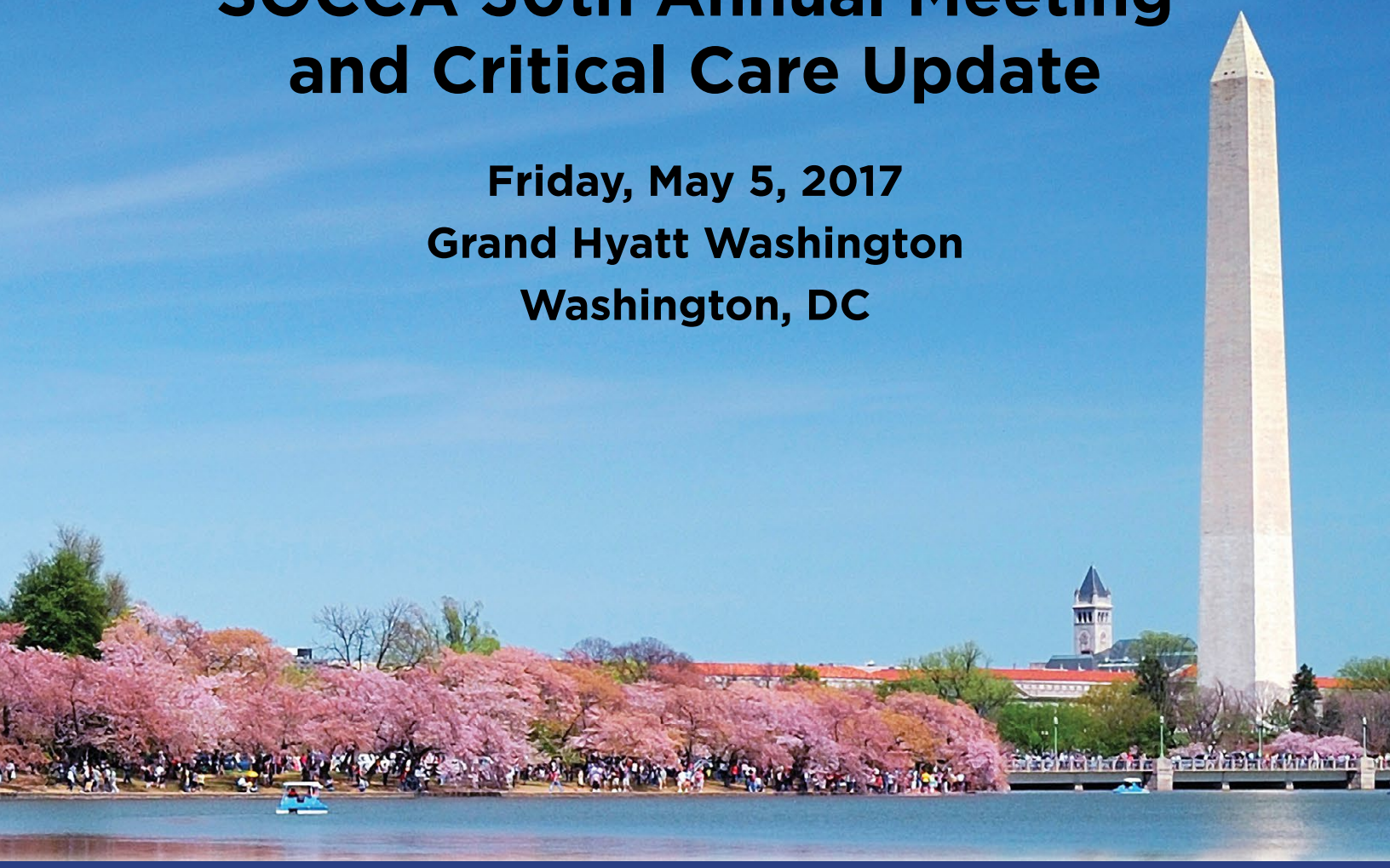
Syllabus

Join the Leaders in Critical Care Anesthesia at the

SOCCA 30th Annual Meeting and Critical Care Update

Friday, May 5, 2017
Grand Hyatt Washington
Washington, DC



Society of Critical Care Anesthesiologists
SOCCA

For more information and program details, visit **www.socca.org**

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Welcome to the SOCCA 30th Annual Meeting and Critical Care Update in Washington, DC!

The SOCCA 30th Annual Meeting and Critical Care Update will take place Friday, May 5, 2017, at the Grand Hyatt Washington, in Washington DC. Join your colleagues for a stimulating program that explores current practices and reviews cutting-edge topics in research and education with the leaders in critical care anesthesia. While in Washington DC, stay an extra day and take advantage of the IARS Aligned Meeting and SOCCA Focus on Critical Care Day sessions on Saturday, May 6, available complimentary to all SOCCA registrants.

Discover Washington, DC

Discover America's rich history in the nation's capital, Washington, DC and recall the significant moments in time when they first occurred. Walk the two-mile green expanse of the National Mall and take in the neoclassical monuments and buildings, including the iconic ones that house the federal government's three branches: The Capitol, White House and Supreme Court. Roam the many halls of the free Smithsonian Museums, paddle on the Potomac River or sit back on a double-decker tour bus and soak in the beautiful sights of the city. Indulge in the food, wine, local breweries and funky marketplaces available in DC. From American history to culinary delicacies to cultural events, you can find it all in Washington, DC. Make the most of your time in the nation's capital!

Washington, DC by the Numbers!

2015 was the first time that visitors could take photos on their White House tour, as announced by Former First Lady Michelle Obama.

535 miles of book shelves and 162 million objects can be found at the Library of Congress, giving DC the largest library in the world.

60,000 objects, ranging in size from Saturn V rockets to jetliners to gliders to space helmets to microchips, can be found at the Smithsonian's National Air and Space Museum.

1884 was the year the Washington Monument was unveiled as the tallest structure in the world, standing at 555 feet and 5 1/8 inches in height, until the Eiffel Tower opened in 1889 and took the title.

59 pieces of Chinese granite make up the MLK Memorial, commemorating civil rights leader Martin Luther King, Jr., and designed and assembled by Chinese sculptor Lei Yixin.

1929 was the first year a phone was installed on the president's desk in the White House. The original phone number for the White House in 1878 was just the number 1.

2 Former presidents, Herbert Hoover and John Quincy Adams, kept pet alligators at the White House.

19 feet tall and weighing almost 15,000 pounds, the bronze Statue of Freedom sculpture on the top of the U.S. Capitol Building is larger than it looks.

1901 was the year DC's first baseball team began playing as the Washington Senators. Not until 1971 was their name changed to the Washington Nationals.

180 embassies and international cultural centers are located in Washington, DC. More than 16 percent of DC residents speak a language other than English.

64,000 square feet and over 200 artifacts make up the first and only public museum in the United States solely dedicated to espionage, the International Spy Museum.

Welcome to the SOCCA 30th Annual Meeting and Critical Care Update in Washington, DC!

May 5, 2017

Welcome to the SOCCA 30th Annual Meeting and Critical Care Update. We are pleased to have leading critical care anesthesiologists, educators and researchers attend and participate in an extraordinary learning experience among the history, culture and beauty of the nation's capital, Washington, DC.

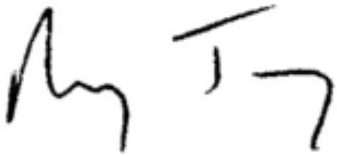
Here are some of the highlights of this year's meeting:

- **Education Session 1: *Sepsis 3 – Love It or Hate It, What Changes?*** Discusses the pitfalls, risks and potential roadblocks to the treatment of sepsis and examines different treatment approaches around the world.
- **SOCCA Lifetime Achievement Award Presentation: Critical Care 2017: 30 Years in Under 30 Minutes** – Join Dr. Todd Dorman, Senior Associate Dean for Education Coordination and Professor of Anesthesiology and Critical Care Medicine at Johns Hopkins University School of Medicine, as he discusses his perspectives on and contributions to critical care anesthesia.
- **Education Session 2: *Acute Lung Injury – Scientific Advances and the Road to Recovery*** – Examines the latest advances in the treatment of critical illness.
- **Address from the American Society of Anesthesiologists** – Join Dr. Jeffery Plagenhoef, President, American Society of Anesthesiologists, as he discusses the ASA's role in critical care anesthesia.
- **Education Session 3: *Training the Next Generation – An Update for Critical Care Education*** – Describes the challenges faced by trainees as they make the transition into their first job and offers tips for making the most of the opportunities available in critical care medicine.
- **SOCCA Young Investigator Award Presentation** – Discover cutting-edge research from the Young Investigator Award Winner and first and second runners-up.
- **Moderated Poster Discussion Session** – Hear about the latest innovations and breakthroughs in research and education from abstract authors as they present their original research.
- **Education Session 4: *Trauma and Mass Casualty – The Intensive Care Response*** – Uncover the challenges and extraordinary approaches to treating trauma in extreme situations, from the combatant's eyes to terrorism and mass casualty.

Continue your education by visiting the SOCCA Tabletop Exhibit Area for the latest innovations in technology, equipment, pharmaceutical services, and medical publications.

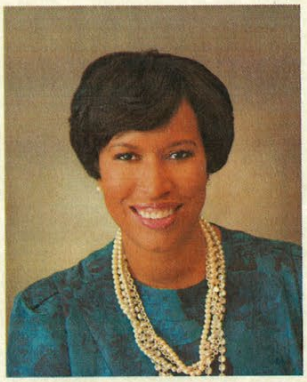
We are confident that you will find this time together to be advantageous and fulfilling while you enjoy everything Washington, DC has to offer.

Sincerely,



Avery Tung, MD, FCCM

President, Society of Critical Care Anesthesiologists



WE ARE WASHINGTON DC

Welcome

Association of University Anesthesiologists
International Anesthesia Research Society
Society of Critical Care Anesthesiologists
2017 Annual Meetings

May 4, 2017

As Mayor of the District of Columbia, I am pleased to welcome participants and members of the Association of University Anesthesiologists (AUA), the International Anesthesia Research Society (IARS), and the Society of Critical Care Anesthesiologists (SOCCA) to the nation's capital for your 2017 Annual Meetings.

The AUA, IARS and SOCCA 2017 Annual Meetings bring together the leaders in anesthesiology to exchange ideas and information with the goal of improving patient care around the world.

I am delighted that you have chosen Washington, DC, to host your event this year. While you are here, I invite you to enjoy all that our city has to offer and I encourage you to visit our museums, monuments, restaurants and diverse neighborhoods.

On behalf of the residents of the District of Columbia, I wish you a successful event.

Muriel Bowser
Mayor, District of Columbia

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Continuing Medical Education (CME) Activity Information

Activity Overview
The Society of Critical Care Anesthesiologists (SOCCA) 30th Annual Meeting and Critical Care Update is designed to optimize outcomes for critically ill patients and their families through evidence-based and clinically-oriented physician education. The purpose of the SOCCA Annual Meeting and Critical Care Update is to advance knowledge, improve competence, and enhance performance of intensive care teams.

Target Audience
The SOCCA 30th Annual Meeting and Critical Care Update is designed for anesthesiologists in the clinical and laboratory setting.

Educational Objectives
As a result of participating in this live CME activity, learners will be able to:

- Evaluate the current state of emerging knowledge and practice patterns and assess the relevance to their professional practice;
- Incorporate new knowledge from advances in anesthesiology practice into their professional practice areas; and
- Distinguish gaps in their knowledge, behavior, and patient outcomes that may result in a need for additional education and training.

