Centres of Excellence: Cardiovascular Centre, University Hospital Zurich, Switzerland

“A Mixture of People From All Over the World Who Have Competencies and Are the Best in Some Areas”

The Cardiovascular Centre, University Hospital Zurich, Zurich, Switzerland, has an international reputation built on its pioneering research. Thomas F. Lüscher, MD, FRCP, FACC, professor and chair of the Division of Cardiology, University Hospital Zurich, talks to Mark Nicholls.

The Cardiovascular Centre at the University Hospital Zurich (UHZ), Zurich, Switzerland, provides the widest range of expertise and facilities for the diagnosis and treatment of diseases of the heart and circulation in Switzerland. It also has an international reputation for innovation and research, with groups focusing on heart imaging, heart rhythm disorders, atherosclerosis, myocardial infarction, and molecular cardiology.

Andreas Grüntzig, MD, performed the first balloon dilation in 1977 at the Division of Cardiology, and in the 1990s that work shifted toward the characterisation of the endothelium and its role in mediating cardiovascular disease. More recently, the research has focused on looking at the impact of genes on risk factors and, in particular, how they change endothelial and vascular functions and eventually lead to atherosclerosis and disease.

The Origins of the Cardiovascular Centre
Can Be Traced to the Arrival of Swedish Surgeon
Ake Senning, MD, in 1960

UHZ sits in the city centre, with views across Lake Zurich and the snow-covered Alps. The first mention of a hospital in Zurich occurs in the Vatican records of 1204, and by 1732 a hospital with 650 beds existed there. The current buildings opened in 1839 and have lasted throughout the 20th Century. UHZ now has 850 beds, with an annual turnover of 850.5 million Swiss francs and 265,000 care days.

One can trace the origins of the Cardiovascular Centre at Zurich to the arrival of Swedish surgeon Ake Senning, MD, in 1960. Already renowned for his work with Rune Elmqvist, MD, for performing the first implantable pacemaker operation in 1958, and in congenital heart surgery, he began the first significant cardiac programme at UHZ.

Paul Lichtlen, MD, who had learned cardiac catheterisation in the United States at the Johns Hopkins University, Baltimore, Md, and the Cleveland Clinic, Cleveland, Ohio, with Mason Sones, MD, helped enhance this work. When he joined the staff at UHZ, he brought the Sones technique with him.

On other pages...

Circulation: Arrhythmia and Electrophysiology

Circulation: Arrhythmia and Electrophysiology is the first of 6 subspecialty journals to be spawned from Circulation to reflect the changing needs of cardiovascular researchers and cardiologists worldwide and meet the growing demand for tightly focused information in areas at the cutting edge of cardiology.
Professor Senning and, later, his successor, the cardiovascular surgeon Marko Turina, MD, who has recently retired, expanded the programme, starting bypass work in 1967. In 1972, they carried out the first transplantations in Zurich, and Professor Grüntzig (Figure 1) then followed this milestone with the first balloon dilation, in 1977.

Professor Senning had a reputation as a generous and supportive surgeon, and Professor Lichtlen (Figure 2) established Zurich as one of the first centres in Europe for carrying out coronary angiography; its rising reputation attracted patients from several countries.

Cardiology Represents the Biggest Division of Medicine at UHZ

UHZ has 42 departments and institutes, and cardiology clearly represents the biggest division of medicine, both in patient turnover and procedures.

The Cardiovascular Centre is 1 of 4 heart centres in the canton of Zurich, which covers a population of 1.5 million in an area where cardiovascular disease still represents the most common cause of death. For women, who have a life expectancy of 84 years in the canton, cardiovascular disease accounts for 40% of deaths, and for men, with a life expectancy of 79 years, it accounts for 35% of deaths.

The Cardiovascular Centre includes divisions of Cardiology, Heart and Vascular Surgery, and Angiology.

A Frequently Cited Research Group Is Based at the Division of Cardiology

Thomas F. Lüscher, MD, FRCP, FACC, heads the Division of Cardiology. Its diagnostic services include ultrasonography, nuclear medicine examinations, magnetic resonance imaging, computed tomography, and catheter interventions. It also provides facilities for the treatment of hypertension, hyperlipidaemia, rhythm disorders, congenital heart disease, and heart failure.

