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.
Perspective

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

Cardiothoracic Surgical Critical Care
• George Washington University Medical Center
• Johns Hopkins University – Cardiac Surgery ICU

Development and Direction of the Annual Conferences
• Cardiothoracic Surgical (CTS) Critical Care 2004 - 2008
• Cardiovascular-Thoracic (CVT) Critical Care 2009 - 2011

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

Co-Director AATS/STS Postgraduate CT Critical Care Course 2010, 2011

Co-Director STS CT Critical Care Symposium 2011, 2012
Setting the Stage for the

“AATS/STS
Cardiothoracic Critical Care Symposium”
Driving the “The Ongoing Evolution”

- Increased Severity of Clinical States
- Advances in Supportive Technology & Pharmacology
- The Changing CT Critical Care Team
- New Information Technology
- Quality Improvement Initiatives
Increased Severity of Clinical States
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”
High Acuity Clinical Issues

- LV / RV Failure +/- Requiring Mechanical Support
- ALI / ARDS / TRALI
- Acute Renal Failure – CSA - AKI
- Mesenteric Ischemia
- Cerebral Dysfunction / Edema / Infarction
- Endocrine Insufficiencies – Hyperglycemia, Adrenal, Thyroid
- Coagulopathies / Blood Product Transfusions
- Systemic & Local Infections
- Multi-System Organ Failure
### Table 1. Distribution of Risk Factors and Frequency of Adverse Outcomes in Overall Study Population, Isolated Coronary Artery Bypass Graft Surgery (2002–2006)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Patients</th>
<th>Percent of Patients Experiencing Endpoint</th>
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<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>774,881</td>
<td>100.0</td>
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<td>Age, years</td>
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<tr>
<td>&lt; 55</td>
<td>137,318</td>
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<td>55–64</td>
<td>221,697</td>
<td>28.61</td>
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<td>65–74</td>
<td>245,132</td>
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<td>≥ 75</td>
<td>170,734</td>
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<td>560,006</td>
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<tr>
<td>Female</td>
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# STS National Database Risk Factors

## CABG

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<th>Renal Function</th>
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<th>CVA</th>
<th>RF</th>
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<td>Creatinine &lt; 1.00 mg/dL</td>
<td>274,197</td>
<td>35.39</td>
<td>1.6</td>
<td>1.1</td>
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<td>Creatinine 1–1.49 mg/dL</td>
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<td>51.47</td>
<td>2.0</td>
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<td>Creatinine 1.5–1.99 mg/dL</td>
<td>57,779</td>
<td>7.46</td>
<td>4.5</td>
<td>2.3</td>
<td>10.8</td>
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<td>Creatinine 2.0–2.49 mg/dL</td>
<td>12,463</td>
<td>1.61</td>
<td>6.9</td>
<td>2.9</td>
<td>14.3</td>
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<td>Creatinine ≥ 2.5 mg/dL</td>
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<td>1.02</td>
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<td>Dialysis</td>
<td>12,415</td>
<td>1.60</td>
<td>8.4</td>
<td>2.7</td>
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<td>11,288</td>
<td>1.46</td>
<td>3.3</td>
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Acute Renal Failure

Clinical Issues in Cardiac Surgery Patients

- Volume Overload Consequences
- Increase Risk of Infections
High Acuity Case Example

- 65 yo man, S/P AVR (Tissue) 5 years previously
- Developed Coag negative Staph Bioprosthetic Valve Endocarditis with an Aortic Root Abscess
- Underwent Re-operative Median Sternotomy, Removal of AVR, Debridement of Abscess Cavity, Reconstruction of Aortic Root with Homograft
- Extensive adhesions
- TBT 195’
- Major Coagulopathy – Packing to Control
“Open Chest Protocol”

Used in Extreme Situations:

- Continued bleeding / Coagulopathy requiring mediastinal packing
- Marked Mediastinal & Pulmonary Edema
  - Prolonged CPB time
  - Preoperative shock state – MI, CP Arrest
- Emergency ECMO / Temporary VAD
Open Chest Protocol
## ICU “Open Chest Protocol”

- Full Ventilatory Support – SIMV with PS & PEEP
  - Compromised Respiratory Mechanics
  - Transfusion Associated Acute Lung Injury (TRALI)
- Hemodynamic Monitoring incl Mixed Venous O2 Sats
- Optimizing Hemodynamics & Perfusion
  - Potential Mechanical Assist / ECMO
ICU “Open Chest Protocol”