Accreditation Statement
This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the International Anesthesia Research Society (IARS) and the Society of Critical Care Anesthesiologists (SOCCA). The IARS is accredited by the ACCME to provide continuing medical education for physicians.

CME Credit
The International Anesthesia Research Society (IARS) designates this live activity for a maximum of *6 AMA PRA Category 1 Credits™.* Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Disclosure
The International Anesthesia Research Society (IARS) makes every effort to develop CME activities that are independent, objective, scientifically balanced presentations of information. The IARS has implemented mechanisms requiring everyone in a position to control content to disclose all financial relationships with commercial interests. Disclosure of any or no relationships is made available in advance of all educational activities. The IARS evaluates, and if necessary, resolves any conflicts of interest prior to the start of the activity. Individuals who refuse or fail to provide the required disclosures are disqualified from being a planning committee member, teacher, or author of CME, and cannot have control of, or responsibility for, the development, management, presentation or evaluation of the CME activity.

Disclaimer
The information provided in this CME activity is for continuing education purposes only and is not meant to substitute for the independent medical judgment of a healthcare provider relative to diagnostic and treatment options of a specific patient's medical condition.

Commercial Support
The following commercial interests have provided support for this live activity: La Jolla Pharmaceutical (satellite symposium) and Inflammatix (satellite symposium).

General Information

How to Use the Syllabus

In this Syllabus, you will find the information you need to make the most of your Annual Meeting experience. Included is a complete listing of Annual Meeting events and a Schedule-at-a-Glance grid for Friday, May 5 and Saturday, May 6.

The education sessions and Moderated Poster Discussion Sessions are listed by day and then by time in each specific section within the Syllabus.

See page 10 of this Syllabus for a map of the SOCCA Headquarters Hotel, Grand Hyatt Washington, with meeting rooms and registration area.

Location

SOCCA Headquarters Hotel

Grand Hyatt Washington Hotel
1000 H St. NW • Washington, DC 20001
t: 202-582-1234
The Annual Meeting education sessions will take place on the Constitution Level of the hotel. The Registration Desk will be located in the foyer of the Independence Level.

SOCCA Onsite Registration Hours

Thursday, May 4 . . . . . 6:00 am – 6:00 pm
Friday, May 5 . . . . . 6:00 am – 6:00 pm

Registration Materials

Registration materials will be available for pick-up at the Registration Desk in the foyer on the Independence Level. The **Room Locator**, distributed at the Registration Desk, will list the locations for all education sessions, the lunch and special events. Your registration packet includes your name badge, which you must wear at all times while attending events. Only attendees with name badges will be admitted to meeting rooms and special events. If you misplace your badge, please visit the Registration Desk for a replacement.

Annual Meeting Registration Cancellation Policy

The registration cancellation deadline was Friday, April 21, 2017. Registrations cancelled on or before Friday, April 21, 2017 were refunded, minus a $50 processing charge.

Services

Internet Availability

Complimentary wireless internet is available in the conference area, exhibit area and all SOCCA-scheduled meeting rooms. Open your internet browser and choose the network labeled, **"Hyatt Meeting"**. When prompted for an access code, enter **"AM2017."** Please no streaming or video downloads.

Official App of the IARS, AUA, and SOCCA 2017 Annual Meetings

The IARS, AUA, and SOCCA Annual Meetings will feature an interactive app, **IARS 2017**, allowing you to view the complete event schedule, explore all sessions, and get detailed presenter information. Participate in the interactive games on the app each day and connect with your peers and colleagues. Download the interactive Annual Meeting app, **IARS Mtgs App**, available for iPhone, iPad, Android, and HTML5 for Blackberry in the Google Play and Apple Stores. Your **username** for the app is the email with which you registered for the Annual Meeting. The **password** for all users is: **iars2017**. Expand your professional network and make the most of your Annual Meeting experience!

Special Events

Residents and Fellows Breakfast with the SOCCA President

Friday, May 5, 2017, 7:30 am – 8:00 am
This is an informal meeting with your colleagues and mentors.

Residents and Fellows Program

Friday, May 5, 2017, 5:45 pm - 6:45 pm
Residents and fellows will meet with a group of enthusiastic faculty members for light snacks, drinks and a rewarding session allowing them to share insights and experiences with people from different programs and different levels of training.

SOCCA Reception with Exhibitors

Friday, May 5, 6:30 pm – 7:30 pm
Mingle and connect with colleagues and peers during the SOCCA Reception with Exhibitors. Plus, visit the SOCCA tabletop exhibits.

(continued)

Scholars' Program and Mentor-Trainee Reception

Education Sessions:
Saturday, May 6, 9:30 am – 5:00 pm

Mentor-Trainee Reception:
Saturday, May 6, 5:00 pm – 6:00 pm

Through innovative teaching approaches, scholars will find the much-needed skills they desire while interacting with peers and mentors. This special program will have a broad appeal, particularly to early-career scholars in anesthesiology. Socialize and discuss the curriculum and tips for advancing your career with your fellow scholars and mentors at the Scholars' Program Mentor-Trainee Reception.

Scholars' Program and the Scholars' Program Mentor-Trainee Reception requires pre-registration and an additional $50.00 non-refundable fee.

Alignment Reception
Saturday May 6, from 6:00 pm - 7:30 pm

Celebrate the Alignment of the IARS, AUA, and SOCCA Annual Meetings at this special event! Visit the tabletop exhibits and catch up with your colleagues while enjoying a taste of the unique culinary flavors of Washington, DC.

Information

Dress Code
The dress code for the SOCCA 30th Annual Meeting and Critical Care Update is business/business casual.

Electronic Devices
Please silence all electronic devices during education sessions. Videotaping and recording of sessions are not allowed without the written permission from the presenter(s).

Photography Release
The Society of Critical Care Anesthesiologists plans to take photographs at the SOCCA 30th Annual Meeting and to reproduce them in SOCCA news or promotional materials, whether in print, electronic or other media, including the SOCCA website. By participating in the SOCCA 30th Annual Meeting, you grant SOCCA the right to use your name, photograph, and biography for such purposes.

No Smoking Policy
Smoking is not permitted at SOCCA events. We respectfully request that you abide by our smoke-free policy. Thank you.

Special Services
If you are in need of any special services please contact SOCCA staff at iarsmeeting@orchid.events or at the Registration Desk during the Annual Meeting for special accommodations.

Washington, DC Travel Tips

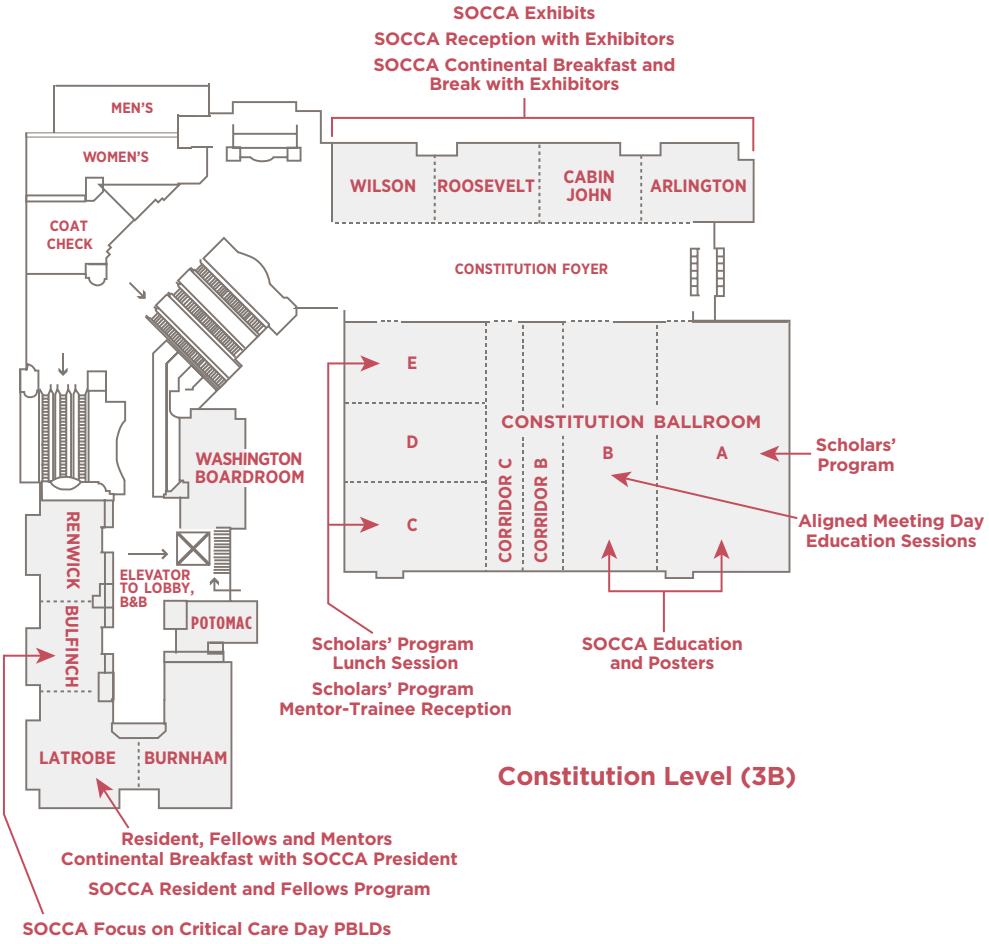
Time Zone
Washington, DC follows Eastern Daylight Time (EDT).

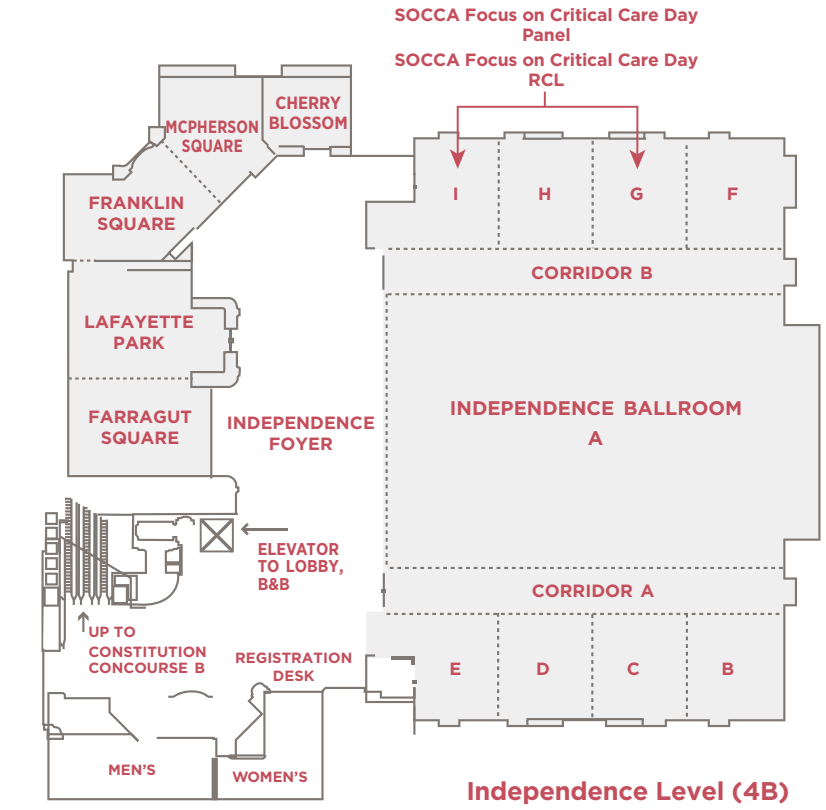
Washington, DC Airports
There are three major airports in the Washington, DC region to choose from: Ronald Reagan Washington National Airport (code: DCA), Washington Dulles International Airport (code: IAD) and Baltimore/Washington International Thurgood Marshall Airport (code: BWI). Ronald Reagan Washington National Airport is the closest airport to the SOCCA Headquarters Hotel, Grand Hyatt Washington.

