Cardiac surgery: where are we going?

Ottavio Alfieri
S.Raffaele University Hospital, Milan

Senning Lecture, Zurich, June 12th 2015
Texas Heart Institute, 1970
The Pioneering Phase of Cardiac Surgery


Congenital and Valve (Closed Heart)
CPB Open Heart
Valve Surgery
CABG HTx
TAH
Åke Senning (1915-2000)
Major contributions of Prof. Senning to the treatment of heart diseases

• 1951: Pump oxygenator for CPB (experimental)
• 1953: Open heart surgery: removal of mixoma
• 1957: Atrial inversion operation for TGA
• 1958: First implantable pace-maker
• 1958: Autogenous fascia lata valve for AVR
• 1969: First heart transplant in Switzerland
• 1977: Supporting Andreas Gruntzig in first percutaneous coronary angioplasty
Since 1970....... up to now

Improvements and refinements

Consolidation and validation

Evolution and transformation
Future: where are we going?

„The trouble with the future is that it’s so much less knowable than the past.“

John Lewis Gaddis, *The Landscape of History*
CABG will be history in 2010
(Predictions of the year 2000)
MACCE to 5 Years

CABG (N=897) vs TAXUS (N=903)

Before 1 year:
- CABG: 12.4% vs TAXUS: 17.8% (P=0.002)
- 1–2 years:
  - CABG: 5.7% vs TAXUS: 8.3% (P=0.03)
  - 2–3 years:
    - CABG: 4.8% vs TAXUS: 6.7% (P=0.10)
    - 3–4 years:
      - CABG: 4.2% vs TAXUS: 7.9% (P=0.002)
      - 4–5 years:
        - CABG: 5.0% vs TAXUS: 6.3% (P=0.27)

Cumulative Event Rate (%)

P<0.001

Months Since Allocation

Cumulative KM Event Rate ± 1.5 SE; log-rank P value; *Binary rates

ITT population
Five-year results of the SYNTAX trial suggest that 71% of all patients are still best treated with CABG; however, for the remaining patients PCI is an alternative to surgery.
Joint Cardiology (ESC) and Cardiac Surgery (EACTS)

25 members from 13 European countries (reflects the 'Heart Team')

• 9 non interventional cardiologists,
• 8 interventional cardiologists,
• 8 cardiac surgeons

Extensively reviewed by external referees
Table 9. Indications for CABG versus PCI in stable patients with lesions suitable for both procedures and low predicted surgical mortality

<table>
<thead>
<tr>
<th>Subset of CAD by anatomy</th>
<th>Favours CABG</th>
<th>Favours PCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1VD or 2VD - non-proximal LAD</td>
<td>IIb C</td>
<td>I C</td>
</tr>
<tr>
<td>1VD or 2VD - proximal LAD</td>
<td>IA</td>
<td>IIa B</td>
</tr>
<tr>
<td>3VD simple lesions, full functional revascularisation achievable with PCI, SYNTAX score ≤ 22</td>
<td>IA</td>
<td>IIa B</td>
</tr>
<tr>
<td>3VD complex lesions, incomplete revascularisation achievable with PCI, SYNTAX score &gt; 22</td>
<td>IA</td>
<td>III A</td>
</tr>
<tr>
<td>Left main (isolated or 1VD, ostium/shaft)</td>
<td>IA</td>
<td>IIa B</td>
</tr>
<tr>
<td>Left main (isolated or 1VD, distal bifurcation)</td>
<td>IA</td>
<td>IIb B</td>
</tr>
<tr>
<td>Left main + 2VD or 3VD, SYNTAX score ≤ 32</td>
<td>IA</td>
<td>IIb B</td>
</tr>
<tr>
<td>Left main + 2VD or 3VD, SYNTAX score ≥ 33</td>
<td>IA</td>
<td>III B</td>
</tr>
</tbody>
</table>

- In the most severe patterns of CAD, CABG appears to offer a survival advantage as well as a marked reduction in the need for repeat revascularisation.
The certainties
Bulk of Population Growth

World population
By five-year age group, m

Source: UN

*Projection

The Economist, May 14th 2011
Areas of Activity of Cardiac Surgery

- Structural Heart Disease
- HF and Arrhythmias
- Atherosclerosis
Overlapping target

SURGERY

- Off pump
- Port access
- Endoscopic
- Robotics
- Percutaneous

CARDIOLOGY

- Valve disease
- Peripheral stenting
- CPS
- Septal ablation
- ASD/VSD closure

INVASIVENESS
Patient Centered Care

• **Team work:** Multidisciplinary team of specialists choosing the best treatment modality.