- Acute Renal Insufficiency
  - Optimal Renal Perfusion

- Management of Volume Overload
  - Diuretics
  - Hemofiltration / CVVHD

- Cont IV Sedation & Analgesia
  - Periodic Neuro Assessment
  - Optimal Cerebral Perfusion
ICU “Open Chest Protocol”

- Correction of Coagulopathy
  - Preoperative Anti-Platelet Therapy
  - Aprotinin Controversy
  - Increasingly Recognized Risks of Blood Transfusion

- Return to OR for Removal of Pack, Reassessment, & Closure

- Prevention of Infection
  - Antibiotics until 24 hrs after Chest Closure
Advances in Supportive Technology & Pharmacology
New & Recurrent Issues & Controversies

Support of the Circulation
- Optimal Combinations of Pharmacologic Agents
- When to Use Mechanical Support & What System

Management of Pulmonary Hypertension
- Latest Strategies
New & Recurrent Issues & Controversies

**Respiratory Failure**
- Optimal Ventilator Mode & Protocol to Wean Complex Patients from the Ventilator
- ALI / ARDS – Optimal Ventilatory Support

**ECMO**
- Indications
- Technology
- Veno-Venous vs. Veno-Arterial
New & Recurrent Issues & Controversies cont’d

Renal Insufficiency / Renal Failure
  • Management of Volume Overload
  • Renal Replacement Therapy
    • When to Start
    • What System & What Dose
Advances in Pharmacology

- Vasoactive Agents
- Anticoagulants & Antiplatelet Agents
- Antiarrhythmics
- Antimicrobials
- Diuretics
- Sedatives/Analgesics
Complex Supportive Technology

- Advanced Ventilator Systems
- Ventricular Assist Devices
- ECMO Systems
- Renal Replacement
Advances in Supportive Technology

- Invasive & Non-Invasive Monitoring Systems
- Point of Care Laboratory Systems
- ICU Monitoring & Alert Systems

Invitation - Visit “The ICU of the Future”
The Changing Multi-Disciplinary CT Critical Care Team
Earlier Model of CT Critical Care

- CT Surgeon directs the Critical Care.

- CT Surgeon, His/Her House Staff, PA’s and Critical Care Nurses perform most of the care.

- Critical Care is learned during Residency and in Clinical Practice.
The CT Surgeon as Critical Care Physician

- Critical Care is inherent to the specialty of CT surgery.
- CT Surgeons from the beginning of Training take care of many of their patients in ICU’s.
- Surgeons have the best understanding of the procedures performed and the potential complications for a particular patient.
- The Patient “places his/her life in the surgeon’s hands.”
Definition of Thoracic Surgery by American Board of Thoracic Surgery

- THORACIC SURGERY ENCOMPASSES THE OPERATIVE, PERIOPERATIVE, AND SURGICAL CRITICAL CARE OF PATIENTS WITH ACQUIRED AND CONGENITAL PATHOLOGIC CONDITIONS WITHIN THE CHEST. INCLUDED ARE …
Changing Role of CT Surgeons

ICU Attendings
- CT Surgeons
- Non-Surgeon Intensivists
- Certification

CT Surgical Residents & Fellows
- Operative vs Critical Care Experience
- Training
- Balance of Responsibility & Communication
The Multi-Disciplinary Team

- Increasingly Recognized as the Optimal Approach
  - Specialized Knowledge & Experience

- The CT Surgeon continues to have a Leadership Role on the team
  - Even if not directing minute to minute care.

- Important Challenges
  - Communication
  - Power-Sharing
## Critical Care Certification for CT Surgeons

**American Board of Surgery**
- One of the Subspecialty Certifications:
  - Surgical Critical Care
- Requires a 1-Year Fellowship

**American Board of Thoracic Surgery**
- Only Subspecialty Certification:
  - Congenital Cardiac Surgery
- Potential Certification in the Subspecialty of CT Critical Care
Certification in the Subspecialty of CT Critical Care

Potential Criteria for Certification

- Clinical Experience Documentation
- CME Requirement
- Examination in CT Critical Care

Political Issues
Development of CT Critical Care as a Specialty from Within CT Surgery

- FACTS-Care Multi-Disciplinary
  “CVT Critical Care” Conferences:

- AATS Postgraduate CT Critical Care Courses:

- STS CT Critical Care Symposia
  2011, 2012
Heightened Role of Advance Practice Providers

