12 MHIF STUDIES
Are currently in the TOP 5 for enrollment worldwide

10,000 +
Hours of professional education provided by MHIF each year

PIPECANE OF
UPCOMING STUDIES:

AC6 - Phase 3
Dr. Traverse

Apollo
Dr. Soraja

BioVentrix Revivent TC
Dr. Eckman

DEFINE PCI
Dr. Brikakis

ECLIPSE
Dr. Brikakis

HEART-FID
Dr. Eckman

Orion 10
Dr. Knickelbine

PACES (Smoking RCT)
Dr. Miedema

Pioneer III
Dr. Burke

Prelude EFS
Dr. Goessl

Reduce LAP-HF
Dr. Samara

THANKS
To Dr. Eckman for your continued support for MHIF Research!

MHIF NEWS CONTINUES TO TRAVEL:
Congrats to Dr. Kevin Harris on generating visibility to MHIF research.

Death and Cardiac Arrest in U.S. Triathlon Participants, 1985-2016: a Case Series, published in the Annals of Internal Medicine, Sept. 2017 continues to draw media attention, garnering headlines like:

“Triathlon deaths not rare, and risks rise with age.”
- Reuters Health
The 12 year Experience of the MHI/ANW Aortic Dissection Program

Kevin M Harris MD FACC FASE
Minneapolis Heart Institute Foundation
at Abbott-Northwestern Hospital

Talk Overview

• Thoracic aorta measurements and principles
• Aortic Dissection – MHI and IRAD contributions
• New approaches
• Design and Results of the MHI program
The Importance of Early Recognition

Multimodality Imaging of Diseases of the Thoracic Aorta in Adults: From the American Society of Echocardiography and the European Association of Cardiovascular Imaging Endorsed by the Society of Cardiovascular Computed Tomography and Society for Cardiovascular Magnetic Resonance

Steven A. Goldenstein, MD, Co-Chair, Armando Evangelista, MD, FESC, Co-Chair, Subhay Abbara, MD, Andrew Arai, MD, Federico M. Aro, MD, FASE, Luigi P. Bidano, MD, PhD, FESC, Michael A. Blomen, MD, Heidi M. Connolly, MD, Hug Cuiller-Calabria, MD, Martin Cremer, MD, Richard B. Devereux, MD, Reimund A. Erbel, MD, FASE, FESC, Rosella Ferroni, MD, Eric M. Jessberger, MD, Joseph M. Lindsay, MD, Marti McCullough, MBA, RDMS, FASE, Hector I. Michehina, MD, FASE, Christoph A. Nienaber, MD, FESC, Jae S. Oh, MD, FASE, Mauro Paggi, MD, FESC, Allen J. Taylor, MD, Jonathan W. Weinsaft, MD, Jose Luis Zamorano, MD, FESC, FASE. Contributing Editors: Harry Dicz, MD, Kim Eagle, MD, John Elefteriades, MD, Guillaume Joneau, MD, PhD, FESC, Hervé Rousseau, MD, PhD, and Marc Schepens, MD, Washington, District of Columbia; Barcelona and Madrid, Spain; Dallas and Houston, Texas; Bethesda and Baltimore, Maryland; Padova, Piner, and Milan, Italy; Cleveland, Ohio; Rochester, Minnesota; Zurich, Switzerland; New York, New York; Essen and Rostock, Germany; Boston, Massachusetts; Ann Arbor, Michigan; New Haven, Connecticut; Paris and Toulouse, France; and Bruges, Belgium.
Thoracic aortic aneurysm imaging

- Measurements of aortic diameter should be taken at reproducible anatomic landmarks, perpendicular to the axis of blood flow, and reported in a clear and consistent format
- CT or MRI: external diameter measured perpendicular to the axis of blood flow
- Direct comparison to prior images whenever possible
- Repeat imaging in 6 months and then annual
- Once aorta > 4.5 cm, consider repeat 6 months
Aortic Root: 2D measurements

Measurement of aortic root diameter at sinuses of Valsava from 2-dimensional parasternal long-axis image
- end diastole
- use the maximum diameter measured perpendicular to the long axis of the vessel

Ascending Aorta Size

Biaggi, JASE, 2009
Genetic influence of thoracic aortic aneurysms

- Syndromic Aneurysms
- Marfan Syndrome (FBN1)
- Loeys-Dietz (TGFBR1, TGFBR2, TGFB2, TGFB3)
- Vascular Ehlers-Danlos (COL3A1)
- Shprintzen-Goldberg

