Society of Thoracic Surgeons in the 21st Century

Keith S. Naunheim, M.D.
President, Society of Thoracic Surgeons
I only wish
Surgeon Demographics

Ikonomides JS
Ann Thorac Surg 2016; 102:2118

4343 active STS members
29% response rate
Median age 54 yrs

Over 7300 members in 95 countries

Academic 37%
Hospital employed 40%
Private practice 18%
Govt employed 2%
Other 3%
STS Mission

Enhance the ability of cardiothoracic surgeons to provide the highest quality patient care through education, research, and advocacy

How the hell do we do that?
Funding Research

In fiscal year 2017-18, the TSF Raised $1.5 million dollars for charitable use. Gave almost $900,000 in awards to surgeons. Since 1998 as the TSFRE, $16 million for CT surgery research/education. 200 research and fellowship grants awarded. Basic, applied & health policy research. Residents, early & mid career attendings.
STS Databases

Adult Cardiac
1080 sites
6.5 million
51 papers

TVT Registry
570 sites
140,000

Congenital Cardiac
117 sites
475,000
31 papers

General Thoracic
288 sites
560,000
19 papers

STS IN THE 21st CENTURY
**Adult Cardiac**
- 1080 sites
- 95% of cases
- 6.5 million cases

**TVT Registry**
- 570 sites
- 100% of cases
- 140,000 cases

**STS Intermacs**
- 163 sites
- 99% of cases
- >19,000 cases

**General Thoracic**
- 288 sites
- 35% of cases
- 560,000 cases
Cardiac Surgery Trends

STS IN THE 21st CENTURY

CABG
AVR
MVR


Numbers: 0, 20000, 40000, 60000, 80000, 100000, 120000, 140000, 160000, 180000
Cardiac Surgery Trends

CT SURGERY IN THE USA STS IN THE 21st CENTURY

US population All + 7.7%
≥ 65 + 24%

CABG

AVR

MVR
Cardiac Surgery Trends

STS IN THE 21st CENTURY

CABG

Off Pump 12%
IMA 99%, BIMA 5%, Radial 5%

CABG

AVR

MVR
Cardiac Surgery Trends

STS IN THE 21st CENTURY

- CABG
  - Off Pump: 12%
  - IMA: 99%, BIMA: 5%, Radial: 5%
- MVR
  - Repair/Replace: 60/40
- AVR
- MVR

Year: 2008 to 2017
Cardiac Surgery Trends

CT SURGERY IN THE USA

STS IN THE 21st CENTURY

CABG

CABG Off Pump 12%
IMA 99%, BIMA 5%, Radial 5%

MVR Repair/Replace 60/40

AVR Declining volumes

AVR

MVR

Declining volumes

STS Databases

**STS IN THE 21st CENTURY**

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Cardiac Surgery Trends

SAVR vs TAVR

STS/ACC TVT Registry March 2018

High risk
Intermediate
Low risk

STS IN THE 21st CENTURY

SAVR
TAVR

AVR
AVR & CABG
TAVR
Moral of the Story

TAVR is absolutely here to stay
TMVR is probably here to stay
If you  
   a. Are under the age of 55
   b. Want to implant valves
It’s time to get some wire skills
STS Databases

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STS Intermacs Database

LVAD Intermacs
Over 160 programs
Over 19000 patients
Continued growth

NIH
National Heart, Lung, and Blood Institute

International Society for Heart & Lung Transplantation
The Society of Thoracic Surgeons
LVAD Trends

Intermacs Annual Report 2017

Implants: June 2006 – December 2017, n=13337
Data entered through January 2018

- Continuous Flow Intracorporeal LVAD Pump - Axial
- Continuous Flow Intracorporeal LVAD Pump - Centrifugal
- Pulsatile Flow Intracorporeal TAH
- Pulsatile Flow Intracorporeal LVAD Pump
- Pulsatile Flow Paracorporeal LVAD Pump

Axial Centrifugal

MOMENTUM 3

HeartMate II vs III
Centrifugal flow in III
Fewer strokes
Fewer reoperations

NEJM 2018; 378:1386
ECMO Trends

McCarthy et al Sem Thorac Cardiovasc Surg 2015; 27:81
Evolving Your Practice

LVAD
ECMO

STS IN THE 21st CENTURY
STS Databases

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Thoracic Surgery Trends

National Lung Screening trial NEJM 2011

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Person Years</th>
<th>Lung ca Deaths</th>
<th>Mortality per 10,000</th>
<th>Mortality Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDCT</td>
<td>144,103</td>
<td>356</td>
<td>247</td>
<td>20%</td>
</tr>
<tr>
<td>CXR</td>
<td>143,368</td>
<td>443</td>
<td>309</td>
<td>p = 0.004</td>
</tr>
</tbody>
</table>

“Screening with low dose chest CT conclusively reduces mortality from lung cancer in high risk patients.”