Transportation
Washington, DC is a bustling city with a great local public transportation system. The Metrorail and Metro bus offer the most clean and efficient transportation in the city providing routes to all parts of Washington DC. The Metro consists of light rail trains and buses. Base fares range from $1.75 to $4.00, to calculate the exact cost of your fare visit **https://goo.gl/LMYNvu**. The Metro Center train station is accessible from the lobby of the hotel. Taxis, rental car services and Uber & Lyft cars are also available throughout the city. For more information on traveling, visit **https://goo.gl/pkJhWI**.

Weather
Although Washington, DC's weather can be extreme, the spring is milder with temperatures in the 60s and occasional showers. Pack for both rain and sunshine!

SOCCA Headquarters Hotel Floor Plan





What to Do in Washington, DC

National Mall and Memorial Parks
America's most visited national park is where the past, present and future come together. The monuments and memorials in this park honor American forefathers and veterans.

The 8 Must-See Memorials at the National Mall

1. The Franklin Delano Roosevelt Memorial
2. Korean War Veterans Memorial
3. Vietnam Veterans Memorial
4. Thomas Jefferson Memorial
5. Martin Luther King, Jr. Memorial
6. World War II Memorial
7. Washington Monument
8. The Lincoln Memorial

DC Neighborhoods

Find out why the District is such a unique city. There's so much to love about each one of DC's neighborhoods, from history on Capitol Hill and high-end boutiques in Georgetown to performing arts in Penn Quarter and a 24-hour diner in Adams Morgan. Get familiar with the lay of the land and find your place in DC.

Southwest Waterfront

Native Americans, European Settlers, and now, the new Wharf development, this quadrant of Washington, DC has one constant — it's always evolving. Today, visitors have much to see in this unique neighborhood a few blocks from the National Mall, including the new District Wharf, the Mead Center, Maine Avenue Fish Market, East Potomac Tennis Center, Women's Titanic Memorial, Mandarin Oriental Hotel Spa and the tiki-style bar Cantina Marina to name a few hot spots.

The Smithsonian National Museum of Natural History

Opened in 1910 to invoke discovery and education of the natural world, its green dome and immense size (comparable to 18 football fields) are signatures, as well as the 126 million natural science specimens and cultural artifacts that the museum contains. The Museum of Natural History is centrally located in Washington, DC on the National Mall. Like all Smithsonian Institution Museums, admission is free. Its regular hours are 10:00 am to 5:30 pm, but hours are extended during the summer with a closing time of 7:30 pm.

Visit **washington.org/smithsonian-institution-museums** to learn more about all The Smithsonian Museums in Washington, DC.

DC's Arts and Culture
The backbone of the city is built on arts and culture. Enjoy awe-inspiring art galleries, unmatched museums, thriving performing arts and music scenes and so much more.

Famous places to visit include:

- **The John F. Kennedy Center for the Performing Arts**
- **Ford's Theatre**
- **The Smithsonian National Portrait Gallery**

Click here to learn more about DC's arts and culture.

For more information on What to Do in Washington, DC, **click here.**

Restaurants in Washington, DC

Restaurants at the Grand Hyatt Washington

Starbucks
Coffee
Lobby
Hours: Daily 5:30 am–8:00 pm

Cabinet
Breakfast; Special Lunch on Weekends, $$
Declaration Level (1B)
Hours: M-F 6:30 am – 11:00 am; Sat-Sun 6:20 am-3:00 pm

Cure Bar & Bistro
Lunch, Dinner and late night, $$ - $$$
Lobby and Declaration Level (1B)
Hours: M-F 11:00 am – 1:00 am; Sat-Sun 3:00 pm – 1:00 am

Restaurants near the Grand Hyatt Washington

DBGB DC
French Bistro, $$$
931 H Street NW
202-695-7660
Distance from hotel: 1 min (233 ft.)

Capitol City Brewing Company
American, Bar, Pub, Contemporary, Gluten Free Option, $$-$$$
1100 New York Avenue Northwest
202-628-2222
Distance from hotel: 1 min (305 ft.)

Centrolina
Seasonal Italian, $$
974 Palmer Aly NW,
202-898-2426
Distance from hotel: 2 min (492 ft.)

Del Frisco's Double Eagle Steak House
American, Steakhouse, $$$$
950 I St NW # 501
202-289-0201
Distance from hotel: 3 min (0.1 miles)

Fig & Olive D.C.
American, Mediterranean, European, $$$$
934 Palmer Aly NW,
202-559-5004
Distance from hotel: 3 min (0.1 miles)

Fire & Sage
American, Bar, Pub, $$ - $$$
775 12th Street Northwest
202-661-8925
Distance from hotel: 2 min (0.1 miles)

Fruitive
Juice Bars & Smoothies, Vegan, Live/Raw Food, $$
1094 Palmer Aly NW
202-836-7749
Distance from hotel: 2 min (0.1 miles)

Mango Tree
Asian, Thai, Vegetarian Friendly, $$ - $$$
929 H St NW
202-408-8100
Distance from hotel: 2 min (0.1 miles)

Momofuku CCDC
Japanese, Asian, Gluten Free Options, $$ - $$$
1090 I St NW,
202-602-1832
Distance from hotel: 2 min (0.1 miles)

Haad Thai Restaurant
Asian, Thai,$$ - $$$
1100 New York Ave NW,
202-682-1111
Distance from hotel: 3 min (0.2 miles)

Cuba Libre Restaurant & Rum Bar
Caribbean, Latin, Bar, Spanish, Cuban, Central American, Pub, Gluten Free Options, $$ - $$$
801 9th St NW, Penn Quarter, (Corner of 9th & H Streets)
202-408-1600
Distance from hotel: 4 min (0.2 miles)

Pret A Manger
Soups, Cafe, Fast Food, Vegetarian Friendly, Vegan Options, $
1155 F Street NW,
202-464-2791
Distance from hotel: 4 min (0.2 miles)

Zaytinya
Lebanese, Mediterranean, European, Turkish, Greek, Middle Eastern, Gluten Free Options, $$ - $$$
701 9th St NW, Edison Place
202-638-0800
Distance from hotel: 4 min (0.2 miles)

Ella's Wood-Fired Pizza
Italian, Pizza, Gluten Free Options, $$ - $$$
610 9th St NW,
202-638-3434
Distance from hotel: 5 min (0.3 miles)

Mayur Kabob
Indian, Pakistani, Halal , $$ - $$$
1108 K St NW,
202-637-9770
Distance from hotel: 6 min (0.3 miles)

Daikaya
Japanese, $$
705 6th Street Northwest
202-589-1600
Distance from hotel: 9 min (0.4 miles)

Restaurants in Washington, DC *(continued)*

Restaurants near the Grand Hyatt Washington, continued

Corduroy
Upscale, Seasonal New American menu, $$$
1122 9th St NW
202-589-0699
Distance from hotel: 9 min (0.4 miles)

Coffee near the Grand Hyatt Washington Hotel

Rare Sweets
Dessert, Coffee, and Teas
963 Palmer Alley
202-499-0077
Distance from hotel: 2 min (0.1 miles)

Dolcezza Gelato and Coffee
904 Palmer Alley NW
202-733-2879
Distance from hotel: 3 min (0.2 miles)

Sip of Seattle
Coffee & Tea, Breakfast and Brunch, Juice Bars & Smoothies, $
1120 G St NW
202-393-5058
Distance from hotel: 4 min (0.2 miles)

Bluebird Bakery
918 F St NW
202-510-9917
Distance from hotel: 5 min (0.3 miles)

Peet's Coffee
435 11th St NW
202-400-3258
Distance from hotel: 7 min (0.4 miles)

Chinatown Coffee Co.
475 H St NW #1
202-320-0405
Distance from hotel: 9 min (0.4 miles)

La Colombe Coffee
900 6th St NW
202-795 7909
Distance from hotel: 9 min (0.4 miles)

Bakers & Baristas
501 7th St NW,
202-347-7895
Distance from hotel: 10 min (0.5 miles)

Timgad Cafe
Cafes, Coffee and Tea, Sandwiches
1300 Pennsylvania Ave
202-289-6444
Distance from hotel: 10 min (0.5 miles)

Other Restaurants of Note

Rasika
Indian, $$
633 D St, NW
202-637.1222
Distance from hotel: (0.6 miles)
12 min walk; 9 min bus ride (M Red), 4 min car ride

Fiola
Italian, $$$
601 Pennsylvania Avenue Northwest
202-628-2888
Distance from hotel: (0.7 miles)
15 min walk; 8 min bus ride (M Green/ Yellow); 6 min car ride

Little Serow
Thai, $$$
1511 17th Street Northwest
Walk in; no reservations or phone.
Distance from hotel: (1.2 miles)
15 min bus ride/walk (M Red), 10 min car ride

Red Hen
Italian, $$
1822 First Street NW
202-525-3021
Distance from hotel: (1.6 miles)
20 min bus ride/walk (M Green/ Yellow); 10 min car ride

Blue Duck Tavern
American, $$$
1201 24th St NW,
202-419-6755
Distance from hotel: (1.7 miles)
14 min bus ride/walk (M orange/ silver/blue); 12 min car ride

Lincoln Park Kitchen & Wine Bar
Wine Bars, American,$$
106 13th St SE
202-765-0449
Distance from hotel: (2.3 miles)
29 min bus ride/walk (M orange/ silver/blue), 13 min car ride

Rose's Luxury
New American, $$
717 8th Street SE
202-580-8889
Distance from hotel: (2.6 miles)
19 min bus ride/walk (M orange/ silver/blue); 10 min car ride

BlackSalt Fish Market & Restaurant
Seafood, Palisades, $$$
4883 MacArthur Blvd
202-342-9101
Distance from hotel: (4.4 miles)
36 min bus ride/walk (D6), 17 min car ride

SOCCA 30th Annual Meeting and Critical Care Update
Friday, May 5, 2017 • Grand Hyatt Washington • Washington, DC

Program Schedule

7:00 am – 8:00 am **Continental Breakfast with Exhibitors**

7:15 am – 8:00 am **SOCCA Sunrise Symposium** *(non-CME)* – Open to all attendees

7:30 am – 8:00 am **SOCCA Residents, Fellows and Mentors Continental Breakfast with SOCCA President**

8:00 am – 8:15 am **Welcome Address and Introduction**
Avery Tung, MD, FCCM, President, Society of Critical Care Anesthesiologists

Andrew C. Steel, BSc, MBBS, MRCP, FRCA, FRCPC, EDIC, Chair, Committee on Education

8:15 am – 9:45 am **Education Session I**
Sepsis 3 – Love It or Hate It, What Changes?
Moderator: Mark E. Nunnally, MD, FCCM

8:15 am – 9:15 am **Panel: Perspectives on Sepsis 3 Criteria**

8:15 am – 8:40 am **Bench to Bedside – Lactate, More Than a Marker**
Vidula Vachharajani, MD, FCCP

8:40 am – 9:00 am **Sepsis Everywhere – How Do The Criteria Map to a World-Wide Problem?**
Satish Bhagwanjee, MB, ChB

9:00 am – 9:15 am **Q&A**

Learner Objectives: After participating in this activity, the learner will be able to: (1) Identify the basic pathophysiology and importance of metabolic derangements in acute systemic inflammatory response in sepsis; (2) Assess which sources lead to lactic acid generation and reasons for its accumulation in systemic circulation; (3) Discuss the role of lactate as a biomarker in sepsis; (4) Discuss the purpose of definitions; (5) Apply Sepsis definitions in the care of patients; and (6) Review evidence more critically.