- Nonsyndromic
- Bicuspid aortic valve
- Familial TAA (ACTA2, MYH11, MYLK)

Aortic size at time of Type A aortic dissection
Preparticipation Screening of Athletes dying of Aortic Disease

25 Athletes

Cleared to Participate
N = 19

Unrecognized despite screening
N = 14

*6 evaluated for chest/back pain shortly before collapse and 3 were dc'd from ER

Harris et al. Under recognition of Aortic and aortic valve disease in Competitive athletes JACC 2015
Surgical threshold for Ascending Aorta Aneurysm

- Asymptomatic Ascending: 5.5
- Genetic syndrome: (4-5)
- BAV: 5.5
- Need AVR: 4.5
- Growth > .5 cm/year: consider at < 5.5
- Symptoms suggestive of expansion
IRAD Centers

St. Michael's Hospital, Toronto
Brigham & Women's Hospital
Massachusetts General Hospital
Tronse University
University Hospital, Rostock
Medical School Graz (Austria)
Robert Bosch Krankenhaus, Stuttgart
University of Tokyo Hospital
San Donato, Milan
Univ. Hospital S. Orsola, Bologna

Minneapolis Heart Institute
University of Massachusetts Hospital
Mayo Clinic
University of Michigan Health System
University of Pennsylvania
University Hospital Vall d’Hebron, Barcelona
Hospital “12 de Octubre”, Madrid
Cardiocentro Ticino (Switzerland)
Hadassah Univ. Hospital, Jerusalem

Page 10 of 47
Case 1

- 2:06 PM OSH: 61 yo M with 8/10 CP arrives
- Risks: Hyperlipidemia. Borderline HTN, Prior tobacco
- Exam: BP 177/108
- Lab: NI troponin, EKG
- Admit: r/o MI,
- Tx Lovenox, Plavix

- Cardiac arrest, CPR, Dopamine, ROSC
- Transfer arranged with ANW ER
- 8:55 PM Arrives to H4100
- 9:45 PM arrives to Cath lab
- 10:00 PM- CV surgery paged
- 10: 30 PM- Arrival in OR
- Hypotension, CPR,
- Salvage operation reveals uncontrolled bleeding from aorta
Clinical And Pathologic Findings Of Aortic Dissection At Autopsy: Review Of 338 Cases Over 6 Decades
Nick Huynh MD, Sarah Thordsen MD, Taylor Thomas, Shannon M. Mackey-Bojack MD, Emily R. Duncanson, MD, Darlington Nwaudo, Ross F. Garberich MS, Kevin M. Harris MD
A. Percentage of Aortic Dissection Cases

<table>
<thead>
<tr>
<th>Case</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aortic Rupture</td>
<td>196 (58%)</td>
</tr>
<tr>
<td>Ascending Aorta</td>
<td>139 (41)</td>
</tr>
<tr>
<td>Descending Aorta</td>
<td>20 (6)</td>
</tr>
<tr>
<td>Aortic Root</td>
<td>20 (6)</td>
</tr>
<tr>
<td>Aortic Arch</td>
<td>13 (4)</td>
</tr>
<tr>
<td>Abdominal Aorta</td>
<td>4 (1)</td>
</tr>
</tbody>
</table>

B. Intimal Tear Location

C. Complications of Aortic Dissection (Cases of Death)

<table>
<thead>
<tr>
<th>Complication</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aortic Rupture</td>
<td>196 (58%)</td>
</tr>
<tr>
<td>Ascending Aorta</td>
<td>139 (41)</td>
</tr>
<tr>
<td>Descending Aorta</td>
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</tr>
<tr>
<td>Aortic Root</td>
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</tr>
<tr>
<td>Aortic Arch</td>
<td>13 (4)</td>
</tr>
<tr>
<td>Abdominal Aorta</td>
<td>4 (1)</td>
</tr>
<tr>
<td>Aortic Dissection-specific complications</td>
<td>24 (7%)</td>
</tr>
<tr>
<td>Acute Myocardial Infarction</td>
<td>14 (4)</td>
</tr>
<tr>
<td>GI Bleed/fistula</td>
<td>10 (3)</td>
</tr>
</tbody>
</table>