Areas of specialisation include performance and cardiac risk factor assessment; diagnosis and treatment of lipid metabolism disorders including low-density lipoprotein apheresis and high blood pressure; heart imaging using myocardial scintigraphy, positron emission tomography, magnetic resonance imaging, and computed tomography; and diagnosis and treatment of angina pectoris, heart rhythm disorders, congenital heart defects, heart valve disease, and cardiac insufficiency.

The Division of Cardiology has 20 staff cardiologists working across 8 subdivisions covering outpatients, general cardiology, congenital diseases, and echocardiography. It also has a research division in the Institute of Physiology, carrying out translational research with 28 scientists working on basic molecular cardiology. This includes one of the most frequently cited research groups in the field of cardiovascular diseases and atherosclerosis.

The Division of Heart and Vascular Surgery Performs About 1200 Procedures Requiring the Heart–Lung Machine Each Year

The Division of Heart and Vascular Surgery, headed by Michele Genoni, MD, has evolved as many heart surgery interventions have become standard procedures. With 10 staff surgeons, the division represents the heart surgery field at UHZ and has about 40 beds as well as an intensive care unit. Each year, Heart and Vascular Surgery staff perform more than 1800 surgical procedures, with about 1200 of these requiring use of the heart–lung machine.

Areas of specialisation include heart valve replacement and coronary bypass operations, heart valve surgery, interventional rhythmology and rhythm disorders, aortic surgery, heart transplantations, ventricular septum defect repair, and vascular surgery.

Several research projects are also taking place at the Division of Heart and Vascular Surgery, including the...
Cardiovascular Regenerative Research Programme, which targets tissue engineering and cell transplantation and focuses on the development and in vitro generation of novel cell-based therapies for cardiovascular applications.

The Division of Angiology Carries Out About 1000 Percutaneous Transluminal Angioplasties Each Year
Interventional angiologist Beatrice Amann-Vesti, MD, heads the Division of Angiology, which provides a wide range of services covering the full spectrum of vascular diseases, both in the outpatient and inpatient sections. It provides innovative treatment options for arterial occlusive diseases.

Research at the division focuses on peripheral arterial occlusive disease and microcirculation. The areas of speciality include diagnosis and therapy of peripheral arterial occlusive disease, investigation of patients with aortic aneurysm, diagnosis and therapy of venous diseases, treatment of patients with vasculitis, special examinations with primary and secondary lymphoedema, and interdisciplinary angiodysplasia consultations.

Although smaller than the Divisions of Cardiology and Heart and Vascular Surgery, the Division of Angiology, with Professor Amann-Vesti and 2 other staff, performs about 1000 percutaneous transluminal angioplasties each year. Alfred Bollinger, MD, a pioneer in vascular medicine who also served as the mentor of Professor Grünzig, founded the division.

Funding Comes From a Variety of Sources
The UHZ receives state funding, but it also classifies about one third of its patients as private, foreign, or from outside the canton of Zurich; these patients generate revenue for UHZ. However, newer areas of treatment and research receive funding through “soft” money from donations, research foundations, and strategic alliances with research-oriented pharmaceutical industry sectors.

Professor Lüscher says, “I have a foundation for cardiovascular research with a turnover of 5 million Swiss francs per year, which is supporting research in cardiovascular areas but also supports parts of the clinical programme. For instance, when we started arrhythmology 10 years ago, there was only 1 staff member, and now we have 4 and do about 300 procedures, so we also need some soft money to run this. With restrictions in budgets, it is extremely important to have a foundation that allows us to foster the new areas.”

Assistant professors such as Felix Tanner, MD, in vascular biology, receive funding through the foundation, as do fellows from between 12 and 14 different countries including Germany, Italy, Poland, Ukraine, Russia, India, China, Japan, and North Korea. Several of these fellows receive individual stipends for their work. Other funding
comes from the Swiss National Research Foundation, the European Union, the Swiss Heart Foundation, and the German Research Foundation.

“Our Vision Is to Have Translational Research From Bench to Bedside Whereby We Develop the Protocols in Animals and Then Go to Patients”

The Division of Cardiology represents one of the most frequently cited research groups in the field of cardiovascular diseases and atherosclerosis. “Over time it has, of course, changed,” says Professor Lüscher. “One of the most important contributions in the 1970s was the development of balloon angioplasty, and then it was mainly haemodynamics and research on the consequences of aortic stenosis on the left ventricle and mitral stenosis. When I came to Zurich, it was more atherosclerosis research and endothelial cell biology.” Of the subdivisions in cardiology at UHZ, imaging is particularly active, with the clinical service and the research going “hand in hand.”