9:15 am – 9:30 am **Coming Plagues: Resistance and Its Impact**
Ramanan Laxminarayan, PhD, MPH

9:30 am - 9:45 am **Code Sepsis and Proportional Response**
David Shimabukuro, MD

Q&A

Learner Objectives: After participating in this activity, the learner will be able to: (1) Formulate a path for greater coordination among all stakeholders to promote knowledge sharing and a mutual commitment to antimicrobial stewardship; (2) Collect information about the underlying drivers of antimicrobial use to contribute to the evolving definition of "appropriate antimicrobial use;" (3) Practice "appropriate antimicrobial use" to guide stewardship efforts, including the education of the general public and health care personnel; (4) Formulate a framework around a "Code Sepsis" response; and (5) Discuss the need and cost-effectiveness for a Code Sepsis team.

 (continued)

9:45 am – 10:15 am **SOCCA Lifetime Achievement Award Presentation**
Critical Care 2017: 30 Years in Under 30 Minutes
Todd Dorman, MD, FCCM

Learner Objectives: After participating in this activity, the learner will be able to: (1) Describe the changes that have occurred in the management of critically ill patients over the last thirty years; and (2) Describe the lessons learned from those changes as a means to focus on the future.

10:15 am – 10:45 am **Break with Exhibitors**

10:45 am – 12:00 pm **Education Session II**
Acute Lung Injury – Scientific Advances and the Road to Recovery
Moderator: Andrew C. Steel, BSc, MBBS, MRCP, FRCA, FRCPC, EDIC

10:45 am –11:05 am **Precision Medicine: Advancing Management of Critical Illness**
Aleksandra Leligdowicz, MD, PhD

11:05 am –11:30 am **ECLS – One Circuit Does Not Fit All**
Jacob Gutsche, MD

11:30 am –12:00 pm **Risk Stratification and Patient- and Family-Centered Outcomes After Critical Illness**
Margaret Herridge, BSc, MSC, MPH, MD

Learner Objectives: After participating in this activity, the learner will be able to: (1) Discuss ARDS pathophysiology and precision medicine; (2) Identify how precision medicine may improve the definition of ARDS; (3) Demonstrate how pathophysiology-based risk stratification could leverage clinical trial outcomes; (4) Describe the indications and ECLS circuits commonly used for patients with acute lung injury; and (5) Assess the risks and benefits associated with the different ECLS circuits.

12:00 pm – 1:00 pm **SOCCA Lunch Symposium** *(non-CME)* – Open to all attendees

1:00 pm – 1:15 pm **Address from the American Society of Anesthesiologists**
Jeffrey Plagenhoef, MD

1:15 pm – 2:15 pm **Education Session III:**
Training the Next Generation – An Update for Critical Care Education
Moderator: Sheela Pai Cole, MD

1:15 pm – 1:30 pm **A Trainee in Difficulty or a Difficult Trainee?**
Andrew C. Steel, BSc, MBBS, MRCP, FRCA, FRCPC, EDICi

1:30 pm – 1:45 pm **The Brand New Intensivist and the Real Challenges of the "First Job"**
Ashish Khanna, MD, FCCP

1:45 pm – 2:00 pm *The Art of Delivering Bad News: Teaching Compassion*
Erin Hennessey, MD

Q&A

Learner Objectives: After participating in this activity, the learner will be able to: (1) Identify the characteristics of trainees in difficulty, difficult trainees, and trainees with difficulties; (2) Identify the first steps in addressing learners in difficulty; (3) Discuss the responsibilities of faculty in evaluation, remediation and probation; (4) Assess how these plans are applied and how they can support the learner in difficulty; (5) Discuss the different types of challenges faced by a trainee during transition into their first job; (6) Differentiate first job challenges as perceived differently by trainees and staff at different stages of their careers; (7) Identify and describe current evidence as related to concerns of an intensivist with their first job; (8) Describe different teaching strategies, including simulation, to incorporate compassion training into critical care medicine training; (9) Discuss barriers to teaching compassion and barriers to evaluating trainees' competence in compassion; and (10) Recognize the importance of improving compassion training to physicians beyond the level of the trainee.

2:15 pm – 3:00 pm **SOCCA Young Investigator Award Presentation**
Moderator: Daryl J. Kor, MD, MSc

2:15 pm – 2:30 pm **Young Investigator Award Winner**
Multistate Perioperative Outcomes of Carotid Revascularization: Carotid Artery Stenting vs. Carotid Endarterectomy
Abdullah Rasheed, MD

2:30 pm – 2:45 pm **First Runner-Up**
Night-Time Extubation Does Not Increase The Risk of Reintubation, Length of Stay, or Mortality: Experience of An Anesthesia-Based Airway Management Model in A Large Urban Teaching Hospital
Kelly K. Everhart, MD, MS

2:45 pm – 3:00 pm **Second Runner-Up:**
Multiple Biomarkers Improve Prediction for Infection in the SICU
William M. White, MD

Learner Objectives: After participating in this activity, the learner will be able to: (1) Identify why stroke is the fifth leading cause of death in the U.S.; (2) Discuss how post-operative complications present significant morbidity and mortality; (3) Describe why extubation failure and need for reintubation is common in the ICU and has been associated with increased morbidity, resource consumption, length of stay (LOS), and mortality; (4) Examine how night-time extubation in a 24-7 anesthesia-based airway management model affects the risk of reintubation, hospital LOS, or mortality; (5) Discuss how one or more admission biomarkers, such as procalcitonin, may affect prediction of culture proven infection; and (6) Compare how admission procalcitonin with other classical measures for suspected infection affect association of culture-proven infection in the surgical ICU.

3:00 pm – 4:15 pm **Moderated Poster Discussion Session**

Learner Objectives: After participating in this activity, the learner will be able to: (1) Describe the latest developments in anesthesiology research in basic, clinical and population science; (2) Examine recent research findings relative to anesthesiology and evaluate their application to the learner's own research and clinical practice; and (3) Construct strategies for integrating new knowledge into anesthesiology research programs.

4:15 pm – 4:30 pm **Break with Exhibitors**

4:30 pm – 5:30 pm **Education Session IV:**
Trauma and Mass Casualty – The Intensive Care Response
Moderator: Maureen McCunn, MD, MIPP, FCCM

4:30 pm – 4:50 pm **The Anesthesiologist as Prehospital Resuscitationist**
Samuel M. Galvagno Jr., DO, PhD, FCCM

4:50 pm – 5:10 pm **Hysteria: Mass Casualty Through the Eyes of the Combatant**
Sasha Grek, MD

5:10 pm – 5:30 pm **Policy Considerations for Building Resilience in Our Health Care Response to Mass Killing and Terrorism**
Kevin B. Gerold, DO, JD, FCCM, FCCP

Learner Objectives: After participating in this activity, the learner will be able to: (1) Discuss historical contributions of anesthesiologists in the field of critical care medicine and prehospital care; (2) Debate the role of the anesthesiologist as a resuscitation expert in the prehospital arena; and (3) Appraise opportunities for anesthesiologists to participate in non-traditional critical care environments; (4) Identify the obstacles to delivering health care in a mass casualty clinical situation; (5) Discuss the roles and responsibilities of the critical care provider in a mass casualty situation; and (6) Identify roles, responsibilities, and resources for local institutional response to crisis.

5:30 pm – 5:45 pm **Closing Remarks**

5:45 pm – 6:30 pm **SOCCA Annual Business Meeting**

5:45 pm – 6:45 pm **SOCCA Residents and Fellows Program**

6:30 pm – 7:30 pm **SOCCA Reception with Exhibitors**

Focus on Critical Care Day

Saturday, May 6

The Society of Critical Care Anesthesiologists (SOCCA) Focus on Critical Care Day on **Saturday, May 6,** will examine and challenge current practices in critical care and highlight new discoveries in research and education. This SOCCA supported, dynamic education program will include one Review Course Lecture, two Problem-Based Learning Discussion Sessions and one Panel presented by the leaders in critical care anesthesia. SOCCA full registrants may attend the bonus Focus on Critical Care Day education sessions as part of their SOCCA Annual Meeting registration fee (pre-registration is required).

9:30 am –10:30 am

Problem-Based Learning Discussions
Ventricular Assist Device: Coming to Your Operating Room
Presenter: Carlee A. Clark, MD, Associate Professor, College of Medicine, Department of Anesthesia and Perioperative Medicine, Medical University of South Carolina (MUSC), Charleston, South Carolina

9:30 am – 11:00 am

Integrated Quality Trauma Care: From Concepts to Reality
Moderator: Miguel A. Cobas, MD, FCCM, Associate Professor of Clinical Anesthesiology, Program Director, Critical Care Medicine Fellowship, University of Miami Health System, Miami, Florida; Treasurer, SOCCA

Panelists:

- **Comprehensive Trauma Care: From Concept to Reality**
  Miguel A. Cobas, MD, FCCM
- **Practical Guide to Trauma Readiness: Perspective of the Anesthesiologist**
  Roman Dudaryk, MD, Assistant Professor of Clinical Anesthesiology, University of Miami Health System, Miami, Florida
- **Quality of Trauma Care: Is Your Skin in the Game?**
  Thomas E. Grissom, MD, FCCM, Associate Professor, Department of Anesthesiology, R Adams Cowley Shock Trauma Center, University of Maryland School of Medicine, Baltimore, Maryland
- **From Lifesaver to Lifetime Care**
  Maureen McCunn, MD, MIPP, FCCM, Professor, Department of Anesthesiology, R Adams Cowley Shock Trauma Center, University of Maryland School of Medicine, Baltimore, Maryland

3:00 pm – 3:45 pm

Review Course Lecture: Perioperative Ultrasound
Presenter: Michael Haney, MD, PhD, Department of Surgical and Perioperative Sciences, Anesthesiology and Intensive Care Medicine, Umeå University, Umeå, Sweden

4:00 pm – 5:00 pm

Sepsis: The Deadly Superbug
Presenter: Peggy White, MD, Assistant Professor of Medicine, Associate Program Director of the Multi-Disciplinary Adult Critical Care Medicine Fellowship, University of Florida College of Medicine, Gainesville, Florida

Aligned Meeting Day at the IARS 2017 Annual Meeting and International Science Symposium

Saturday, May 6

The following sessions are part of the Aligned Meeting Day at the IARS 2017 Annual Meeting and International Science Symposium. SOCCA registered attendees are invited to attend these IARS sessions as part of their SOCCA registration fee. CME for these sessions will only be provided to registrants of the IARS 2017 Annual Meeting.