• **Individualized treatment:**
  – Treatment modality chosen according to risk assessment, clinical characteristics, anatomical considerations, wishes of the individual patient.
The likelihoods
Coronary Surgery

- LIMA
- BIMA
- Skeletonization
- Total Arterial
- No touch
- Beating Heart

Graph showing complexity vs. time with LIMA as the baseline.
Uniform standards do not apply to readmission following coronary artery bypass surgery: A multi-institutional study

Robert Lancey, MD, a Paul Kurlansky, MD, b Michael Argenziano, MD, b Michael Coady, MD, c Robert Dunton, MD, d James Greelish, MD, e Edward Nast, MD, f Samuel Gwin Robbins, MD, g Melissa Scribani, MPH, b Judy Tingley, MPH, RN, b Timothy Williams, MD, i Alex Zapolansky, MD, j and Craig Smith, MD b

For Heart Disease, a Joint Effort

Hybrid Procedure Offered in Maryland Combines Bypass, Angioplasty in Single Operation

By NASEEM SOWTI
Washington Post Staff Writer

Bypass surgery and angioplasty, often seen as opposing approaches to treating blocked blood vessels in the heart, are being combined in a single, minimally invasive procedure at the University of Maryland Medical Center (UMMC) in Baltimore.

The technique, called the simultaneous hybrid procedure, puts heart surgeons and interventional cardiologists, two types of specialists sometimes in conflict over the best approach to treating serious heart disease, in the same operating room at the same time.

"Coronary artery disease can be treated in two ways," said Robert Poston, who performs the bypass portion of the hybrid procedure at UMMC. "We're combining the best of both worlds." The procedure is safer and more efficient and shortens the patient's hospital stay, he said.

Others are less enthusiastic about the innovation.

"There's no convincing evidence that the hybrid procedure is superior," said Stuart Selkin, assistant director of cardiology at Washington Hospital Center, one of the largest and most advanced cardiac care centers in the country. It is not

1st Hybrid procedure (12/29/04)
MINIMALLY INVASIVE LIMA on LAD
MINIMALLY INVASIVE CABG: COMPLETE ARTERIAL REVASCULARIZATION VIA A SMALL THORACOTOMY

Distal anastomoses via small thoracotomy

Predischarge CT angiography
Sintax score 38
Final, 13 m. after the procedure
Heart Team: Not optimal candidate for surgery, diffuse LAD disease, a staged PCI was planned.
PROspective Global REgiStry for the Study of CTO interventions

1/2012 to 2/2014
n=632
Technical success: 92.4%
Major complications: 1.9%
Success similar w/o and with prior CABG (93.7% vs. 90.0%)

• Appleton Cardiology, WI
• Dallas VAMC/UTSW, TX
• Peaceheath Bellingham, WA
• Piedmont Heart Institute, GA
• St Luke’s Mid America Heart Institute, MO
• Torrance Medical Center, CA

Christopoulos, Karmpaliotis, Alaswad, Wyman, Lombardi, Grantham, Thompson, Brilakis et al, JIC 2014
only 8 operators performed 50 or more CTO PCI per year.
Aortic Valve Implantation
The Evolving Process

Conventional through midline sternotomy
Surgical through minimal incision
On pump, arrested heart sutureless valve replacement
Surgical apico-aortic valved conduit
Transaortic delivery
Transapical delivery
Transaxillary delivery
Transcarotid delivery
Percutaneous transfemoral

TAVI
AHA/ACC TAVI Guidelines - 2014

Class I:
- Heart Valve Team should collaborate on decisions
- Pts not suitable for AVR and survival > 12 mos