Professor Lüscher adds, “We have evaluated computed tomography and coronary angiography simultaneously by using them in patients on a routine basis; magnetic resonance imaging was more of a research programme; perfusion magnetic resonance imaging was very successful here; and echocardiography today is mainly a clinical service with some academic impact. I think the biggest contribution in terms of citations—over 20,000 citations—comes from the molecular cardiology work that looks at the molecular and cellular mechanism of atherosclerosis.”

The catheterisation laboratory has a programme for patients with infarction, where researchers retrieve the thrombi and examine the inflammatory molecules. “Our vision is to have translational research from bench to bedside whereby we develop the protocols in animals and then go to patients,” Professor Lüscher says. “The translational aspect is very important for us.”

Professor Lüscher suggests that the centre’s major research contribution involves delineating the role of the endothelium in coronary artery disease. The centre has characterised this role in cells and in human arteries before going to clinical trials in the catheterisation laboratory, with more recent interest in nitric oxide and endothelium.1

“Nitric oxide was a major theme of our research,” Professor Lüscher says. “More recently, we have made a significant contribution in terms of understanding tissue factor expression: how arteries and the endothelium in particular become thrombogenic by expressing a molecular tissue factor that initiates the coagulation cascade, and how inflammation and inflammatory cytokines can change the endothelium from an antithrombotic and vasodilator surface to a prothrombotic, more vasoconstrictor type of organ. That may be crucial for ischaemia and vascular occlusion.”

Future Research Likely Will Focus on Genes and the Risk Factors That Lead to Artery Dysfunction

Work has begun on an animal model mouse that lacks a gene called P66; Giovanni Camici, BSc, and colleagues2 have already published on this, showing that the lack of this gene can lead to diabetes mellitus but not vascular disease. “There are genes that [contribute to major] risk factors such as diabetes, lipids, high blood pressure, and ageing and that actually change endothelial and vascular functions and, eventually, lead to atherosclerosis and disease,” says Professor Lüscher. “Not everybody who smokes or has high cholesterol gets atherosclerosis to the same extent, so there is an important role of genes modulating the effects of what we call risk factors.”

Work has also focused on the JNK gene product, which also has an important influence on atherosclerosis. “If you knock this gene out [of] the animals, they are less able to form foam cells, have less atherosclerosis, and have less endothelial dysfunction, so this is an important area of research for our group,” he says.

A research team is examining high-density lipoprotein from patients with myocardial infarction compared with healthy patients, to see how the protective role of high-density lipoprotein may differ. Other researchers are looking at the impact of mental stress on vascular function.

Figure 4. In the catheterisation laboratories at UHZ, researchers retrieve thrombi to examine the inflammatory molecules and carry out clinical trials.
The Division of Cardiology Has Secured a Number of Awards and Prizes

Among the awards and prizes in 2007, Giovanni Camici received the 30,000–Swiss franc Swiss Cardiology Prize from the Swiss Society of Cardiology for his article in *Circulation.*

Professor Lüscher gave the Grüntzig Lecture last year, entitled “When Mechanics Meets Biology,” at the European Society of Cardiology and has explored the mechanical damage of such procedures including restenosis and occlusion.

Other awards have gone to work on drug-eluting stents and endothelial regeneration. Professor Lüscher recently received the Khwarizmi International Award from the Iranian government for the work of the Division of Cardiology on the inflammatory role in acute myocardial infarction.

Looking Beyond National Borders to Attract Motivated and Talented People

Professor Lüscher believes that other centres can achieve global success similar to that achieved by the Cardiovascular Centre at UHZ.

He says, “In Zurich, we had the grace of being a small country, and that meant we could never fill the positions with Swiss people alone. For instance, in our faculty, out of 140 chairs I would say about 40% to 45% are foreign people. I think a mixture of people from all over the world who have competencies and are the best in some areas is really the secret for success. Basically, you have to get good people. Zurich is a nice place to live, it is very international, and the university is always very open, and that really makes it a good institution. But there are still many countries in Europe that are very secluded in terms of their academics, and that is unfortunate.”

“Probably, Cardiology and Cardiac Surgery Should Grow Together and Become a Single Discipline”

In the next decade, Professor Lüscher forecasts a change and a blending of the various disciplines in cardiac care, with cardiology and cardiac surgery becoming significantly closer.

