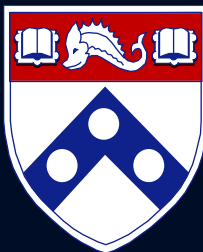


Aortic Surgery Education in the USA:

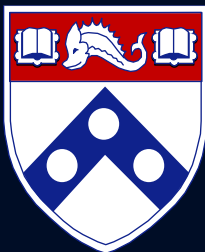
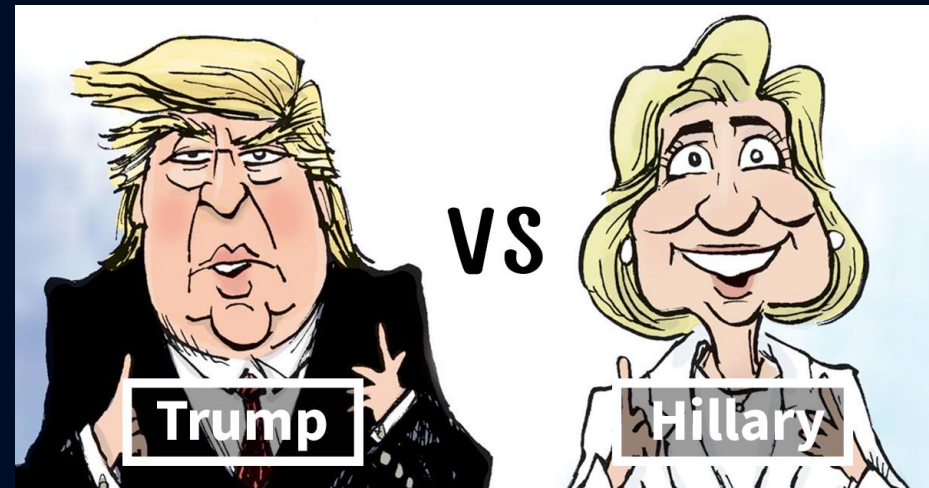
The Cardio-Aortic Paradigm

Nimesh D. Desai M.D. Ph.D.

Co-Director, Thoracic Aortic and Vascular Center for Excellence
Hospital of the University of Pennsylvania

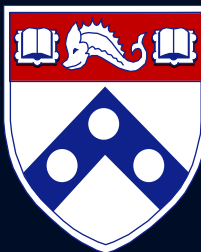


Disclosures



Cardiothoracic Surgery Training: US perspective

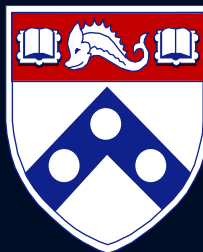
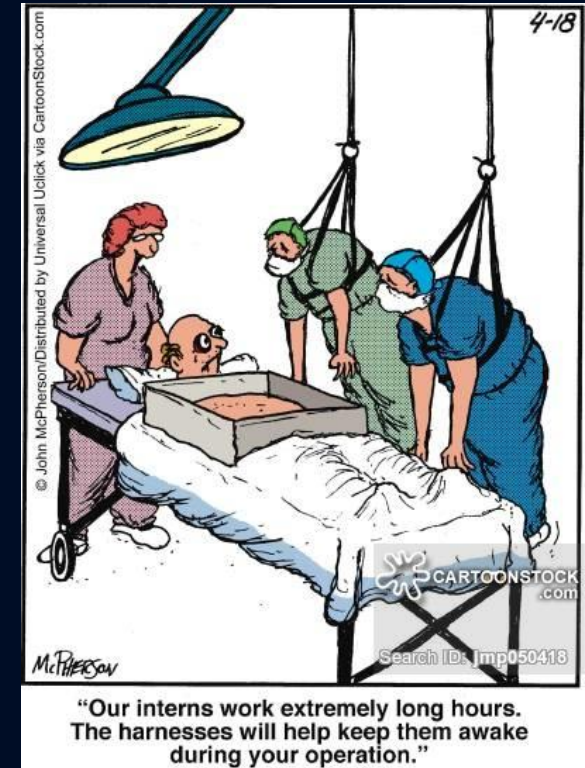
- Traditional Training Pathway
 - 5 years General Surgery
 - 2-3 years Cardiothoracic Surgery
- Fast-track Pathway
 - 4 years of General Surgery
 - 3 years Cardiothoracic Surgery
- Integrated Pathway
 - 6 years Cardiothoracic Surgery
 - Likely ONLY training pathway in next 10 years



Surgical Volume (Intensity)