Class Ila:
- Reasonable alternative to surgical AVR in high surgical risk pts

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>COR</th>
<th>LOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical AVR is recommended in patients who meet an indication for AVR (Section 3.4) with low or intermediate surgical risk (Section 2.5 in the full-text guideline)</td>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>For patients in whom TAVR or high-risk surgical AVR is being considered, members of a Heart Valve Team should collaborate to provide optimal patient care</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td>TAVR is recommended in patients who meet an indication for AVR for AS who have a prohibitive surgical risk and a predicted post-TAVR survival &gt;12 mo</td>
<td>I</td>
<td>B</td>
</tr>
<tr>
<td>TAVR is a reasonable alternative to surgical AVR in patients who meet an indication for AVR (Section 3.4) and who have high surgical risk (Section 2.5 in the full-text guideline)</td>
<td>IIa</td>
<td>B</td>
</tr>
<tr>
<td>Percutaneous aortic balloon dilation may be considered as a bridge to surgical or transcatheater AVR in severely symptomatic patients with severe AS</td>
<td>IIb</td>
<td>C</td>
</tr>
<tr>
<td>TAVR is not recommended in patients in whom existing comorbidities would preclude the expected benefit from correction of AS</td>
<td>IIIa</td>
<td>B</td>
</tr>
</tbody>
</table>
PARTNER Study Design

Symptomatic Severe Aortic Stenosis

ASSESSMENT: High-Risk AVR Candidate
3,105 Total Patients Screened

Total = 1,057 patients
2 Parallel Trials: Individually Powered

High-Risk
n = 699

High-Risk TF
1:1 Randomization
TF TAVR vs AVR
Primary Endpoint: All-Cause Mortality (1 yr) (Non-Inferiority)

High-Risk TA
1:1 Randomization
TA TAVR vs AVR

Inoperable
n = 358

ASSESSMENT: Transfemoral Access

1:1 Randomization
TF TAVR n = 179 vs Standard Therapy n = 179
Primary Endpoint: All-Cause Mortality Over Length of Trial (Superiority)
Transcatheter Aortic-Valve Replacement for Inoperable Severe Aortic Stenosis

Two-Year Outcomes after Transcatheter or Surgical Aortic-Valve Replacement

US CoreValve High-Risk Trial

Transcatheter Aortic-Valve Replacement with a Self-Expanding Prosthesis

David H. Adams, M.D., Jeffrey J. Popma, M.D., Michael J. Reardon, M.D.,
Steven J. Yakubov, M.D., Joseph S. Coselli, M.D., G. Michael Deeb, M.D.,
Thomas G. Gleason, M.D., Maurice Buchbinder, M.D., James Hermiller, Jr., M.D.,
Neal S. Kleiman, M.D., Stan Chetcuti, M.D., John Heiser, M.D., William Merhi, D.O.,
George Zorn, M.D., Peter Tadros, M.D., Newell Robinson, M.D.,
George Petrossian, M.D., G. Chad Hughes, M.D., J. Kevin Harrison, M.D.,
John Conte, M.D., Brijeshwar Maini, M.D., Mubashir Mumtaz, M.D.,
Sharla Chenoweth, M.S., and Jae K. Oh, M.D.,
for the U.S. CoreValve Clinical Investigators*
ABSTRACT

BACKGROUND
We compared transcatheter aortic-valve replacement (TAVR), using a self-expanding transcatheter aortic-valve bioprosthesis, with surgical aortic-valve replacement in patients with severe aortic stenosis and an increased risk of death during surgery.

METHODS
We recruited patients with severe aortic stenosis who were at increased surgical risk as determined by the heart team at each study center. Risk assessment included the Society of Thoracic Surgeons Predictor Risk of Mortality estimate and consideration of other key risk factors. Eligible patients were randomly assigned in a 1:1 ratio to TAVR with the self-expanding transcatheter valve (TAVR group) or to surgical aortic-valve replacement (surgical group). The primary end point was the rate of death from any cause at 1 year, evaluated with the use of both noninferiority and superiority testing.

RESULTS
A total of 795 patients underwent randomization at 45 centers in the United States. In the as-treated analysis, the rate of death from any cause at 1 year was significantly lower in the TAVR group than in the surgical group (14.2% vs. 19.1%), with an absolute reduction in risk of 4.9 percentage points (upper boundary of the 95% confidence interval, −0.4; P<0.001 for noninferiority; P = 0.04 for superiority). The results were similar in the intention-to-treat analysis. In a hierarchical testing procedure, TAVR was noninferior with respect to echocardiographic indexes of valve stenosis, functional status, and quality of life. Exploratory analyses suggested a reduction in the rate of major adverse cardiovascular and cerebrovascular events and no increase in the risk of stroke.