7:30 am – 8:00 am **Opening General Session: Welcome and Opening Remarks**

8:00 am – 9:00 am **T.H. Seldon Memorial Lecture: Vital Directions in Health and Medicine in Uncertain Times**
Presenter: Victor J. Dzau, MD, President, National Academy of Medicine, Washington, DC; Chancellor Emeritus and James B. Duke Professor of Medicine, Duke University, Durham, North Carolina

9:00 am – 9:30 am Break

9:30 am –12:30 pm **Symposium-01: AUA: Recognizing the "Painful" Truths of the Opioid Abuse Epidemic**
Moderator: Y.S. Prakash, MD, PhD, Chair, Division of Anesthesia Research; Vice Chair, Department of Anesthesiology, Mayo Clinic, Rochester, Minnesota

Panelists:

- **Understanding and Responding to the Intersecting Issues Related to Pain and Opioid Misuse**
  Wilson Compton, MD, MPE, Deputy Director, National Institute on Drug Abuse, Bethesda, Maryland
- **FDA's Role in Addressing the Opioid Epidemic**
  Ellen Fields, Deputy Director, Division of Anesthesia, Analgesia, and Addiction Products (DAAAP), Office of New Drugs, Center for Drug Evaluation and Research, FDA, Silver Spring, Maryland
- **Frontlines of the Opioid Epidemic**
  Lynn Webster, Vice President of Scientific Affairs, PRA Health Sciences, Immediate Past President, American Academy of Pain Medicine, Raleigh, North Carolina
- **Mechanisms of Opioid Abuse: Dissecting Necessary from Unnecessary Need**
  Mary Jeanne Kreek, MD, Senior Attending Physician, Patrick E. and Beatrice M. Haggerty Professor, Laboratory of the Biology of Addictive Diseases, The Rockefeller University, New York, New York

(continued)

9:30 am –10:30 am

Scholars' Program
The Scholars' Program requires pre-registration and an additional $50 fee to attend.

Scholar–01: Introduction to the Translational Research Continuum

Moderator: Michael Montana, MD, PhD, Pediatric Fellow, Department of Anesthesiology, Washington University School of Medicine in St. Louis, St. Louis, Missouri

Presenter: George Mashour, MD, PhD, Executive Director, Translational Research, Office of Research, Executive Director, Michigan Institute for Clinical and Health Research, Associate Dean for Clinical and Translational Research, Medical School, Director, Center for Consciousness Science, Bert N. La Du Professor and Associate Chair of Anesthesiology Research, Associate Professor, Department of Neurosurgery, University of Michigan Medical School, Ann Arbor, Michigan

10:45 am – 11:45 am

Scholar–02: Keynote Session: Rigor and Reproducibility Across the Translational Spectrum

Moderators:
Sinziana Avramescu, MD, PhD, FRCPC, Assistant Professor, Department of Anesthesia, University of Toronto; Staff Anesthesiologist, Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada; Regional Representative: International, eSAS; and Katie Schenning, MD, MPH, Assistant Professor of Anesthesiology & Perioperative Medicine, Oregon Health and Science University, Co-Chair Membership, eSAS

Katie J. Schenning, MD, MPH, Assistant Professor, Department of Anesthesiology & Perioperative Medicine, Oregon Health & Science University, Portland, Oregon, Co-Chair Membership, eSAS

Panelists:

- **Trouble in the Laboratory: Problems with Rigor and Precision**
  James Eisenach, MD, President, FAER, Immediate Past Editor-in-Chief, *Anesthesiology*

- **Reproducibility Crisis in Scientific Research**
  Steven L. Shafer, MD, Professor of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine, Stanford, California; Adjunct Associate Professor of Bioengineering and Therapeutic Sciences, University of California, San Francisco, San Francisco, California; Immediate Past Editor-in-Chief, *Anesthesia & Analgesia*

 (continued)

12:00 pm – 1:00 pm

Scholar–03: Plenary Session I: Expanding Our Horizons in Anesthesiology Research Training

Moderators:
Julie Freed, MD, PhD, Adult Cardio-Thoracic Anesthesiology Fellow, Department of Anesthesiology, Medical College of Wisconsin, Milwaukee, Wisconsin; Co-Chair Partnerships, eSAS

James W. Ibinson, MD, PhD, Assistant Professor, Department of Anesthesiology and Clinical and Translational Science Institute, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania

Panelists:
- **Developing Skills in Commercialization: Adapting Elements of the NSF I-CORPs Program to Create a Customized Program for Academic Physicians**
  Connie Chang, MBA, Managing Director, Fast Forward Medical Innovation, University of Michigan Health System, Ann Arbor, Michigan
- **The Challenges of Building Diversity in Academic Anesthesiology**
  Paloma Toledo, MD, MPH, Assistant Professor of Anesthesiology, Northwestern University Feinberg School of Medicine, Chicago, Illinois

1:00 pm – 2:00 pm

Scholar–04: Lunch Session: Inspirational Tales of Career Success

Moderator: Michael S. Avidan, MBBCh, Professor, Anesthesiology and Cardiothoracic Surgery, Director, INQUIRI, Division Chief, Cardiothoracic Anesthesiology and Cardiothoracic Intensive Care, Washington University School of Medicine in St. Louis, St. Louis, Missouri; President-Elect, AUA

Panelists:
- **How to Maximize Your Success in Academia: Tips for Junior Faculty**
  Oluwaseun Johnson-Akeju, MD, Assistant Professor, Anaesthesia, Harvard Medical School; Anaesthesia, Critical Care and Pain Medicine, Massachusetts General Hospital, Boston, Massachusetts
- **Anesthesia, Informatics and Health Policy: My Unexpected Journey to Nashville**
  Jesse Ehrenfeld, MD, MPH, Associate Professor of Anesthesiology, Bioinformatics, Surgery, and Health Policy; Director of Education Research, Vanderbilt Office of Health Sciences Education; Associate Director, Anesthesiology & Perioperative Informatics Research Division, Vanderbilt University Medical Center, Nashville, Tennessee; Chair, Massachusetts Committee on LGBT Health, Chair, Massachusetts General Hospital LGBT Employee Resource Group, Member, Board Committee on Quality at Fenway Community Health Center

(continued)

2:00 pm – 3:30 pm

Scholar–05: NIH Funding for Transition to An Early Independence: Information Session and Q&A with NIH Representatives

Moderators:
Aaron J. Norris, MD, Anesthesiology Specialist, Barnes Jewish Hospital, St. Louis, Missouri; Chair Events, eSAS

Vivianne Tawfik, MD, PhD, Instructor, Department of Anesthesiology, Perioperative and Pain Medicine, Assistant Director, Fellowship in Anesthesia Research and Medicine Program, Stanford University School of Medicine, Stanford, California; Co-President, eSAS

Presenters:
- **Funding Opportunities for Early-Career Investigators at the National Institute of General Medical Sciences (NIGMS)**
  Alison Cole, PhD, Branch Chief, Pharmacological and Physiological Sciences Branch, Division of Pharmacology, Physiology, and Biological Chemistry, Nation Institute for General Medical Sciences, Bethesda, Maryland

- **Funding Opportunities for Early Career Investigators at the National Institute on Aging**
  Luci Roberts, PhD, Director, Division of Planning, Evaluation and Analysis, Office of Planning, Analysis and Communication (OPAC), National Institutes of Health (NIH), Bethesda, Maryland

- Jane Scott, ScD, MSN, Director, Office of Research Training & Career Development, National Heart, Lung, and Blood Institutes, National Institutes of Health (NIH), Bethesda, Maryland

4:00 pm – 5:00 pm

Scholar–06: Plenary Session II: Precision Medicine: What Anesthesiology Can Contribute

Moderators:
Michael Robert Mathis, MD, Clinical Lecturer, Cardiovascular Anesthesia, University of Michigan, Michigan Medicine, Ann Arbor, Michigan; Regional Representative: Mid-West, eSAS

Elizabeth L. Whitlock, MD, MSc, Clinical Instructor and T32 Research Fellow, Department of Anesthesia and Perioperative Care, University of California, San Francisco, San Francisco, California; Co-President, eSAS

Panelists:
- **Pharmacogenomics in Anesthesiology**
  Debra A. Schwinn, MD, Associate Vice President for Medical Affairs, Professor of Anesthesiology, Pharmacology & Biochemistry, University of Iowa, Iowa City, Iowa

- **The National Precision Medicine Initiative**
  Sachin Kheterpal, MD, MBA, Associate Professor of Anesthesiology, University of Michigan Health System, Ann Arbor, Michigan; Member, NIH Advisory Panel on Precision Medicine

 (continued)

Aligned Meeting Day, *continued*

5:00 pm – 6:00 pm **Scholars' Program Mentor-Trainee Reception**
Grand Hyatt Washington
Based on rigorous evaluation of both mentors' skills and trainees' needs, goal-directed interactions will be catalyzed.

6:00 pm – 7:30 pm **IARS Alignment Reception**
Grand Hyatt Washington
SOCCA attendees invited to attend.

Speaker Presentations

Education Session I: Perspectives on Sepsis 3 Criteria

Bench to Bedside – Lactate, More Than a Marker

Speaker: Vidula Vachharajani, MD

Summary: Diagnostic criteria for septic shock include elevation of lactate (>2) per new definitions for sepsis, Sepsis-3[1]. The evidence base for this inclusion, derived from vast literature supporting the positive correlation between increased lactate and sepsis mortality and Delphi process[2]. This talk is focused on exploring the controversies surrounding the sources of lactate production during sepsis, reasons for its accumulation and an attempt to convince the audience about the sepsis being an immuno-metabolic disease.

The association between in increased lactate/ lactate clearance and sepsis mortality is known for over two decades; however the origin of lactate remains controversial.[3-5] While tissue hypoxia and hypo-perfusion are commonly implicated in development of hyperlactatemia it does not explain the hyperlactatemia during hyper dynamic state of sepsis, prior to tissue hypoperfusion.[6,7] The literature supports a significant role of aerobic glycolysis during sepsis5. The presentation will discuss aerobic glycolysis and glucose metabolism during early and late sepsis. More importantly, the presentation will also explore some potentially therapeutic implications for key regulators of glucose metabolic pathways.[8]

REFERENCES:

1. Singer, M., et al. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA : the journal of the American Medical Association 315, 801-810 (2016).
2. Shankar-Hari, M., et al. Developing a New Definition and Assessing New Clinical Criteria for Septic Shock: For the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA : the journal of the American Medical Association 315, 775-787 (2016).
3. Friedman, G., Berlot, G., Kahn, R.J. & Vincent, J.L. Combined measurements of blood lactate concentrations and gastric intramucosal pH in patients with severe sepsis. Critical care medicine 23, 1184-1193 (1995).
4. Nguyen, H.B., et al. Early lactate clearance is associated with improved outcome in severe sepsis and septic shock. Critical care medicine 32, 1637-1642 (2004).
5. James, J.H., et al. Linkage of aerobic glycolysis to sodium-potassium transport in rat skeletal muscle. Implications for increased muscle lactate production in sepsis. The Journal of clinical investigation 98, 2388-2397 (1996).
6. Jansen, T.C., van Bommel, J. & Bakker, J. Blood lactate monitoring in critically ill patients: a systematic health technology assessment. Critical care medicine 37, 2827-2839 (2009).
7. Bakker, J. Lost in translation: on lactate, hypotension, sepsis-induced tissue hypoperfusion, quantitative resuscitation and Surviving Sepsis Campaign bundles. Critical care medicine 43, 705-706 (2015).
8. Cheng, S.C., et al. Broad defects in the energy metabolism of leukocytes underlie immunoparalysis in sepsis. Nature immunology 17, 406-413 (2016).