Medicare & USPSTF cover for screening
Thoracic Surgery Trends

Suppositions

Screening will lead to smaller, early stage lesions

Americans want less invasive treatment methods

Increased usage of minimally invasive surgery

Increased usage of sub lobar resections

Increased usage of non surgical therapy (SBRT)
# Thoracic Surgery Trends

## STS IN THE 21st CENTURY

### STS - Minimally Invasive Lobectomy for Clinical Stage 1 Lung Ca

<table>
<thead>
<tr>
<th>Harvest</th>
<th>Date</th>
<th>Minimally Invasive Procedures</th>
<th>Total Procedures</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2014</td>
<td>July 2011 - June 2014</td>
<td>10112</td>
<td>15869</td>
<td>63.7%</td>
</tr>
<tr>
<td>Fall 2015</td>
<td>July 2012 - June 2015</td>
<td>11,178</td>
<td>16,686</td>
<td>67.0%</td>
</tr>
<tr>
<td>Spring 2016</td>
<td>Jan 2013 - Dec. 2015</td>
<td>12,314</td>
<td>18,081</td>
<td>68.1%</td>
</tr>
<tr>
<td>Fall 2016</td>
<td>July 2013 - June 2016</td>
<td>12,502</td>
<td>17,515</td>
<td>71.4%</td>
</tr>
<tr>
<td>Spring 2017</td>
<td>Jan 2014 - Dec. 2016</td>
<td>13,393</td>
<td>18,378</td>
<td>72.9%</td>
</tr>
<tr>
<td>Fall 2017</td>
<td>July 2014 - June 2017</td>
<td>14,521</td>
<td>19,509</td>
<td>74.4%</td>
</tr>
</tbody>
</table>

Limited to the STS General Thoracic Database
Thoracic Surgery Trends

da Vinci® surgery adoption in lobectomy

Unpublished quarterly analysis of the Premier Database
Thoracic Surgery Trends

Kapadia et al Ann Thorac Surg 2017; 104:1881

SEER Data
2000-2010
Stage I
NSCLC Resections

Pneumo 4 → 2%
Lobe 83 → 80%
Sublobar 13 → 18%
Adoption of Stereotactic Body Radiotherapy for Stage IA Non-Small Cell Lung Cancer Across the United States

Jordan A. Holmes, Timothy M. Zagar, Ronald C. Chen

Affiliations of authors: Department of Radiation Oncology, University of North Carolina at Chapel Hill, Chapel Hill, NC (JAH, TMZ, RCC); University of North Carolina-Lineberger Comprehensive Cancer Center, Chapel Hill, NC (RCC); Sheps Center for Health Services Research, University of North Carolina at Chapel Hill, Chapel Hill, NC (RCC).

National Cancer Database (70% of all cancer pts) 2008 to 2013 107,233 pts stage IA NSCLC Demographics, comorbidity, treatment type & year
Trends in SBRT

Holmes et al. JNCI Ca Spect 2017; 1:1-6

Are patients getting adequate treatment?

No RCT proves SBRT is equivalent

No RCT proves SBRT isn’t
Mission

Highest quality clinical care

Research

Education

Advocacy
Thoracic Meetings

Symposium on
Robotic Thoracic Surgery

May 18-19, 2018 • Chicago, IL
sts.org/roboticthoracic

New in 2018!
MULTIDISCIPLINARY THORACIC CANCERS SYMPOSIUM
BRINGING PERSONALIZED CARE TO YOUR PATIENTS
HILTON SAN DIEGO | SAN DIEGO | MARCH 14-16, 2019
Cardiothoracic Meetings
CT SURGERY IN THE USA

15th Annual
Multidisciplinary Cardiovascular and Thoracic Critical Care Conference

October 4-6, 2018
Omni Shoreham Hotel
Washington, DC
Cardiothoracic Meetings

November 8-9, 2018
Shenyang, China

Chinese Society of Thoracic and Cardiovascular Surgery
Cardiac Meetings

Symposium on
Robotic Cardiac Surgery:
Mitral Valve Repair,
Coronary Bypass, and More
Cardiac Meetings