CONCLUSIONS
In patients with severe aortic stenosis who are at increased surgical risk, TAVR with a self-expanding transcatheter aortic-valve bioprosthesis was associated with a significantly higher rate of survival at 1 year than surgical aortic-valve replacement. (Funded by Medtronic; U.S. CoreValve High Risk Study ClinicalTrials.gov number, NCT01240902.)
TAVI Technologies in randomized trials

First Generation Devices

Edwards Lifesciences  Medtronic CoreValve
New Self-Expanding TAVI Systems

PORTICO
(St. Jude)

ENGAGER
(Medtronic)

ACURATE
(Symetis)

EVOLUT R
(Medtronic)
Not All New TAVI Systems are Self-Expanding Designs

**Direct Flow:**
Polyester fabric cuff with two inflatable rings; positioning wires for placement; bovine tissue valve

**Lotus:**
Nitinol wire frame, bovine tissue valve; outer PU skirt; mechanical expansion and locking

**Jena Valve:**
Nitinol-based, positioning feelers and clipping mechanism; porcine aortic root valve

**SAPIEN 3:**
balloon exp (4 sizes), cobalt frame; bovine tissue valve; outer skirt; precise positioning
...Expanding TAVI...

"Off-Label" TAVI

- Bicuspid aortic valve
- Pure Native Valve Aortic Regurgitation
- TAV-in-SAV
- Moderate and low surgical risk
- Anatomical boundaries
- Subclavian and aortic access
- Mitral prosthesis and Mitral disease
- TAV-in-TAV
Patients undergoing TAVI procedure (N = 1544)
Pazients reporting difficult thoracic approach, porcelain aorta or severe frailty score are excluded

Log-EuroSCORE:
- Mean = 14.1 ± 11.8
- Median = 10.3
- 75th percentile = 16.9
New perspectives: transcatheter aortic valve implantation in the year 2020

In 2020 transcatheter aortic valve implantation (TAVI) will be the default treatment in patients with aortic stenosis

Performance
Safety (mortality, stroke)
Vascular complications
Perivalvular leaks
Conduction defects
Durability
New perspectives: transcatheter aortic valve implantation in the year 2020

In 2020 transcatheter aortic valve implantation (TAVI) will be the default treatment in patients with aortic stenosis

Surgical AVR will be limited to contraindications to TAVI and to pts requiring combined cardiac or aortic surgery.
Sutureless aortic prosthesis

Medtronic 3f Enable
Sorin Perceval S
Edwards Intuity
THE EVOLVING APPROACH TO MITRAL VALVE INTERVENTIONS

open heart
- Sternotomy
- Minimally Invasive
- Robotic

closed heart
- Percutaneous
Percutaneous Devices Landscape 2010/2015

- **Edge-to-Edge**
  - MitraClip*
  - Edwards Mobius

- **Coronary sinus annuloplasty**
  - Cardiac Dimensions Carillon*
  - Edwards Monarc
  - Viacer-PTMA*
  - Cerclage annuloplasty

- **Indirect annuloplasty**
  - Ample PS3
  - St. Jude AAR
  - Mycor i-Coapsys

- **Direct annuloplasty**
  - Mitralign*
  - QuantumCor
  - MiCardia ebCor

- **Mitral valve replacement**
  - EndoValve
  - CardiAQ
  - Valtech Cardiovalve
  - ValveXchange

- **Chordal shortening and other**
  - Cardiosolutions
  - Mitra-Spacer*
  - NeoChord
  - Valtech VChordal
Clinical update

The future of transcatheter mitral valve interventions: competitive or complementary role of repair vs. replacement?


Aims
Rheumatic heart disease (RHD) accounts for over a million premature deaths annually; however, there is little contemporary information on presentation, complications, and treatment.

Methods and results
This prospective registry enrolled 3343 patients (median age 28 years, 66.2% female) presenting with RHD at 25 hospitals in 12 African countries, India, and Yemen between January 2010 and November 2012. The majority (63.9%) had moderate-to-severe multivalvular disease complicated by congestive heart failure (33.4%), pulmonary hypertension (28.8%), atrial fibrillation (AF) (21.8%), stroke (7.1%), infective endocarditis (4%), and major bleeding (2.7%).