Speaker Presentations

EDUCATION SESSION I: Perspectives on Sepsis 3 Criteria, continued

Sepsis Everywhere – How Do The Criteria Map to a World-Wide Problem?

Satish Bhagwanjee, MD

This presentation will address the new definition of Sepsis. The secret to effective Sepsis management depends on early recognition of severe forms of infection and rapid interventions that target primary pathogenetic mechanisms. The historical evolution of the definition and its role in clinical practice will be highlighted. In particular the importance of describing severity of an illness in a definition will be emphasized. Other critical care definitions e.g. ARDS will be mentioned to illustrate implications across multiple domains.

The goal is to help clinicians to improve diagnosis and treatment.

Notes

Speaker Presentations

Education Session I: Love It or Hate It, What Changes?, continued

Coming Plagues: Resistance and Its Impact

Speaker: Ramanan Laxminarayan, PhD, MPH

In this talk, I will discuss patterns of antimicrobial use in the United States and globally, drivers of antimicrobial use in hospitals and the community and behavioral approaches to improving antimicrobial stewardship.

Notes

Education Session I: Sepsis 3 - Love It or Hate It, What Changes?, continued

Code Sepsis and Proportional Response

Speaker: David Shimabukuro, MD

Notes

Speaker Presentations

SOCCA Lifetime Achievement Award Presentation

Critical Care 2017: 30 Years in Under 30 Minutes

Speaker: Todd Dorman, MD, FCCM

I will take the audience on a quick tour of critical care since I began my career 30 years ago. Attendees will be able to discuss how critical care is sometimes about doing less and not more. Importantly, critical care offers the opportunity to learn something new every day.

Notes

Speaker Presentations

Education Session II: Acute Lung Injury – Scientific Advances and the Road to Recovery

Precision Medicine: Advancing Management of Critical Illness

Speaker: Aleksandra Leligdowicz, MD, PhD

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Precision Medicine in ARDS

Aleksandra Leligdowicz, MD PhD
FRCPC
University of Toronto, Canada
UCSF, California, USA

SOCCA meeting, Washington, DC
5.May.2017

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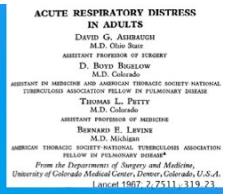
DISCLOSURES

- None

ARDS History: 1967


ACUTE RESPIRATORY DISTRESS IN ADULTS

DAVID G. ASHBAUGH, M.D. Ohio State, ASSISTANT PROFESSOR OF SURGERY
D. BOYD BIGELOW, M.D. Colorado, ASSISTANT IN MEDICINE AND AMERICAN THORACIC SOCIETY NATIONAL TUBERCULOSIS ASSOCIATION FELLOW IN PULMONARY DISEASE
THOMAS L. PETTY, M.D. Colorado, ASSISTANT PROFESSOR OF MEDICINE
BERNARD E. LEVINE, M.D. Michigan, AMERICAN THORACIC SOCIETY-NATIONAL TUBERCULOSIS ASSOCIATION FELLOW IN PULMONARY DISEASE*
*From the Department of Surgery and Medicine, University of Colorado Medical Center, Denver, Colorado, U.S.A.
Lancet 1967; 2: 7511: 319-23

- Ashbough, et al: 12 patients with respiratory distress after a variety of stimuli
- Autopsy findings:
  - dilated capillaries
  - alveolar atelectasis
  - interstitial and intra-alveolar hemorrhage & edema
  - alveolar macrophages
  - hyaline membranes

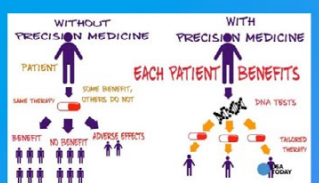
- "Despite a variety of physical and possibly biochemical insults, the *response of the lung was similar*"
- "The loss of lung compliance, refractory cyanosis, and microscopic atelectasis point to *alveolar instability as likely source of trouble*"
- "*Positive end-expiratory pressure* would theoretically prevent complete collapse and improve oxygenation by maintaining alveolar ventilation"
- "The use of positive end-expiratory pressure merely buys time: *unless the underlying process can be successfully treated or reversed, the prognosis is grave*"

Why is ARDS so challenging?

- ARDS is a ***heterogeneous syndrome***
- Definition is ***not specific***
- Pathophysiology is incompletely understood
- Variable interaction between genotype, phenotype, race, environment, and therapy
- Which supportive measures are best for which patients?

Precision Medicine

- **NIH definition**
  - An approach for disease treatment and prevention that takes into account *individual variability* in genes, environment, and lifestyle
  - More accurate prediction of which treatment & prevention strategies for a particular disease will work in which patients



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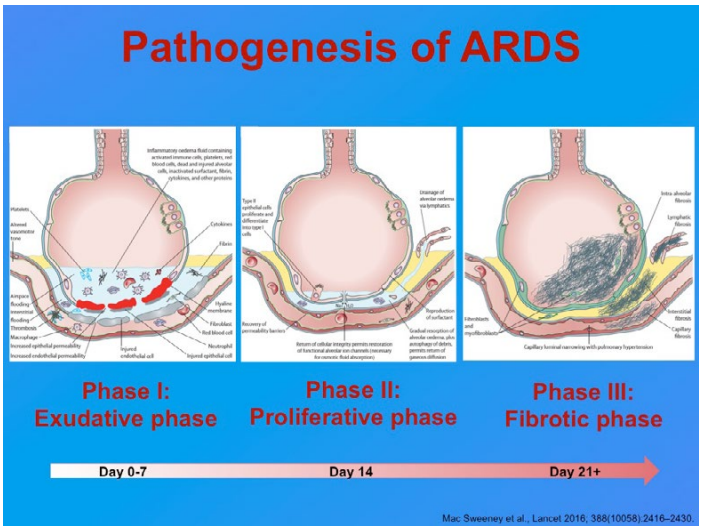
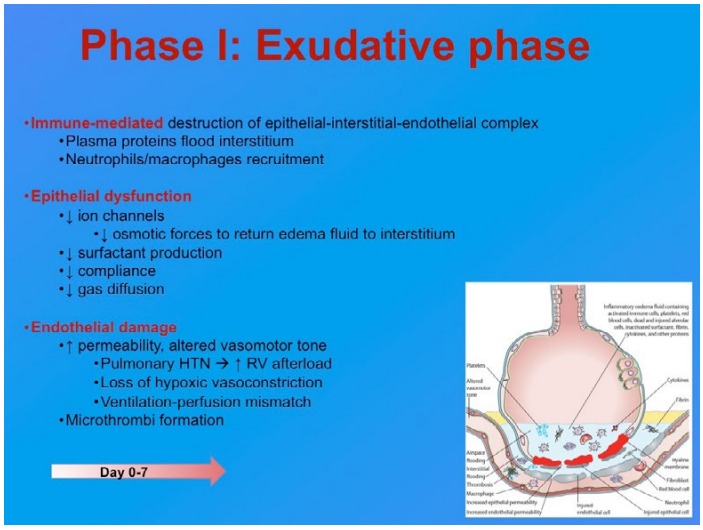
Speaker Presentations

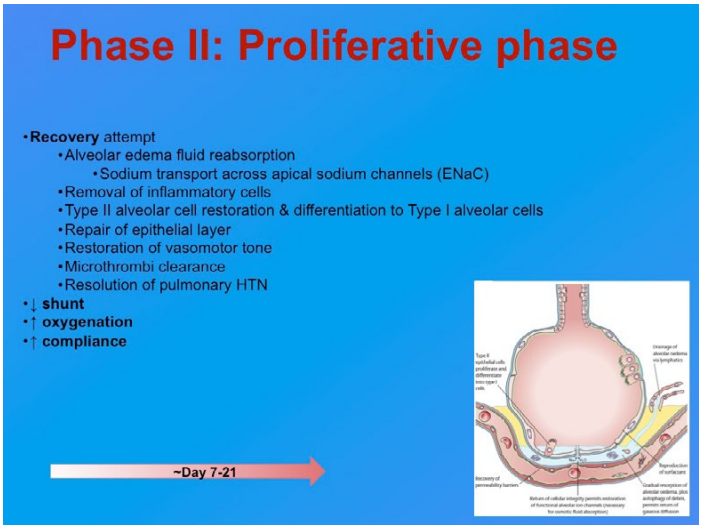
Education Session II, continued

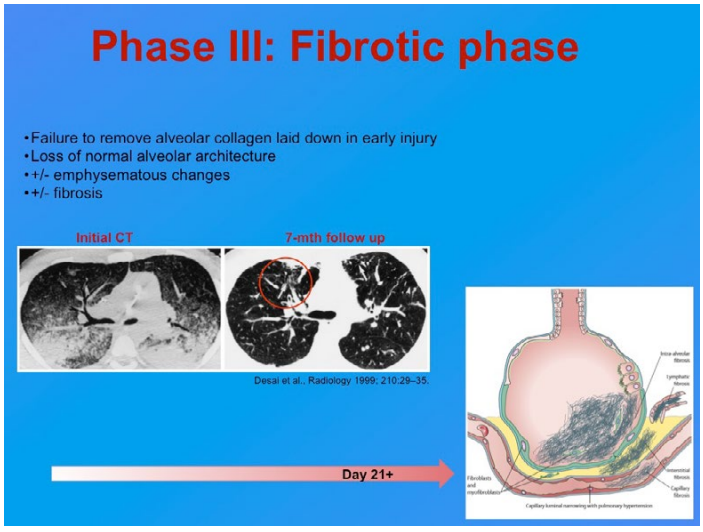
Precision Medicine: Advancing Management of Critical Illness

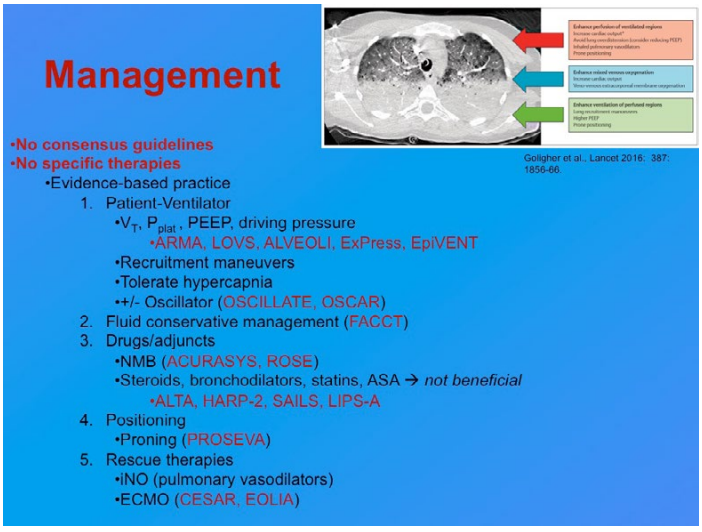
Speaker: Aleksandra Leligdowicz, MD, PhD