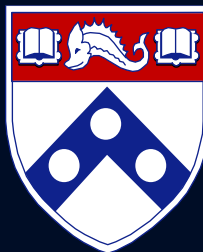
ABTS

- The Board's operative experience requirements include an annual average of 125 major operations performed by each resident based on the following lengths of training programs:
- 2-year programs: 125 major cardiothoracic operations for each year, for a total of 250 major cases;
- 3-year programs: 125 major cardiothoracic operations for each year, for a total of 375 major cases;
- 4/3 joint training programs: 125 major cardiothoracic operations for the last two years of training, for a total of 250 major cases;



Surgical Volume (Intensity)

- 6-year programs:
- PGY 1-3: 375 operations averaged over 3 years of which 125 must be cardiothoracic operations
 - up to 50 which may be component cases that include sternotomy and closure, thoracotomy and closure, LIMA takedown, saphenous vein harvest, aortic and venous cannulation, proximal and distal anastomosis, other vascular anatomosis, gastric/esophageal mobilization).
- PGY 4-6: 125 major cardiothoracic operations for each year, for a total of 375 major cases;



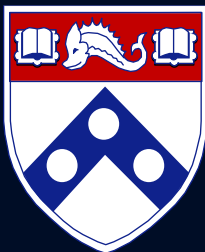
Details...

Cardiac Focused		Requirements	General Thoracic Focused	
Total	Subtotal		Subtotal	Total
		CONGENITAL HEART DISEASE		
10		Primary surgeon		
10		First assistant		
		Primary surgeon or first assistant		10
20		Subtotal Congenital Heart Disease Experience		10
		ADULT CARDIAC		
50		Acquired Valvular Heart Disease Any combination of mitral valve, aortic valve, and/or tricuspid valve replacement or repair. **Tricuspid valve procedures performed with CABG can be double-counted with CABG		25
80		Myocardial Revascularization		40
	15	Re-Do Sternotomy **Can be double-counted with any cardiac procedure	5	
20		Interventional Skills or Procedures Any combination of intra-aortic balloon pump (IABP), intravascular ultrasound, angiography, transvenous pacemaker insertion, image-guided intervention over a wire, percutaneous tracheostomy, tracheal/esophageal stent placement, PleurX® catheter (or similar pleural drainage catheter) insertion, ultrasound-guided pigtail catheter placement for pleural drainage, radiofrequency ablation, and TEVAR.		20
10		Conduit Dissection and Preparation Open or endoscopic saphenous/radial vein harvest and preparation **Can be double-counted with CABG		5
10		Aortic Procedures Any combination of ascending aorta/aortic root replacement, descending aortic replacement, TEVAR, aortic dissection, aortic trauma **Can be double-counted with CABG/Valve Procedures ** TEVAR can be double-counted as an aortic procedure and interventional skills		5
5		Arrhythmia Surgery Left atrial or biatrial maze, pulmonary vein isolation,		0

The Bavaria Orders of Cognitive Sophistication

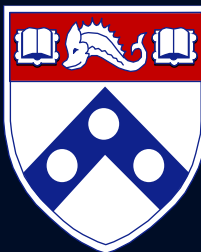


- Knowing what to Do
- Know what **NOT** to Do
- The Exquisite art of Timing.



Back in 2007...

We started a
collaborative
TAVR
program with
Major surgical
involvement



Design of an Endovascular program

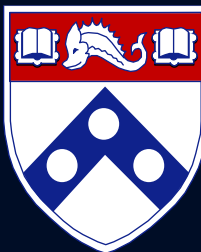


First Hybrid OR at Penn – now have 3

Primary visit to surgical clinic, now we see TAVR eval together

Pts come to surgical service postop and o/p follow-up with surgeons

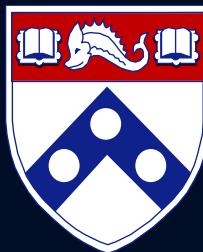
TAVR team surgeons all have full complement of wire skills



Preeminence of the Heart Team

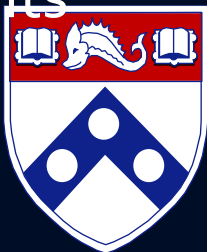
■ Extends Beyond TAVR

- Dissection is the CT Surgeon's Disease
- Cardiologist naturally seek help from CT surgeons
- TAVR Skill set:
 - CTA analysis
 - Wire/Catheter Skills (large bore)
 - Percutaneous Access
 - Understanding the technology... and its limitations
 - Ability to perform the open operation when needed



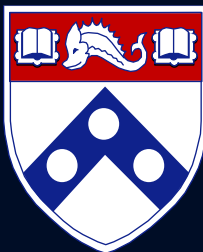
NCD requirements for FDA-approved TAVR devices and indications