One-quarter of adults and 5.3% of children had decreased left ventricular (LV) systolic function; 23% of adults and 14.1% of children had dilated LVs. Fifty-five percent (n = 1761) of patients were on secondary antibiotic prophylaxis. Oral anticoagulants were prescribed in 69.5% (n = 946) of patients with mechanical valves (n = 501), AF (n = 397), and high-risk mitral stenosis in sinus rhythm (n = 48). However, only 28.3% (n = 269) had a therapeutic international normalized ratio. Among 1825 women of childbearing age (12–51 years), only 3.6% (n = 65) were on contraception. The utilization of valvuloplasty and valve surgery was higher in upper-middle compared with lower-income countries.

Conclusion
Rheumatic heart disease patients were young, predominantly female, and had high prevalence of major cardiovascular complications. There is suboptimal utilization of secondary antibiotic prophylaxis, oral anti-coagulation, and contraception, and variations in the use of percutaneous and surgical interventions by country income level.
Direct annuloplasty

the only approach with a proven surgical background

Mitralign
- Bident
  - Arterial access
  - Transannular cinching

GDS
- Accucinch
  - Arterial access
  - Subannular cinching

Valtech
- Cardioband
  - Venous access
  - Annular fixation
Transcatheter Mitral Valve Implantation

• Few extreme human cases with high acute mortality
• Rapid developing field

• **Potential advantages:**
  – easier
  – one device for all
  – reproducible
  – predictable result

• **Open issues:**
  – Safety
  – PV leaks
  – Hemodynamics (vortex)
  – Durability
# MV Replacement

Transcatheter mitral implant devices

<table>
<thead>
<tr>
<th>Company</th>
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<td>Caisson</td>
<td>Caisson TMR</td>
<td>TF</td>
<td>preclinical</td>
</tr>
<tr>
<td>CardiaQ</td>
<td>TMVI-TA</td>
<td>TF / TAp</td>
<td>clinical</td>
</tr>
<tr>
<td>Edwards</td>
<td>Fortis</td>
<td>TAp / TF</td>
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<td>Emory U</td>
<td>MitraCath</td>
<td>NA</td>
<td>Early develop.</td>
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<tr>
<td>HighLife</td>
<td>HighLife MVR</td>
<td>TAt</td>
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<td>IP</td>
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<td>Medtronic</td>
<td>TMVR</td>
<td>TAt / TF</td>
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<td>Micro Interv. Devices</td>
<td>Endovalve TA</td>
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<td>MitrAssist</td>
<td>Mitrassist valve</td>
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<td>ValtechCardio</td>
<td>Cardiovalve</td>
<td>TF</td>
<td>preclinical</td>
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Fully Percutaneous Mitral Repair
The complementary role of transcatheter techniques

- Stand-alone annuloplasty: early treatment FMR /symmetric tethering
- Stand-alone Mitraclip: FMR with asymmetric tethering (IMR)
- Stand-alone Mitraclip: DMR with little annular dilatation
- Combined Annuloplasty and MitraClip: DMR with important annular dilatation and advanced FMR
- MV Replacement: advanced organic MR and advanced FMR
HF: an evergrowing problem

• Approximately 1-2% of adult population in developed countries.
• Prevalence rising to ≥10% among persons 70 years of age or older.

(ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012. EHJ 2012; 33:1787–1847)

Writing Group Members et al.
Circulation 2010; 121:e46-e215.

Hospital discharge for HF from 1979 to 2006.
Writing Group Members et al.
Circulation 2010; 121:e46-e215.
Many ideas...

- **Left ventricle restoration**
  - Restraining devices
    - CorCap
    - ParaCor
    - BACE
    - Coapsys
  - Remodelling
    - Bioventrix
    - Parachute
  - Biomaterials
    - Stem cells
    - Cytokines
    - Matrixes (Algisyl)

- **Mechanical circulatory support**
  - External counterpulsation
    - Sunshine
  - Partial VADs
    - Symphony
    - Circulite
  - New VADs
    - HeartAssist 5
    - HeartMate III - HeartMate X
    - Miniature Heartware
    - *Transcutaneous Energy Transfer*

- **Others**
  - Interatrial shunt device
June 2006 – December 2011: Destination Therapy

INTERMACS Patient Profile Levels 3-7

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<th>Risk Factor Settings</th>
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<td>BMI</td>
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<tr>
<td>Dialysis</td>
<td>No</td>
</tr>
<tr>
<td>Cancer</td>
<td>No</td>
</tr>
<tr>
<td>Continuous Flow Pump</td>
<td>Yes</td>
</tr>
<tr>
<td>Bi-VAD</td>
<td>No</td>
</tr>
<tr>
<td>BUN</td>
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</tr>
</tbody>
</table>