Education Session II, continued

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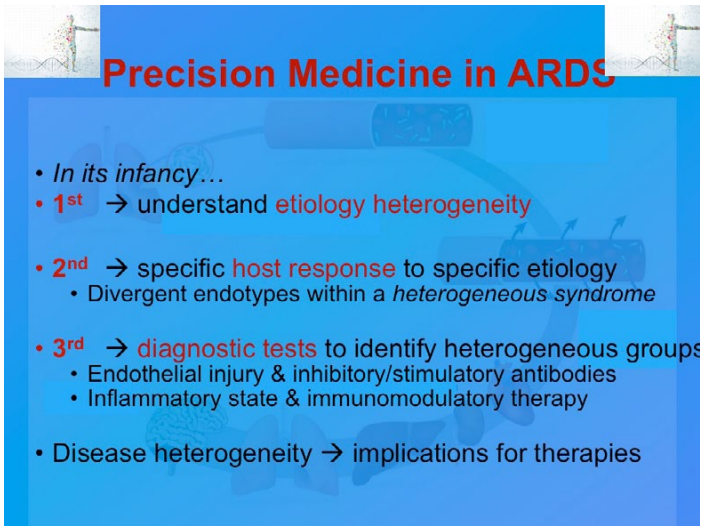
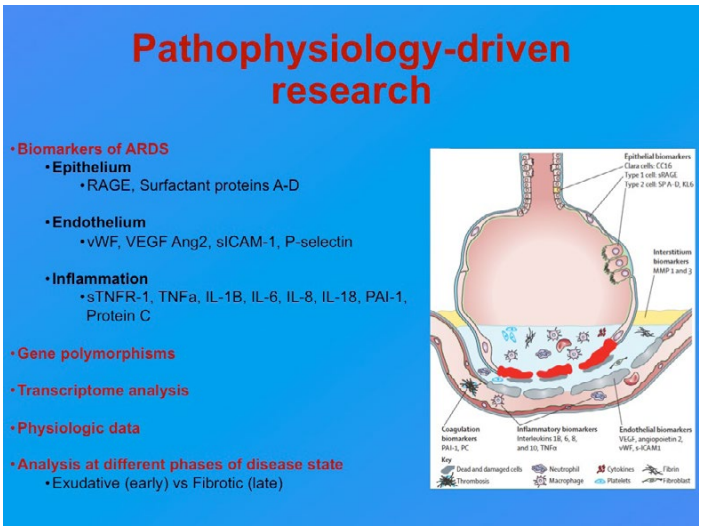
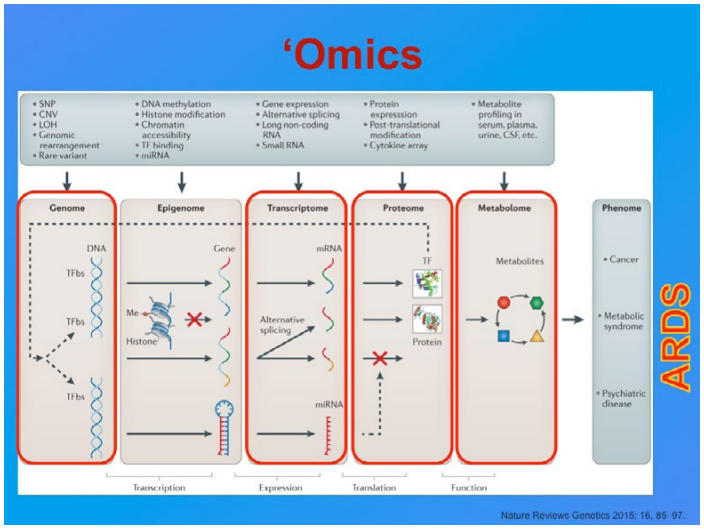
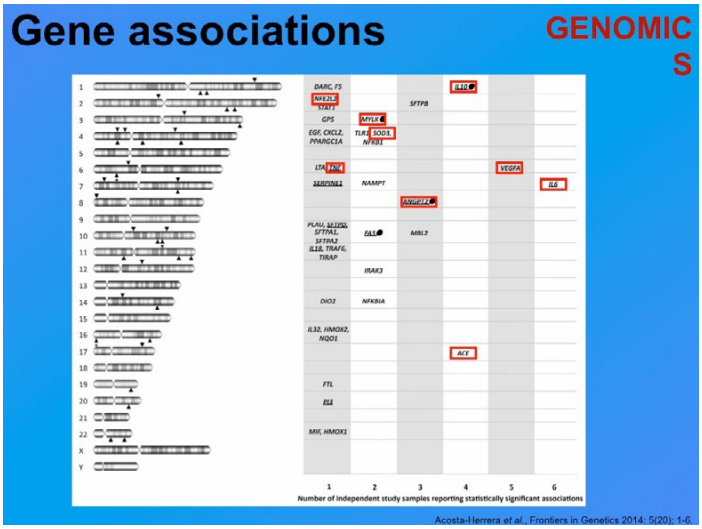
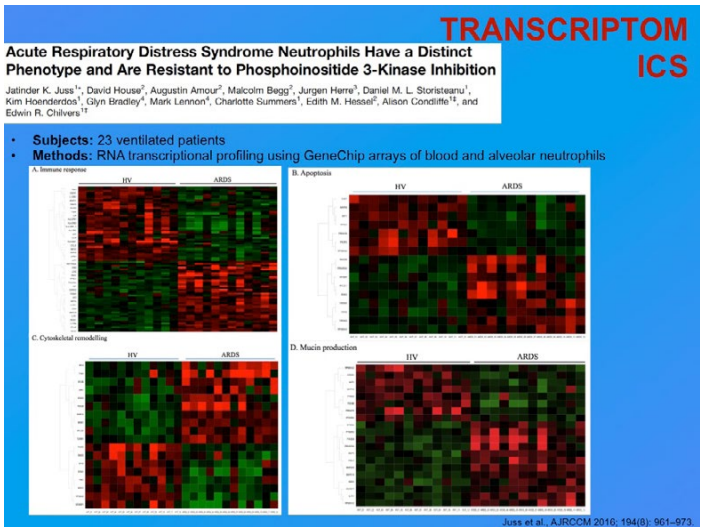
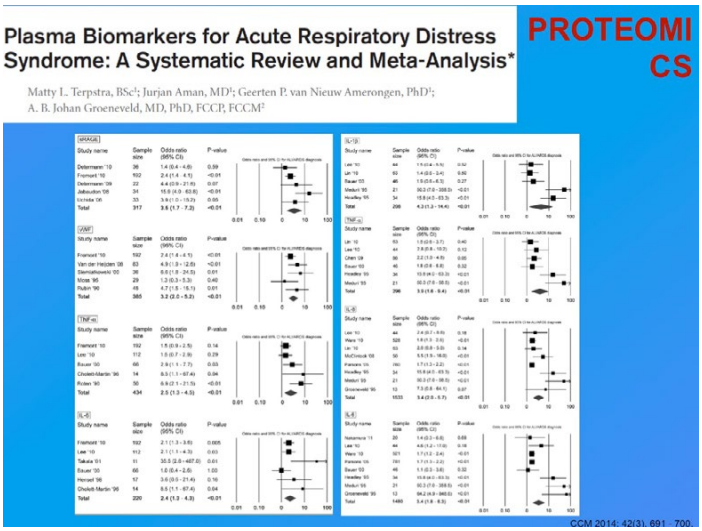










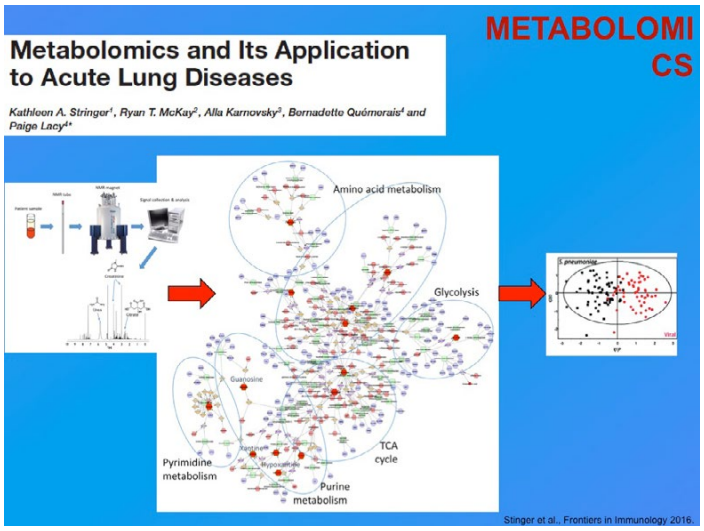


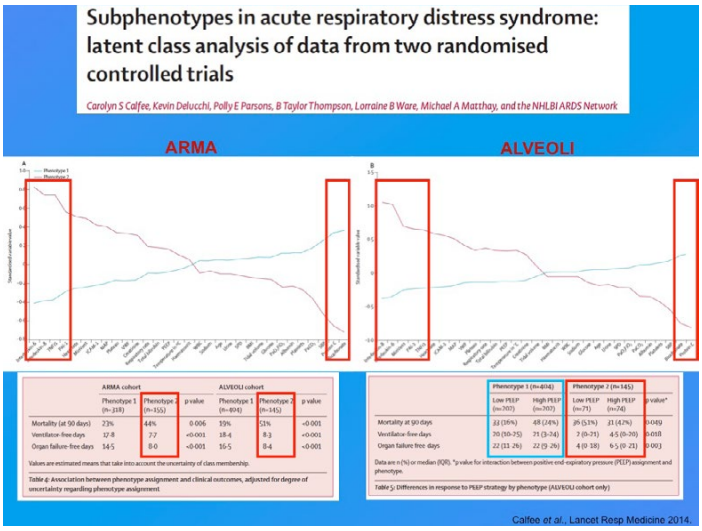
Speaker Presentations

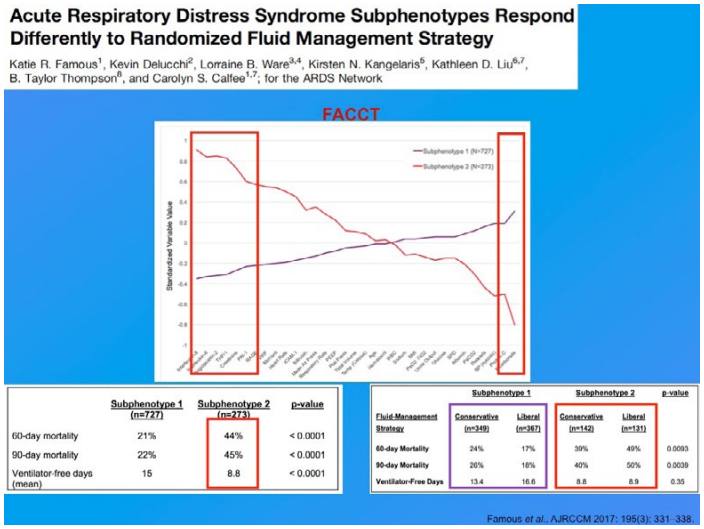
Education Session II, continued

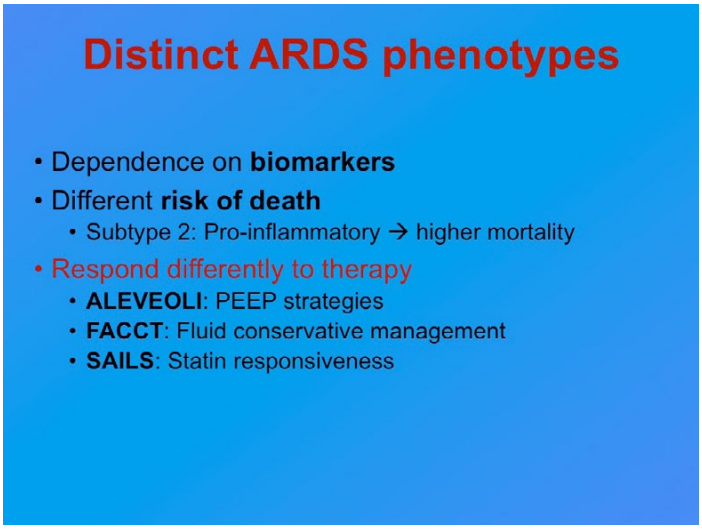
Precision Medicine: Advancing Management of Critical Illness