Aortic Dissection without Rupture

<table>
<thead>
<tr>
<th>Complication</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sepsis/Shock</td>
<td>8 (2)</td>
</tr>
<tr>
<td>Coagulopathy</td>
<td>8 (2)</td>
</tr>
<tr>
<td>Surgical Complications</td>
<td>14 (4)</td>
</tr>
<tr>
<td>CVA</td>
<td>4 (1)</td>
</tr>
<tr>
<td>Cardiopulmonary Arrest</td>
<td>32 (10)</td>
</tr>
<tr>
<td>Comfort Care</td>
<td>5 (2)</td>
</tr>
<tr>
<td>Undetermined</td>
<td>45 (14%)</td>
</tr>
</tbody>
</table>

Median Time: ER arrival to Diagnosis: 4.3 Hours
Diagnosis To OR: 4.3 Hours
Contributors to Delay in Diagnosis
(Time from Presentation to Diagnosis)

Harris, Circulation, 2011

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Contributors to Delay in Diagnosis
(Time from Presentation to Diagnosis)

Harris, Circulation, 2011
Why the Delay? Identification of Factors Which Delay Diagnosis of Acute Aortic Dissection

Sensitivity of the ADD score
• Use of CT as initial test increased (73%)
• Use of endovascular approach for type B increased (31%)
DEBAKEY TYPES I AND II ARE DISTINCT SUBSETS WITHIN TYPE A DISSECTION

Medications for Chronic Dissection

Suzuki et al. AJC 2012
Aortic Intramural hematoma

International Heterogeneity in Diagnostic Frequency and Clinical Outcomes of Ascending Aortic Intramural Hematoma
Jamie M. Pelzel, MD, Alan C. Braverman, MD, Alan T. Hirsch, MD, Kevin M. Harris, MD
### International heterogeneity in Ascending IMH

<table>
<thead>
<tr>
<th></th>
<th>NA/Europe (n = 160)</th>
<th>Japan/Korea (N=149)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Med Tx</td>
<td>49%</td>
<td>78%</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Early Med Mortality</td>
<td>33%</td>
<td>8%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Surgical Mortality</td>
<td>8.5%</td>
<td>15%</td>
<td>NS</td>
</tr>
<tr>
<td>Overall Mortality</td>
<td>21%</td>
<td>9%</td>
<td>.003</td>
</tr>
</tbody>
</table>

- Older age than typical AD
- Identical symptoms
- Less frequent AI (Type A 32% vs 56%)
- Pericardial effusion and peri-aortic hematoma are more frequent
- Identical mortality to typical AD
Intraoperative TEE in Type A Aortic Dissection

- Moderate to Severe AI in 47%
- Additional findings in 64%
- TEE changed management in 39%

Thorsgard, JCV Anesth, 2014

Mechanism of AI
(Intimal Flap prolapse)
Characteristics of flow based on Velocity Vectors

Aortic model without dissection

Aortic model with dissection

Computational Fluid Dynamics Assessment of type-B Dissections as tool to predict Evolution of the Disease and Indicate Treatment Strategies

Domenico Calcaterra, Liza Driver, Sarah Figueroa, Muhammad Bashir, John Lesser, Josef Metzger and Kevin Harris

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Case # 2

- 88 y.o. female, independently living, taken to an outside institution with severe chest/abdominal pain
- CTA revealed a type B aortic dissection
- Transferred to ANW with increasing abdominal pain
Case # 3

- 66 y.o. male presents to the ANW ED on 9.17.2015 for evaluation of severe chest/abdominal pain radiating to the back.
- 73/37, 49, 26, 100% on RA
- WBC 12.6, H/H: 14.6/42.7, Plt 190, cr 4.7, Lactate 8.9
- OR:
  - Exploratory laparotomy
  - Bentall procedure with reimplantation of coronaries
  - Distal aortic stenting with a 20 cm Gore C-TAG
Who should be treated with a stent graft?

1. Proximal aortic diameter predicts risk of late aneurysmal formation (> 4 cm)
2. All patients w/ primary tear starting or extending into the aortic arch or
3. All patients with malperfusion syndromes
4. All patients with false lumen > 2.2 cm
5. All patients with entry tear in the descending aorta of 10 mm or greater
6. Most, if not all type A dissection patients should be treated with a combination of hemi-arch, elephant trunk and short stent in the descending aorta
Why a program?