Inevitably, the Cardiovascular Centre at UHZ will serve as an important centre in helping shape such developments. He points to the example of Professor Grüntzig performing 2% of all interventions at UHZ in 1977, whereas in 2007 the division carried out 75% of them. Professor Lüscher expects that percentage to rise, particularly with the growing emphasis on aortic valve replacements.

Professor Lüscher says, “Probably, cardiology and cardiac surgery should grow together and become a single discipline, with people interested in noninvasive cardiology, interventional cardiology, and surgical cardiology. I think the merging of these disciplines will become a very important feature of cardiovascular medicine in the future.”

**References**


Mark Nicholls is a freelance medical journalist.
This week, the premiere issue of Circulation: Arrhythmia and Electrophysiology is included with the April 22 issue of Circulation. This is one of 6 new journals to be launched in 2008 by the American Heart Association and Lippincott Williams & Wilkins, a division of Wolters Kluwer Health.

William Gregory Stevenson, MD, the journal’s editor says: “Our journal will provide a source of high quality articles focusing on advances in our understanding of the pathophysiology, diagnosis, and treatment of cardiac arrhythmias. As an associate editor [for Circulation] I have been confronted with a large number of investigations that were important and novel for the arrhythmia specialist, but in competition with studies from other disciplines in cardiology, and that could not be assigned sufficient priority for publication in Circulation. Circulation: Arrhythmia and Electrophysiology will provide an extended format for these important studies, as well as presenting a platform for airing reviews and highlighting controversies at the cutting edge of the field.”

Circulation: Arrhythmia and Electrophysiology reflects the rapid evolution of cardiac electrophysiology as a discipline in its own right and will present critical new research on topics such as devices for arrhythmia management, catheter ablation, the pathophysiology of the arrhythmia substrate, and novel biologic therapies. Commentaries and reviews on topics of special interest, editorials and opinion pieces, and other special features will provide a worldwide forum for all professionals in the field.

Bimonthly Issues Feature 3 Review Series
“Advances in Arrhythmia and Electrophysiology” includes overviews of natural history, diagnostic strategies, and treatment approaches, whereas “Basic Science for the Clinical Electrophysiologist” provides insight into basic investigations for the clinician. “Controversies in Arrhythmia and Electrophysiology” discusses controversial topics in the practice of clinical electrophysiology, providing opposing viewpoints in tandem.

Articles Published Immediately on the Web Site
Circulation: Arrhythmia and Electrophysiology is available in both print and online formats. In addition, following the premiere of the first issue, the journal will publish articles immediately upon acceptance on its Web site, http://circep.ahajournals.org.

Joseph Loscalzo, MD, PhD, editor-in-chief of Circulation and the Circulation subspecialty journal family, says, “I am delighted by the release of this first member of the Circulation family of cardiovascular subspecialty journals, and with its new editor, Dr Bill Stevenson. Under his very able leadership, the journal will no doubt become a primary source of the latest information in the field of arrhythmias and electrophysiology for the cardiology community.”

Contributions From Europeans in Issue 1

- 1967–2007: 40 Years of Invasive Clinical Electrophysiology
  This review of the history of clinical electrophysiology by one of the pre-eminent researchers in Europe, Hein Wellens, MD, FACC, discusses the evolution of the field, beginning with the contributions of Dirk Durrer, MD, from Amsterdam, the Netherlands, and Philippe Coumel, MD, FESC, from Paris, France.

- Distinguishing Properties of Cells From the Myocardial Sleeves of the Pulmonary Veins; a Comparison of Normal and Abnormal Pacemakers
  An original research article from the United Kingdom by Sandra A. Jones, PhD, from the University of Hull, James O. Tellez, PhD, and Mark R. Boyett, PhD, from the University of Manchester, Rudi Billeter, PhD, from the University of Nottingham, and Matthew K. Lancaster, PhD, from the University of Leeds.

- Editorial on the Substrate Maintaining Persistent Atrial Fibrillation
  By Michel Haissaguerre, MD, et al. from Bordeaux-Pessac, France.

- Case Report of a Videofluoroscopic Modified Barium Swallow Study for Premature Ventricular Complexes Associated Dysphagia
  By S. Stec, MD, et al. from Warsaw, Poland.

The opinions expressed in Circulation: European Perspectives in Cardiology are not necessarily those of the editors or of the American Heart Association.