STS/ELSO
ECMO
Management Symposium

July 13-15, 2018
USF Health Center for Advanced Medical Learning and Simulation
TAMPA, FLORIDA

sts.org/ecmo
MASTERS IN INNOVATIVE STRUCTURAL HEART AND VALVE THERAPY:
A Case-Based and Hands-On Symposium

December 1-2, 2017
Chicago
SWISSÔTEL CHICAGO
Cardiac Meetings

STS/EACTS Latin America Thoracic and Cardiovascular Surgery Conference

Hilton Cartagena, Colombia

www.CardiovascularSurgery.org
www.EACTS.org
STS Annual Meeting

Didactic Sessions

Tech Con

STS University
Annals of Thoracic Surgery

Monthly CME Articles in General Thoracic Surgery

annalsthoracicsurgery.org
Mission

Highest quality clinical care

Research

Education

Advocacy
STS Legislative Fly-Ins
Summer and Fall 2018
Washington, DC

sts.org/fly-in
The Patient Guide to Heart, Lung, and Esophageal Surgery
A Website Presented by Cardiothoracic Surgeons Committed to Improving Patient Care
Available in English and Spanish
Future Trends

Workforce
Technology
Transparency

STS IN THE
21st CENTURY
The Age of Darkness

CT Surgery Applications

Total Number of Applicants
Active Positions Available
U.S. Medical School Graduate Applicants

- Total Number of Applicants
- Active Positions Available
- U.S. Medical School Graduate Applicants
CT Surgery Resurgence

STS IN THE 21st CENTURY

Bar chart showing:
- Two/Three Year Standard Positions: 92 Applicants
- Two/Three Year Standard Applicants: 125 Applicants
Active Physicians

AAMC Data www.aamc.org/data/workforce/reports/458712/1-3chart.html

STS IN THE 21st CENTURY

All specialties: 34%

Specialties:
- Peds: 60%
- Ob/Gyn: 50%
- Derm: 40%
- Fam Med: 30%
- IM: 20%
- EM: 15%
- Rads: 10%
- Surgery: 7%
- ENT: 5%
- Urology: 3%
- Neurosurgery: 2%
- Thoracic surgery: 1%
- Ortho: 1%
### Demographics

#### The Society of Thoracic Surgeons

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Number of Members*</th>
<th>Number of Women Members</th>
<th>Percentage of Women Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2,509</td>
<td>21</td>
<td>0.8%</td>
</tr>
<tr>
<td>2005</td>
<td>3,347</td>
<td>62</td>
<td>1.9%</td>
</tr>
<tr>
<td>2010</td>
<td>5,899</td>
<td>266</td>
<td>4.5%</td>
</tr>
<tr>
<td>2015</td>
<td>7,012</td>
<td>570</td>
<td>8.1%</td>
</tr>
</tbody>
</table>
Active Trainees

AAMC Data www.aamc.org/data/workforce/reports/458712/1-3chart.html

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peds</td>
<td>70%</td>
</tr>
<tr>
<td>OB/GYN</td>
<td>80%</td>
</tr>
<tr>
<td>DERM</td>
<td>60%</td>
</tr>
<tr>
<td>FAM MED</td>
<td>50%</td>
</tr>
<tr>
<td>IM</td>
<td>40%</td>
</tr>
<tr>
<td>EM</td>
<td>30%</td>
</tr>
<tr>
<td>RADS</td>
<td>20%</td>
</tr>
<tr>
<td>SURGERY</td>
<td>20%</td>
</tr>
<tr>
<td>ENT</td>
<td>20%</td>
</tr>
<tr>
<td>UROLOGY</td>
<td>20%</td>
</tr>
<tr>
<td>NEUROSURG</td>
<td>20%</td>
</tr>
<tr>
<td>THOR SURG</td>
<td>10%</td>
</tr>
<tr>
<td>ORTHO</td>
<td>10%</td>
</tr>
</tbody>
</table>

All specialties: 46%

STS IN THE 21st CENTURY
Female Participation

Female ABTS Diplomats by Year

- New Female Diplomates
- Total Women Certified

Year:
- 1961
- 1965
- 1967
- 1975
- 1976
- 1979
- 1981
- 1982
- 1983
- 1984
- 1985
- 1986
- 1987
- 1988
- 1989
- 1990
- 1991
- 1992
- 1994
- 1995
- 1996
- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2017