- Frequent delay or missed diagnosis
- Aortic disease frequently falls between specialties
- Need for integrated approach and coordination between specialties
Needs for AD Process Improvement

- Delay in diagnosis
- Non standard imaging and pharmacotherapy
- Transfer delays
- Delayed surgical care/blood products
- Intra-op imaging
- Inconsistent follow-up

Cardiovascular Emergencies Program

- **Level One Heart Attack** program (2002) A regional referral system with standardized and protocolized care that focuses on eliminating inefficiencies and maximizing resources
  - Outreach to over 40 hospitals in Minnesota and western Wisconsin
  - Strong relationships with metro and out-state EMS agencies
  - Activated through a single phone call to One Call Transfer Center
  - 24/7 cardiologist consultation with Cardiology Curbside
Inspired by, and modeled after, the statewide trauma system

- Cut times to PCI from > 190 minutes to 98 minutes
- Changed emergency heart attack care throughout the nation

"Rapid transfer of patients with STEMI is feasible in the United States using a standardized protocol and integrated transfer system. This requires a team approach with cooperation between cardiologists, emergency physicians, nurses, and the emergency medical system as well as various health care organizations."

*Am Heart J* 2005; 150:373-84.

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**Level One STEMI: The first of its kind**

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**Level 1 Mortality by Zone**

Following the protocols works!
Special Report

Has the Time Come for a National Cardiovascular Emergency Care System?

Kevin J. Graham, MD; Craig E. Strauss, MD, MPH; Lori L. Boland, MPH; Michael R. Mooney, MD; Kevin M. Harris, MD; Barbara T. Unger, RN; Alexander S. Tretinyak, MD; Paul A. Satterlee, MD; David M. Larson, MD; M. Nicholas Burke, MD; Timothy D. Henry, MD

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Annual Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEMI</td>
<td>400-500</td>
</tr>
<tr>
<td>Cardiogenic Shock</td>
<td>40-50</td>
</tr>
<tr>
<td>OHCA</td>
<td>30-40</td>
</tr>
<tr>
<td>AAD</td>
<td>15-20</td>
</tr>
<tr>
<td>AAA</td>
<td>10-15</td>
</tr>
</tbody>
</table>

Standardized (Protocolized!) Systems of Care for Cardiovascular Emergencies

- Level One STEMI
- Level Two NSTE-ACS
- Cardiac Arrest & Cool-It TTM
- Aortic Dissection
- Abdominal Aortic Aneurysm
- Critical Limb Ischemia
- Cardiogenic Shock & ECMO
- Stroke & NIR
- Pulmonary Embolism
- Shock without Trauma
Acute Aortic Syndromes: Multidisciplinary Care

- Emphasis on a multidisciplinary approach for aortic dissection that is advancing hybrid techniques and limiting risk to the patient
- Involvement between cardiology, CV surgery, and vascular surgery
- Hybrid surgical suite in CV lab

Nearly 60 talks in the first 2 1/2 years of the program, specific to acute aortic dissection, to greater than 30 community hospitals and EMS agencies.

Audiences included physicians, nurses, and paramedics.

Talks consisted of education on acute aortic dissection, using the MHI protocols, and the communication and transfer process.
Zone 1 – less than 90 min
Approximately 26% are EMS or walk-in to ANW.
Another 24% are transferred from Allina hospitals.
About 6% transfer come from other hospital systems.
Remaining 44% transfer from out-state referring hospitals.

Zone 2 – greater than 90 min

ANW/MHI Acute Aortic Dissection Protocol
Is the aortic dissection suspected or confirmed?