1. Participation in a qualified national registry
2. Patient eligibility for TAVR determined by two cardiac surgeons
3. Pre-op and post-op care of patient by heart team
4. Sufficient hospital infrastructure
 - E.g., Sufficient space, in a sterile environment, to accommodate necessary requirement for cases with and without complications
5. ***Joint participation of interventional cardiologist and cardiovascular surgeon in the TAVR procedure***
6. Heart team and hospital program experience requirements
 - Requirements vary based on whether site has previous TAVR experience: 50 open AVR, 1000 cath, 400 PCI



Innovation in Aortic Surgical Procedures

- Components of the System:
 - Strong interaction between CT surgeons, Vascular Surgeons, Interventional Cardiology, Neurology, Radiology
 - System of Transfer and Referral
 - Hybrid Operating Room –Therapeutic and Diagnostic Suite
 - Careful scrutiny of outcomes and continuous quality improvement.



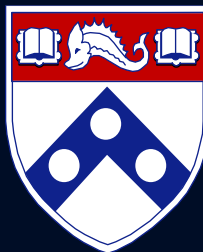
Dedicated Aortic Fellowship Opportunity



**All AORTA,
All the Time!!!**

Similar programs at:
Houston
Stanford
Northwestern
Pittsburgh
Emory
Columbia
And others

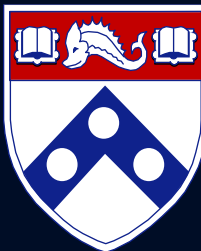
- Dedicated 1 year focused on Aortic Surgery including full endovascular skill set
- 2 months dedicated cardiology cath lab
- Dedicated Vascular surgery time if requested
- Expected to be able to perform diagnostic cath independently, significant exposure to PCI, ASD, Mitraclip
- Scrub on all TEVAR cases (>50/year at our center)
- 1st right to all TAVR cases (>350/year in 2 campuses)





c.July 2008

Cardiothoracic Surgery Fellow IS the interventional fellow....



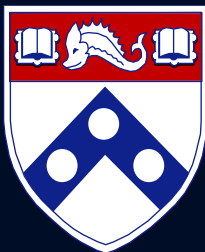
PENN Typical Endovascular Caseload

2+1 Traditional Pathway

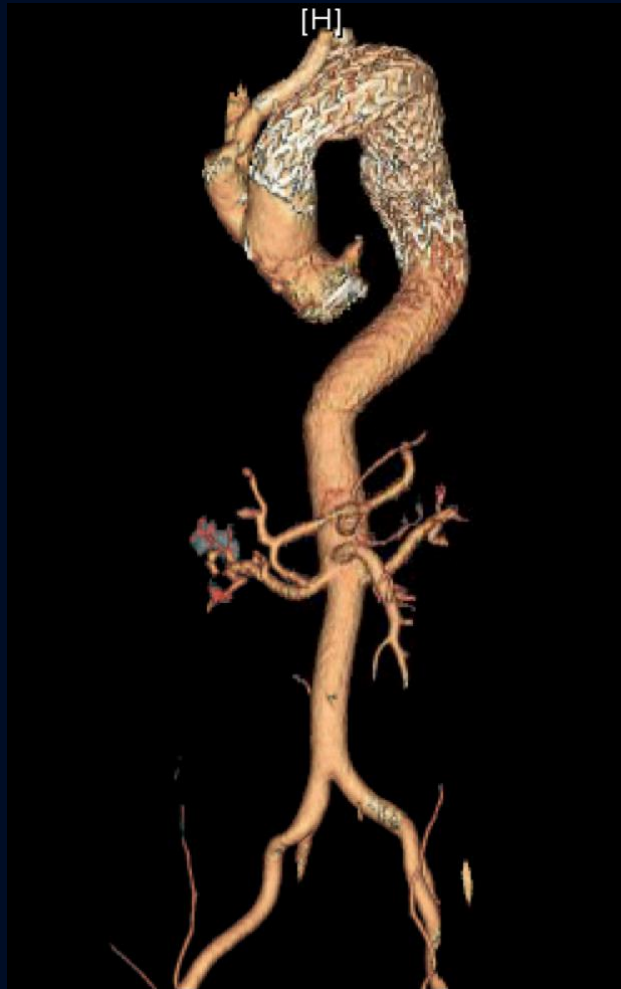
- 75+ TAVR procedures as PRIMARY operator
- 20+ TEVAR procedures as PRIMARY operator
- 150+ small bore cath procedures with IC
- >500 Major open cases
 - 25 Heart Tx, 15 Lung Tx
 - 50 Mitral repair
 - >100 Major open Aortic