Probability of Death by 2 years

Previous Cardiac Surgery

No Previous Cardiac Surgery

Age (years)

Transplant Reference Line
Mechanical Circulatory Support
New VADs

HeartAssist 5
HeartMate III
HeartMate X
Miniature Heartware

Fully Implantable System
Transcutaneous Energy Transfer

Transapical miniaturized ventricular assist device: design and initial testing.
Conventional aortic surgery repair  Endovascular aortic repair
The unknown
The role of the cardiac surgeon in the future scenario of treatment of cardiac diseases
Recruitment to UK cardiothoracic surgery in the era of public outcome reporting

Stephen Westaby*, Kamran Baig, Ravi De Silva, Jonathan Unsworth-White and John Pepper

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Papworth Hospital, Cambridge, UK
Plymouth Hospitals NHS Trust, Plymouth, UK
Royal Brompton Hospital, London, UK
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Abstract

OBJECTIVES: Since 1999 important widely publicized issues have affected morale in UK cardiothoracic (CT) surgery. Because more surgeons are needed, we sought to investigate whether these events have affected recruitment and demographic change in the specialty between 1999 and 2014.

METHODS: We collected information on UK consultant CT surgeons using the SCTS public portal, the GMC Specialist Register and the NHS Annual Workforce Census via the Health & Social Care Information Centre. We analysed the demographics of UK CT surgeons with regard to country of primary medical qualification and ethnicity between 1999 and 2014. We compared the changes with other surgical specialties, cardiology and respiratory medicine.

RESULTS: There has been a worrying decline in UK medical graduates entering the specialty and a 4-fold increase (282%) in consultant appointments from Europe. Whilst consultant numbers expanded by 83% overall, 59% of congenital heart surgeons, 46% of thoracic surgeons and 36% of adult cardiac surgeons are overseas graduates. It is found that 5% are female. Currently, only 32% of trainee surgeons are UK graduates. Of those receiving UK Certificate of Completion of Training in 2013, only 18% were UK graduates compared with 68% in 2000. Comparison with other specialties shows fewer UK graduates in CT surgery with the exception of Obstetrics and Gynaecology (52%). In cardiology, 77% are UK graduates with only 8% from Europe.

CONCLUSIONS: Repeated negative messages have had a detrimental influence on recruitment. Because 55% of UK medical graduates, but less than 5% of CT surgeons are female, recruitment problems may worsen. Action is needed to restore interest in the specialty.

Keywords: Recruitment • Training • Mortality • Surgeon-Specific • Public reporting
Figure 1: Pie charts illustrating the changes in demographics of UK Cardiothoracic Surgery between 1999 and 2014. Blue shows the percentages of UK graduates, Red European and Green Other International Medical graduates.
Cardiac surgery lost its attraction? Possible reasons

- Profession physically and psychologically demanding
- Poor lifestyle
- Exposure to external scrutiny and publication of outcomes
- Defensive practice
- Little innovation
- Limited range of operations
- Experience and expertise challenged by limited working hours
How to counteract loss of attraction

• Multidisciplinary environment and teamwork
• Large units, large teams, high number of pts.
• Innovations and new technologies
• New skills
• Disease oriented groups
• Research (clinical, translational) and scientific production
• Tailored education
Spotlight: Ottavio Alfieri MD, FETCS, FESC

“Education Must Be Tailored to Create Unique and Special Professional Profiles”

Ottavio Alfieri, professor and chair of cardiac surgery and director of the Cardiothoracic and Vascular Department, San Raffaele University Hospital, Milan, Italy, and president elect of the European Association for Cardiothoracic Surgery, talks to Judy Ozkan, BA.
Today: What happens in the world

Cardiac Surgery is growing!
Prevalence of rheumatic heart disease

(Carapetis et al. Lancet Inf Dis 2005;5:685-94)
Characteristics, complications, and gaps in evidence-based interventions in rheumatic heart disease: the Global Rheumatic Heart Disease Registry (the REMEDY study)

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Figure 2 Utilization of valve surgery and valvuloplasty in children and adults from low-income, lower-middle-income, and upper-middle-income countries.
THE EXTRA VALUE OF CARDIAC SURGERY

• Cooperation across the borders
• Bridge to peace
• Symbol of humanitarian help
• Driving force to a better world