Suspected Dissection
- Pre-Management: Morphine as needed
- Labs: CT, EKG, serial troponin, lactate, basic chemistry panel
- CT Chiefs Aortic Dissection Protocol

Confirmed Dissection
- Continue management as noted in suspected dissection
- Notify Hospital Transfer CT Image to Tertiary Hospital
- Instructions to Hospital to perform CT Image and notify the Cardiovascular Services Department

Type A
- Group Pages
- Radiology, Surgical Teams, CICU/Charge Nurse, Cardiac Cath, Remote Cath, Cardiology
- OR Available
- Operating Room Ready
- Blood products: O-negative, Type and Cross

Type B
- Group Pages
- Cardiology, Cardiac Cath, OR Available
- Operating Room Ready
- Blood products: O-negative, Type and Cross
Early Recognition

Aortic Dissection (AoD) Protocol

Upon Patient Arrival
- Acute, severe chest, back, or abdominal pain (ripping, tearing, stabbing, or sharp)
- High risk history (connective tissue disease, genetic markers, known aneurysm, recent aortic manipulation, family Hx of dissection, smoker)
- Clinical findings (pulse deficits, SBP limb differential > 20 mmHg, new murmur)
- CT chest without contrast STAT
- and CT chest/abdomen/pelvis with contrast (no oral)
- Obtain 12 lead EKG and labs (Lactate, D-dimer, Type & Cross, BMP, CBC, INR)
- Label films "STAT AoD" and transmit to 612-863-4941, or send with patient

Checklist format prevents missed steps.

Rapid Transfer & Simplified Management

First steps after recognition are 1) consultation, and 2) arranging for transport.

Clear, concise management options that focus on lowering BP and HR.
One Call Transfer Center

- Call center in Omaha
  - Single phone number for Abbott Northwestern
- Transfer Coordinator
  - Uses various protocols that are situation specific
- Receive call from referring facility
  - Takes call information from referring physician
  - Pages the appropriate MHI/ANW physician
  - Connects physicians and monitors the conversation
  - Arranges transport when requested
  - Connects referring and receiving RNs for report
  - Provides time updates throughout the call, when requested

Surgical involvement

- Type A
  - Cardiothoracic and vascular surgeons and cardiologist
- Type B
  - Vascular surgeon and cardiologist
Outside Transfers

- ED physician included on the initial call
  - Or updated by the surgeon
- All surgical emergencies go through the ED
  - Massive transfusion orders are placed
  - OR has time to prep
  - ED staff monitor during repeat imaging
- CV OR staff come to the ED to bring the pt up
  - Includes the MDA and RN

Capturing Data

that might not otherwise make it into the chart
(or is lost between EHR systems)

that is pertinent to ongoing management of the patient

that focuses the transferring team on management goals
Order Sets

- Several aortic order sets specific to the ED
  - [61032] ED Suspected AoD
  - [62779] ED Treatment AoD
  - [62781] ED Treatment AAA
    - Treatment orders include ‘massive transfusion’

- Acute aorta protocols on the MHI/ANW CV Resources App
  - Along with all our other emergency protocols
- Prior to DC, or about 7 days post procedure, perform CT or MRI and echo
- Repeat MRI (CT) at 3, 6, 9 and 12 mo with f/u visit
  - Consider eliminating the 9 mo imaging and f/u visit if stable at 6 mo
- Repeat MRI (CT), echo and f/u visit annually after 1 year
Long Term Risk of all Aortic Dissections

• Progressive expansion of dissected portions of aorta
  — Large aneurysms
  — Aortic rupture
• Development of new aneurysms elsewhere in a non-dissected segments of the thoracic aorta
• Recurrent dissection

Emphasis for Aortic Dissection f/u visits

• Annual imaging
• Blood pressure management and ideal medications
• Family screening
• Selected genetic screening
• Lifestyle and work restrictions
State of the Program

- 300 Aortic Dissection patients since 2003
  (200 Type A/100 Type B)
  - 127 patients actively followed in clinic
  - 104 known dead
  - 69 not actively followed (pt declined, follow up at other facilities)
State of the program

MHI Aortic Dissection Numbers

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Type A</th>
<th>Type B</th>
</tr>
</thead>
<tbody>
<tr>
<td>2022</td>
<td>10</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>2023</td>
<td>3</td>
<td>5</td>
<td>2</td>
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<tr>
<td>2024</td>
<td>6</td>
<td>10</td>
<td>5</td>
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<tr>
<td>2025</td>
<td>7</td>
<td>13</td>
<td>4</td>
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<td>2026</td>
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<td>2027</td>
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<td>2029</td>
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<td>2030</td>
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<td>2035</td>
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<tr>
<td>2037</td>
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<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2038</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Beta Blocker and TEE use

<table>
<thead>
<tr>
<th></th>
<th>Pre Protocol</th>
<th>Post Protocol</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB on arrival</td>
<td>64%</td>
<td>97%</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>BB on discharge</td>
<td>90%</td>
<td>100%</td>
<td>0.02</td>
</tr>
<tr>
<td>Intra op TEE</td>
<td>25%</td>
<td>98%</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>
All cause, transfer and walk-in.