Total Women Diplomats:
- 0
- 50
- 100
- 150
- 200
- 250
- 300

New Diplomats Certified:
- 0
- 2
- 4
- 6
- 8
- 10
- 12
- 14
- 16
- 18
Female Surgeons

#ILOOKLIKEASURGEON

STS IN THE 21st CENTURY
Technology Trends

More
<table>
<thead>
<tr>
<th>Technology</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Reality</td>
<td>Preop planning</td>
</tr>
<tr>
<td>Augmented Reality</td>
<td>Preop planning</td>
</tr>
<tr>
<td>Artificial Intelligence</td>
<td>Preop planning</td>
</tr>
<tr>
<td>NLP</td>
<td>Intraop decisions</td>
</tr>
<tr>
<td>Computer vision</td>
<td>All of the above PLUS</td>
</tr>
<tr>
<td>Neural networks</td>
<td>EMR</td>
</tr>
<tr>
<td>Machine learning</td>
<td>Imaging analysis</td>
</tr>
<tr>
<td></td>
<td>Computer “judgment”</td>
</tr>
<tr>
<td></td>
<td>Scary SkyNet Stuff</td>
</tr>
</tbody>
</table>
More Mechanical Assist

VAD  ECMO  TAH

STS IN THE 21st CENTURY
More Perc Valves

TAVR

TMVR

STS IN THE 21st CENTURY
More Robotic Surgery

STS IN THE 21st CENTURY
More Robots

Transenterix

Reusable Instrumentation    Haptic Feedback    Eye sensing Camera control
More Robots

STS IN THE 21st CENTURY

Titan

Control Console

Robotic Arm

Uniportal Instrumentation
Robotic Trends

MedRobotics Flex
More Robots

MedRobotics Flex
Robotic Evolution

Gort
Master - Slave

Robocop ED-209
Semiautonomous

T 800
Independent

STS IN THE 21st CENTURY
More Transparency

STS IN THE 21st CENTURY

Doctor: "Oops!"
Patient: "What the...?"
Doctor: "Dang it!"
Patient: "My bad!
Doctor: "Uh-oh..."

OR

Doctor: "Oops!"
Patient: "What the...?"
Doctor: "Dang it!"
Patient: "My bad!
Doctor: "Uh-oh..."

Doctor: "Oops!"
Patient: "What the...?"
Doctor: "Dang it!"
Patient: "My bad!
Doctor: "Uh-oh..."

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Doctor: "Dang it!"
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Doctor: "Uh-oh..."

Doctor: "Oops!"
Patient: "What the...?"
Doctor: "Dang it!"
Patient: "My bad!
Doctor: "Uh-oh..."
Public reporting is the right thing to do and the Society regards this as a professional responsibility.

<table>
<thead>
<tr>
<th>Adult Cardiac</th>
<th>Congenital Cardiac</th>
<th>General Thoracic</th>
</tr>
</thead>
<tbody>
<tr>
<td>CABG</td>
<td>VSD</td>
<td>Lobectomy</td>
</tr>
<tr>
<td>AVR</td>
<td>TOF</td>
<td>Esophagectomy</td>
</tr>
<tr>
<td>AVR + CABG</td>
<td>CAVC</td>
<td></td>
</tr>
<tr>
<td>MVR</td>
<td>AS</td>
<td></td>
</tr>
<tr>
<td>MVR + CABG</td>
<td>AS/VSD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Glenn/HF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fontan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Truncus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Norwood</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coarct</td>
<td></td>
</tr>
</tbody>
</table>
Surgeon Level Composite

Quality reporting currently at program level
  Individual procedures
  Composite score

Next step - reporting at individual surgeon level
  Individual procedures (summing the O/EEs)
  New composite score for five procedures
  Confidential reporting to surgeons - or is it?
More Pressure Than Ever

More difficult patients
More needless paperwork
More ongoing scrutiny
Regulatory agencies
Third Party payers
Media (social & others)

STS involvement maximizes your opportunity for self determination
The Surgeon’s Century

STS IN THE 21st CENTURY
Thank You

Questions?
Transplantation Trends

STS IN THE 21st CENTURY

Heart

Lung
Augmented Reality

STS IN THE 21st CENTURY
Augmented Reality

STS IN THE 21st CENTURY
Man vs Robot

STS IN THE 21st CENTURY
Three Laws of Robotics

1. A robot may not injure a human being, or, through inaction, allow a human being to come to harm.

2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.

3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.