Non-Physician Providers:
- Nurse Practitioners
- Physician Assistants

Factors:
- Increased Staffing Needs with Increased Patient Acuity
- Mandated Restriction of Resident Work Hours
- Need for Surgical Residents to Maximize their Operative Experience
Heightened Role of Advance Practice Providers

Impact of Nonphysician Staffing on Outcomes in a Medical ICU

Hayley B. Gershengorn, MD; Hannah Wunsch, MD; Romina Wañab, MD; David E. Leaf, MD; Daniel Brodie, MD, FCCP; Guohua Li, MD, DrPH; and Phillip Factor, DO, FCCP

MICU’s: Beth Israel Medical Center, New York, NY Presbyterian Hospital-Columbia New York, NY

Methods: We conducted a retrospective review of 390 daytime (7:00 AM-7:00 PM) admissions to two MICUs at one hospital. In one MICU staffed by nurse practitioners and physician assistants (MICU-NP/PA) there were nonphysicians (nurse practitioners and physicians assistants) during the day (7:00 AM-7:00 PM) with attending physician coverage overnight. In the other MICU, there were medicine residents (MICU-RES) (24 h/d). The outcomes investigated were hospital mortality, length of stay (LOS) (ICU, hospital), and posthospital discharge destination.

Results: Three hundred two patients were admitted to the MICU-NP/PA and 288 to the MICU-RES. Mortality probability model III (MPM3) predicted mortality was similar (P = .14). There was no significant difference in hospital mortality (32.1% for MICU-NP/PA vs 32.3% for MICU-RES, P = .96), MICU LOS (4.22 ± 2.51 days for MICU-NP/PA vs 4.44 ± 3.10 days for MICU-RES, P = .59), or hospital LOS (14.01 ± 2.92 days for MICU-NP/PA vs 13.74 ± 3.04 days for MICU-RES, P = .56). Discharge to a skilled care facility (vs home) was similar (37.1% for MICU-NP/PA vs 32.5% for MICU-RES, P = .34). After multivariate adjustment, MICU staffing type was not associated with hospital mortality (P = .29), MICU LOS (P = .29), hospital LOS (P = .19), or posthospital discharge destination (P = .90).

Conclusions: Staffing models including daytime use of nonphysician providers appear to be a safe and effective alternative to the traditional house staff-based team in a high-acuity, adult ICU.
Multi-Disciplinary Team Dedicated to the Critical Care of CT Patients

- CT Surgeons
- Anesthesiologists & Intensivists
- Cardiologists & Radiologists
- Nurse Practitioners
- Physician Assistants
- Bedside Critical Care Nurses
- Perfusionists
- Respiratory Therapists
Intensivists, Critical Care Nurses, NP’s, PA’s, Residents & Fellows
Respiratory Therapists
Respiratory Therapists
Members of the Expanded Multi-Disciplinary Team

- Pharmacists
- Speech Language Pathologists (SLPs)
- Physical Therapists & Occupational Therapists
- Nutritionists
- Social Workers
- Patient Service Representatives
- Pastoral Care Staff
Pharmacists
CV Pharmacists

Cardiovascular Pharmacotherapy

- Newly Recognized Specialty

Pioneer in Developing the Specialty:

- Dr. Joseph Dasta
- Ohio State University
Cardiovascular Pharmacology

- Variety of Pharmaceuticals Used in the CT ICU
  - Vasopressors / Inotropes
  - Vasodilators / Antihypertensives / Beta Blockers
  - Diuretics
  - Anticoagulants / Antiplatelet Agents
  - Lipid Lowering Agents
  - Antibiotics/ Antifungal Agents
  - Immunosuppressive Agents
Cardiovascular Pharmacology

- Issues
  - Effects of Hepatic & Renal Insufficiency
  - Drug Interactions
  - Determination of Effectiveness
- Dose & Duration
Speech Pathologists

Common Types of Cases When Consulted:

- Prolonged Intubation or Hoarseness after Extubation
- Signs of Aspiration after Extubation
- Neurologic Complications
- Aortic Reconstructive Surgery
- Lung Transplantation
- Tracheostomy
- Esophageal Reconstruction
- Oral Communication for Trach/Vent Patients (speaking valves)
Speech Pathologists

Diagnosis and management of:
- Dysphagia
- Aphasia and cognitive disorders
- Voice disorders

Oral communication for Trach/Vent patients (speaking valves)

Education and training for:
- Patients
- Family members
Speech Pathology Evaluation

