Cardiovascular (CVT) Critical Care: Meeting the Challenges

Nevin M. Katz, M.D.

Johns Hopkins University
Foundation for the Advancement of CTS Care (FACTS-Care)
Cardiovascular (CVT) Critical Care: Meeting the Challenges

AATS / STS
CARDIOTHORACIC CRITICAL CARE SYMPOSIUM
Sunday May 5, 2013
Minneapolis, MN

Nevin M. Katz, M.D.

Johns Hopkins University
Foundation for the Advancement of CTS Care
(FACTS-Care)
Disclosures

- No disclosures relevant to this presentation.

- Opinions are my own, based on 30 + years in the field of CVT surgery and critical care and my interpretation of the literature.
Q59. What provider makes the minute-to-minute decisions in your Cardiothoracic Surgical ICU?

a. A CT Surgeon
b. An Anesthesiologist
c. An Intensivist
d. A Resident or Fellow
e. A Physician Assistant or Nurse Practitioner
Q60. The greatest clinical challenge we face in our CT ICU is:

a. Low Cardiac Output
b. Respiratory Failure
c. Renal Failure
d. Coagulopathy
e. Infection
Perspective

Cardiac Surgeon - Georgetown University 20 years
• Heart Transplantation Program Director

Cardiothoracic Surgical Critical Care
• George Washington University Medical Center
• Johns Hopkins University – Cardiovascular Surgery ICU
Development and Direction of the Annual Conferences

- *Cardiothoracic Surgical (CTS) Critical Care 2004 - 2008*
- *Cardiovascular-Thoracic (CVT) Critical Care 2009 - 2012*

Creation & Development of Non-Profit Educational Found’n: FACTS-Care

Co-Director *AATS Postgraduate CT Critical Care Course 2010 - 2013*

Co-Director *STS CT Critical Care Symposium 2011, 2012, 2013*

Project Director *AATS ICU of the Future 2012, 2013*
Johns Hopkins Hospital
Johns Hopkins New Clinical Building
Setting the Stage for the

“AATS / STS
CT Critical Care Symposium”
Meeting the Challenges of Cardiovascular-Thoracic (CVT) Critical Care
Meeting the Challenges of CVT Critical Care

- Operational Challenges
- Clinical Challenges
Operational Challenges of CVT Critical Care

- Organization
- Communication
Multi-Disciplinary CVT Critical Care Team

• CT Surgeons
• Anesthesiologists & Intensivists
• Cardiologists & Radiologists
• Critical Care Nurses & Nurse Practitioners
• Physician Assistants
• Perfusionists
• Respiratory Therapists
The Expanded Multi-Disciplinary CVT Team

- Pharmacists
- Speech Language Pathologists (SLPs)
- Physical Therapists & Occupational Therapists
- Nutritionists
- Social Workers
- Supportive & Pastoral Care Staff
Organization & Communication
Flight 1549

- January 15, 2009
- US Airways Flight 1549 - NY LaGuardia to Charlotte, NC
- During Initial Climb - Flock of Canada Geese
- Result: Complete Lost of Power
- Ditched in 3 mins into Hudson River
- **All 155 occupants safely evacuated.**
Flight 1549: All Lives Saved!
Flight 1549: All Lives Saved!

Captain “Sully” Sullenberger and the Entire Crew of Flight 1549 Were awarded the “Master’s Medal of the Guild of Air Pilots and Air Navigators” for a “Heroic and Unique Aviation Achievement”
Crew Resource Management

- Delegation of Responsibility among Crew Members
- Broad Understanding of the Plan
  - All Members “On the same page”
- Open Lines of Communication
  - Any Member can Speak Up without Consequences
  - Importance of: Situational Awareness
  - Multiple Inputs of Data – Early Recognition of Problems
Crew Resource Management

- Prevention of Errors
  - Checklists
  - Time-Outs

- Preparation to Prevent & Manage
  - Simulations

- Debriefing Procedures / Data Analysis

- Quality Improvement
Medical Communications / Use of Checklists

Checklists

• To Insure Consistent, Optimal Practice
• To Insure Complete Communication

Advocated by Authors:

• Peter Pronovost, MD
  Safe Patients, Smart Hospitals …

• Atul Gawande, MD
  The Checklist Manifesto…
CVT Critical Care Team Building

- Culture of Mutual Respect

- Communication – Lateral & Vertical

- Sharing of Quality Improvement Initiatives
  - Data Collection
  - Protocol Development
  - Re-Analysis
Evolution in CVT Communications

• Rounds with the Entire Critical Care Team

• “Handoffs”
  • Within the ICU
  • After Procedures / Surgery

• “Safety Huddles”

• Use of Checklists to Insure Completeness

• Better Communication to the Patient & Family
Simulation Training

- Cardiothoracic Surgery
  - Development of Simulation Models

- CVT Critical Care
  - Computer Simulation
  - Procedure Models
Meeting the Challenges

