in Germany, a cardiac surgeon (F.M.) recently served as the president of the annual German cardiology meeting and a cardiologist (C.H.) as the president of the German cardiac surgery annual meeting. Such exploratory initiatives could be used to foster closer relationships at an administrative level. The goal would be to have the administrative umbrella of a single professional society that coordinate the educational and scientific initiatives, the disease management registries and outcomes analyses, the advocacy approach towards reimbursement and the training, education and credentialing of physicians and allied health professionals.

Figure 1: At the present time, for patients with coronary artery disease, the professional silos of cardiology and cardio-thoracic surgery often do not overlap, despite the fact that the underlying missions have great similarity. Merging of these Venn diagrams either administratively or as part of a Heart Team could substantially improve patient education and care.

Figure 2: The development of a TAVR Heart Team and blending the disciplines of cardiology and cardio-thoracic surgery will enhance optimal patient selection, procedural performance and outcome.
We fully appreciate the obstacles, barriers and concerns regarding self-interest and loss of autonomy that naturally arise with such a disruptive and far-reaching proposal, but they are not insurmountable. We recognize that this cannot be done immediately in one bold move. We present this as a vision of the gradual convergence of Venn diagrams until we are all one circle.

The theme of the recently concluded German Society for Thoracic and Cardiovascular Surgery annual meeting was ‘ein Herz, ein Team (one heart, one team). Together, we propose ‘one heart, one team, one society’.

Conflict of interest: none declared.

REFERENCES