- Bedside Swallow Evaluation
- Video Fluoroscopic Swallow Study
Physical Therapists
Nutritionists

Formulations for Enteric Feeding

Nutritional Programs for:

- Diabetes
- Hypertension
- CHF
- Renal Failure
- Pulmonary Failure
- Hepatic Failure
The Multi-Disciplinary Critical Care Team

Challenges

• Coordinating the Expertise of Multiple Specialists

• Communication

• “Being on the Same Page”
New Information Technology
Challenges of New Information Technology

- Organization of Clinical Data to Facilitate Management
- Integration of Hospital Information Systems
  - Chemistry
  - Hematology
  - Microbiology
  - Imaging
- Display and Analysis of Clinical Trends
Evolution in Information Technology

- Electronic Medical Record
- Trend Analysis
- Computerized Order Entry
- Wireless Technology
  - Immediately Available
  - Clinical Data
  - Imaging
  - Trends
Continuing Challenges of Data Display

- Large Volume of Data
- Highlighting the Key Issues
- Organization to Guide Management
- Efficiency
Presentation of Clinical Data

Challenges

- Presentation that Guides Formulation of Plans
- A Format that Adapts to Rapid Clinical Changes
- Efficiency of Implementation / Order Entry
Quality Improvement Initiatives
Drivers of Quality Improvement

- Pursuit of Excellence
  - Intrinsic to Our Health Care Professions

- Economic Pressures
  - Hospital Value-Based Purchasing Programs
  - Publicized Hospital Data
Communications / Use of Checklists

Concerns:
- Consistency of Quality Care
- Safety / Avoiding Errors
- Continuity of Care
- Completeness of Communication

Change:
- An Awareness of Communication Gaps
- Expanded Use of Checklists
Communications / Use of Checklists

Checklists

- To Insure Consistent, Optimal Practice
- To Insure Complete Communication
- Standard in the Aviation Industry

Advocated by Authors:
- Peter Pronovost, MD
  Safe Patients, Smart Hospitals …
- Atul Gawande, MD
  The Checklist Manifesto…
Evolution in 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
Flight 1549: All Lives Saved!
Privileged and Confidential For Peer Review Purposes Only

Department of Cardiac Surgery Quality Improvement Committee Meeting Minutes

Date:

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<th>TOPIC</th>
<th>DISCUSSION and PLAN</th>
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<td>Hand Hygiene:</td>
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Privileged and Confidential For Peer Review Purposes Only
To Improve –
You Need to Measure!
ICU Ventilation Time
(Total Initial Hrs)
(Isolated CABG)
“Making It Happen”
Challenges of Clinical Rounding

- Understanding the Issues / Problems Occurring
- Arriving at an Optimal Overall Plan
- Efficiency
- Coordination of Management
System-Structured, Issue-Oriented Approach

- Data Organization:
  - “System-Structured Profile” or “SSP”
  - Flowchart or Computerized Display to Define the Time Course

- Definition of the Clinical Situation:
  - “Issues” Related to Each System

- Dx’ic and Rx Plan for Each System / Issue
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<td>Pro</td>
<td>SRA</td>
<td>C's</td>
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<td>Sat</td>
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<td>SRA</td>
<td>C's</td>
<td>Foley Lines Wires ChTubes/Drains</td>
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A Format for Clinical Rounds

- Development of Plans / Orders
- “Read Back” by the Bedside Nurse
- Checklist Review
- Orders are Transmitted on Rounds via Wireless Computer
Patient - Family Centered Care

- Patient – Family Centered Rounds
- Influence of a Variety of Media
  - TV
  - Internet
  - Magazines / Journals
  - Newsletters
- Heightened
  - Understanding
  - Concerns / Questions
ICU rounds
Presentation / Display of Data
Development of System-Structured Plans
Readback / Review of Checklist
Communications Among the Cardiac Surgical Team
Team Building

- Culture of Mutual Respect
- Communication – Lateral & Vertical
- Sharing of Quality Improvement Initiatives
  - Data Collection
  - Protocol Development
  - Re-Analysis
And now, to address this “Ongoing Evolution” in more detail, we continue with:
AATS/STS
CARDIOTHORACIC CRITICAL CARE SYMPOSIUM
2012

Welcome to All!
Cardiovascular-Thoracic (CVT) Critical Care 2012
9th Annual Conference
Save the Date
Thurs Oct 4 – Sat Oct 6, 2012
Omni Shoreham Hotel
Washington, DC
www.facts-care.org