The Key to Quality Improvement:

Measure It!
Quality Improvement “Dashboard”

Process Measures

- Hand Hygiene Compliance
- Surgical Site Infection (SSI) Rates
- Central Line Associated Blood Stream Infections (CLABSI) Rates
- Surgical Care Improvement Project (SCIP) Measure Compliance
  (For example, Antibiotic Dosing)
Quality Improvement “Dashboard”

Outcome Measures

- MRSA Infections
- Blood Utilization
- Time to Extubation
Meeting the Challenges of CVT Critical Care

- Operational Challenges
- Clinical Challenges
More Complex Critical Care Situations

**Maximally Support Technology**

- Now creates possibility of survival, when previously there was none!
- New Protocols, Side-effects & Risks

**New Surgical / Interventional Procedures**

- Some suitable for high-risk patients, previously considered “inoperable”
Challenges & Developments

Monitoring

• Hemodynamic & Respiratory Monitoring

• Minimally Invasive Monitoring

• Point of Care Technology

• Issues: Invasiveness, Precision, Timeliness
Challenges & Developments

CV

- Severe CHF
  - Pharmacologic Support
  - Interventional Cardiology Procedures
  - Device Support
- Postoperative Extremity Ischemia
Challenges & Developments

CV

- Ventricular Assist Devices / ECMO
  - New Technology
  - New Strategies & Protocols
  - Bedside Emergencies
LVAD in the CVS ICU
Challenges & Developments

CV

- Atrial Fibrillation / Arrhythmias
  - New Surgical Approaches
  - New Interventional Cardiology Procedures
  - Latest Pharmacologic Approaches

- Temporary Pacing in the ICU
- Permanent Pacemaker Management in the ICU
Challenges & Developments

Resp

• Ventilatory Support for Acute Lung Injury
• Management of ARDS
• Use & Timing of Tracheostomy
• Lung Transplantation Management
Circulatory & Respiratory Support
When Renal Failure (AKI) occurs after Cardiac Surgery, the risk of mortality is greatly increased.
Challenge: Acute Renal Failure

Clinical Issues in Cardiac Surgery Patients

- Volume Overload Consequences
- Increase Risk of Infections
Challenge: CSA-AKI

• AKI is associated with an important increased risk in mortality and morbidity after Cardiac Surgery
  • Mortality: 20% – 40% without Dialysis
  • Mortality: 50% - 60% with Dialysis

• Risk Factors have been identified and include:
Independent Risk Factors

- Risk Factors have been identified and include:
  - Blood Transfusion
  - Creat > 1.4
  - Emergency Surgery
  - Reoperation
  - Low EF
  - Mitral Valve Procedure
  - IABP
  - Female Gender
  - Prolonged Duration of CPB
Challenge: CSA-AKI

Keys to Management

• Early Detection
  • Minute-to-Minute Urine Output
  • NIRS Cerebral Oximetry
  • Renal Biomarkers - NGAL

• Optimize Hemodynamics / Renal Perfusion
  • Nesiritide – Atrial Natriuretic Factor – NAPA Study

• Rx of Volume Overload

• Avoidance of Nephrotoxic Agents
Surrogate for Acute Changes in Renal Blood Flow

- In patients with Preop Baseline Urine output
- Measured in the OR & CVS ICU

Minute-to-Minute Urine Output
Challenges

Neuro

• Optimizing Analgesia & Sedation
• Prevention & Management of Delirium
• Monitoring
• Prevention of Stroke
• Acute Stroke
  • Diagnosis
  • Management
  • Interventional Radiology Approach
Challenges

**Endocrine**

- Protocols
  - Glycemic Control
  - Adrenal Insufficiency
  - Hypothyroidism
Challenges

Hematologic

- Management of Bleeding After Cardiac Surgery
  - Coagulopathies
  - Anti-Platelet Therapy Issues
  - Open Chest Protocols
Challenges & Developments

Hematologic

• Anticoagulation Protocols
  • Atrial Fibrillation
  • Prosthetic Valves
Challenges

Microbiologic

- Pneumonias in the CVT ICU
  - Prevention – New Strategies
  - Diagnosis
  - Management
  - Role of Bronchoscopy
Meeting the Challenges of CVT Critical Care

Summary

Operational Challenges: Organization & Communication

- Application of the Principles of Crew Resource Management
- Team Building

Clinical Challenges

- Increased Severity of Clinical States
- A Number of these Challenges are addressed at this AATS/STS CT Critical Care Symposium
Cardiovascular-Thoracic (CVT) Critical Care 2013
Save the Date!
10th Annual Conference
Thurs Oct 10 – Sat Oct 12, 2013
Omni Shoreham Hotel
Washington, DC

www.facts-care.org