1 year Aortic:

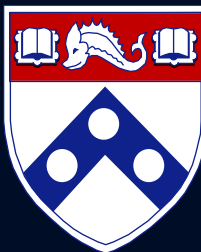
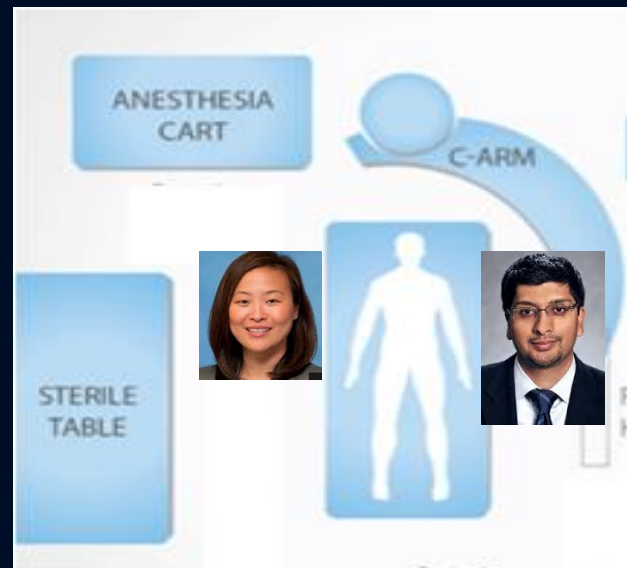
>150 Aortic cases including
Redos, Type A, thoraco
>30 TEVAR
>50 TAVR
150 Cath cases



2014 Aorta Live case from Philadelphia



- Zone 2 Arch with antegrade TEVAR + AVR
- 22 min ACP time
- 92 min X-clamp time
- No complications



Penn Aortic Diaspora



Double Board Certified Vascular and Cardiac Surgery Trainees



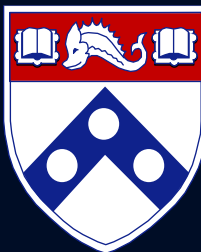
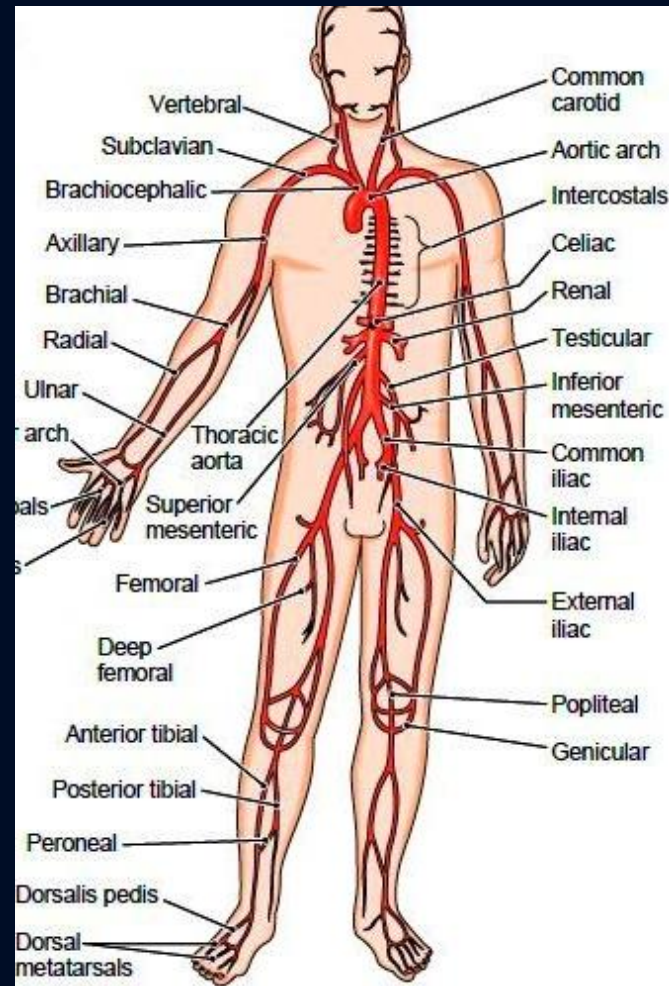
Christine Herman
Halifax, Canada



Gabor Bagameri
Virginia, USA



Marvin Atkins
Current CT fellow



Conclusions

- *Cardio-Aortic Surgery in a new emerging multidisciplinary specialty*
- *Cardio-Aortic surgeons are the natural leaders of this team*
- *Cardio-Aortic surgeons should have strong interventional and open skills to perform these cases*