Pavlovec, Matthew P, 8/1/2016
### Median time from Presentation to the OR
*(in minutes)*

<table>
<thead>
<tr>
<th></th>
<th>In ED to Confirmed</th>
<th>Confirmed to OR</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before the protocol*</td>
<td>255</td>
<td>224</td>
<td>479</td>
</tr>
<tr>
<td>After the protocol, 08/01/2005 – 09/02/2009</td>
<td>163.5</td>
<td>136</td>
<td>299.5</td>
</tr>
<tr>
<td>After the protocol, 09/02/2009 – present</td>
<td>128</td>
<td>122</td>
<td>250</td>
</tr>
</tbody>
</table>

* 01/01/2003 – 07/31/2005

### Median time from Presentation to the OR
*(in minutes)*

<table>
<thead>
<tr>
<th></th>
<th>Referring ED to OR</th>
<th>ANW ED to OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before the protocol*</td>
<td>454.5</td>
<td>120.5</td>
</tr>
<tr>
<td>After the protocol, 08/01/2005 – 09/02/2009</td>
<td>355</td>
<td>93</td>
</tr>
<tr>
<td>After the protocol, 09/02/2009 – present</td>
<td><strong>291.5</strong></td>
<td><strong>101</strong></td>
</tr>
</tbody>
</table>

* 01/01/2003 – 07/31/2005
### Mortality Surgical Type A

<table>
<thead>
<tr>
<th></th>
<th>In-hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before the protocol*</td>
<td>35%</td>
</tr>
<tr>
<td>After the protocol**</td>
<td>21.5%</td>
</tr>
</tbody>
</table>

* 01/01/2003 – 07/31/2005  
** 08/01/2005 – present

### Mortality Type B

<table>
<thead>
<tr>
<th></th>
<th>In-hospital</th>
<th>At 1 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before the protocol*</td>
<td>25%</td>
<td>38%</td>
</tr>
<tr>
<td>After the protocol**</td>
<td>14%</td>
<td>15%</td>
</tr>
</tbody>
</table>

* 01/01/2003 – 07/31/2005  
** 08/01/2005 – present
Adherence with Guideline Recommended Follow Up Care is Associated with Improved Survival in Aortic Dissection

Amit Sharma, Darlington Nwaudo, Matthew Pavlovec, Craig Strauss, Ross Garberich, Benjamin Sun, Jesse Manunga, Domenico Calcaterra, Jessica Titus, and Kevin M. Harris

Log-rank test: p<0.001

Figure 3. Long term survival based on compliance with clinical follow up
Multivariate predictors of mortality

<table>
<thead>
<tr>
<th></th>
<th>HR (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>1.048 (1.013, 1.083)</td>
<td>0.003</td>
</tr>
<tr>
<td>History of Smoking</td>
<td>2.416 (1.054, 5.539)</td>
<td>0.037</td>
</tr>
<tr>
<td>Dissection Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Reference</td>
<td>•</td>
</tr>
<tr>
<td>B</td>
<td>1.929 (0.895, 4.160)</td>
<td>0.094</td>
</tr>
<tr>
<td>Adherence Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 33%</td>
<td>Reference</td>
<td>•</td>
</tr>
<tr>
<td>34 - 67%</td>
<td>0.379 (0.150, 0.960)</td>
<td>0.041</td>
</tr>
<tr>
<td>&gt; 67%</td>
<td>0.312 (0.119, 0.814)</td>
<td>0.017</td>
</tr>
</tbody>
</table>

Subsequent AD Programs

- Duke
- Cleveland Clinic
- Brigham and Women’s Hospital, Boston, MA
- Liverpool
- Tokyo Bay Medical Center
- USC, Los Angeles, CA
- Valley Hospital
• Medicine based on memory is unreliable. Guidelines, when embedded into care systems which remind doctors and nurses of care priorities, can improve the degree to which medical knowledge is directly applied to patient care... Measures of care improve but more importantly they translate into improved patient outcomes. Through collaboration, a systems-based approach and a professional commitment to never-ending improvement, patients can get better care.

• Kim Eagle

Thank you