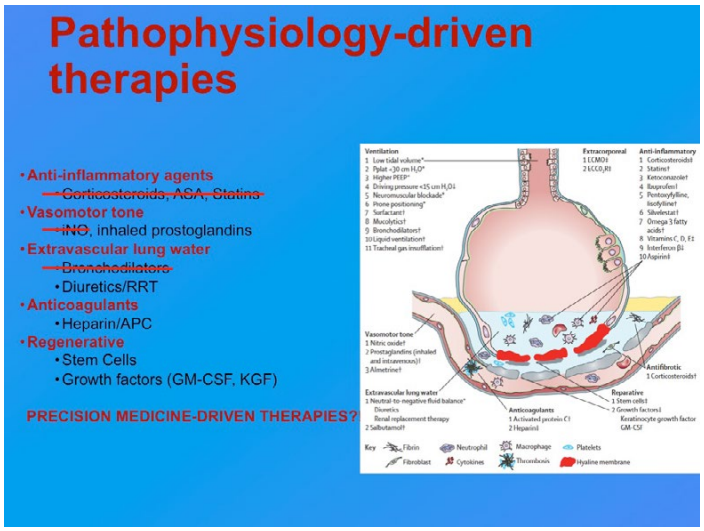
Speaker: Aleksandra Leligdowicz, MD, PhD

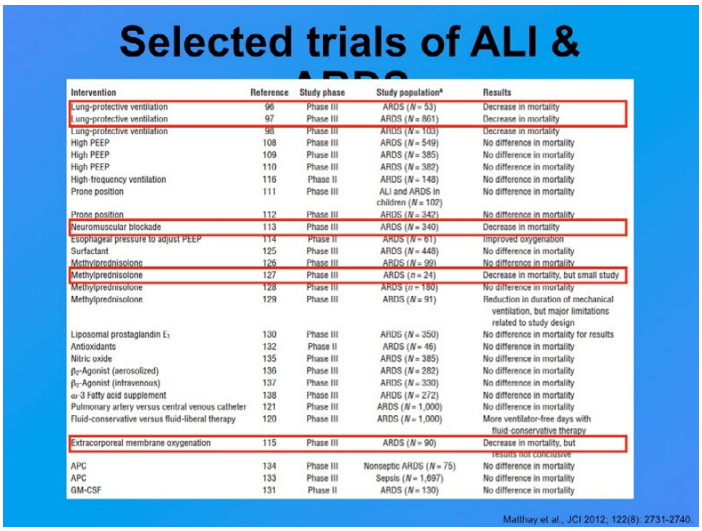












Speaker Presentations

Education Session II, continued

Precision Medicine: Advancing Management of Critical Illness

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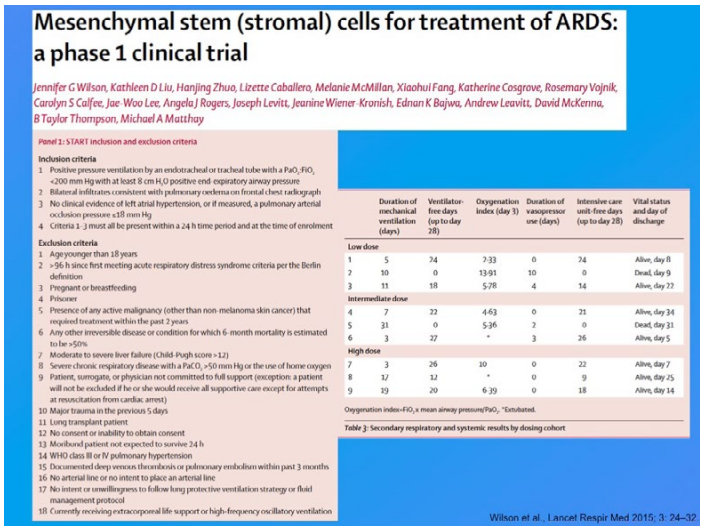


Mesenchymal stem (stromal) cells for treatment of ARDS: a phase 1 clinical trial

Jennifer G Wilson, Kathleen D Liu, Hanjing Zhuo, Lizette Caballero, Melanie McMillan, Xiaohui Fang, Katherine Cosgrove, Rosemary Vojnik, Carolyn S Calfee, Jae-Woo Lee, Angela J Rogers, Joseph Levitt, Jeanine Wiener-Kronish, Ednan K Bajwa, Andrew Leavitt, David McKenna, B Taylor Thompson, Michael A Matthay

Panel 1: START inclusion and exclusion criteria

Inclusion criteria

1. Positive pressure ventilation by an endotracheal or tracheal tube with a PaO_2:FiO_2 <200 mm Hg with at least 8 cm H_2O positive end-expiratory airway pressure
2. Bilateral infiltrates consistent with pulmonary oedema on frontal chest radiograph
3. No clinical evidence of left atrial hypertension, or if measured, a pulmonary arterial occlusion pressure ≤18 mm Hg
4. Criteria 1–3 must all be present within a 24 h time period and at the time of enrolment

Exclusion criteria

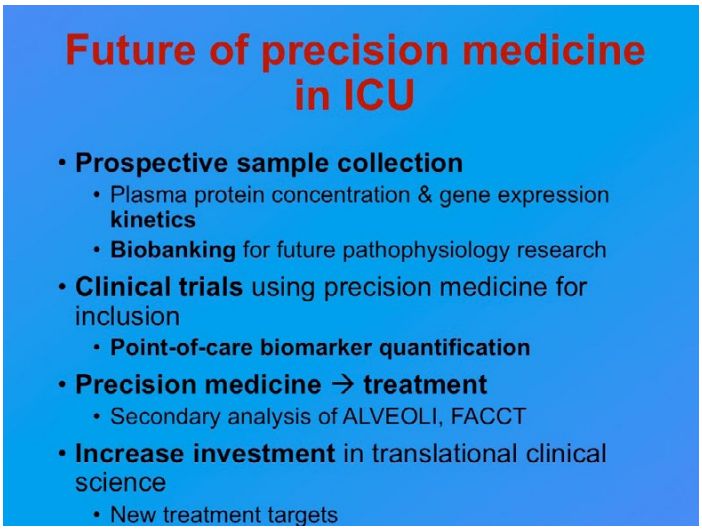
1. Age younger than 18 years
2. >96 h since first meeting acute respiratory distress syndrome criteria per the Berlin definition
3. Pregnant or breastfeeding
4. Prisoner
5. Presence of any active malignancy (other than non-melanoma skin cancer) that required treatment within the past 2 years
6. Any other irreversible disease or condition for which 6-month mortality is estimated to be >50%
7. Moderate to severe liver failure (Child-Pugh score >12)
8. Severe chronic respiratory disease with a $PaCO_2$ >50 mm Hg or the use of home oxygen
9. Patient, surrogate, or physician not committed to full support (exception: a patient will not be excluded if he or she would receive all supportive care except for attempts at resuscitation from cardiac arrest)
10. Major trauma in the previous 5 days
11. Lung transplant patient
12. No consent or inability to obtain consent
13. Moribond patient not expected to survive 24 h
14. WHO class III or IV pulmonary hypertension
15. Documented deep venous thrombosis or pulmonary embolism within past 3 months
16. No arterial line or no intent to place an arterial line
17. No intent or unwillingness to follow lung protective ventilation strategy or fluid management protocol
18. Currently receiving extracorporeal life support or high-frequency oscillatory ventilation

	Duration of mechanical ventilation (days)	Ventilator-free days (up to day 28)	Oxygenation index (day 3)	Duration of vasopressor use (days)	Intensive care unit-free days (up to day 28)	Vital status and day of discharge
Low dose						
1	5	24	7·33	0	24	Alive, day 8
2	10	0	13·91	10	0	Dead, day 9
3	11	18	5·78	4	14	Alive, day 22
Intermediate dose						
4	7	22	4·63	0	21	Alive, day 34
5	31	0	5·36	2	0	Dead, day 31
6	3	27	*	3	26	Alive, day 5
High dose						
7	3	26	10	0	22	Alive, day 7
8	17	12	*	0	9	Alive, day 25
9	19	20	6·39	0	18	Alive, day 14

Oxygenation index=FiO_2 x mean airway pressure/PaO_2. *Extubated.

Table 3: Secondary respiratory and systemic results by dosing cohort

Wilson et al., Lancet Respir Med 2015; 3: 24–32



Future of precision medicine in ICU

- **Prospective sample collection**
  - Plasma protein concentration & gene expression **kinetics**
  - **Biobanking** for future pathophysiology research
- **Clinical trials** using precision medicine for inclusion
  - **Point-of-care biomarker quantification**
- **Precision medicine → treatment**
  - Secondary analysis of ALVEOLI, FACCT
- **Increase investment** in translational clinical science
  - New treatment targets

Speaker Presentations

Education Session II, continued

ECLS – One Circuit Does Not Fit All

Speaker: Jacob T. Gutsche, MD

1) Introduction- Indications and Contraindications for ECLS in patients with ARDS
    a) Hypercarbia
    b) Hypoxia
    c) Cardiac function
    d) Risk Scoring Systems
    i) Resp Score

2) Circuit options
    a) Veno-arterial
        i) Peripheral
        ii) central
    b) Veno-venous
        i) single cannula
        ii) multiple cannula
    c) Veno-Arterio/Venous
        i) Indications and management

3) Circuit modification and troubleshooting
    a) Differential hypoxia
        i) Monitoring
        ii) treatment
    b) Recirculation
        i) Monitoring
        ii) Cannula position
    c) Cardiac Vent
        i) Types
            (1) Pros/Cons

4) Summary

Education Session II, continued

Risk Stratification and Patient- and Family-Centered Outcomes After Critical Illness

Speaker: Margaret Herridge, BSc, MSC, MPH, MD

Notes

Education Session III: Training the Next Generation - An Update for Critical Care Education

A Trainee in Difficulty or a Difficult Trainee?

Speaker: Andrew C. Steel, BSc, MBBS, MRCP, FRCA, FRCPC, EDIC

Assistant Professor, Department of Anaesthesia and Interdepartmental Division of Critical Care Medicine, Toronto General Hospital, University of Toronto, Toronto, Canada

Objectives of this lecture

1. Identify the characteristics of trainees in difficulty, difficult trainees, and trainees with difficulties
2. Identify the first steps in addressing learners in difficulty
3. Discuss the responsibilities of faculty in evaluation, remediation and probation
4. Assess how these plans are applied and how they can support the learner in difficulty.

Case Example:

Dr James is an intensive care medicine doctor who is nearing the end of his ICU training. He has been working on your ICU for the last 4 months. In this time, you have had multiple complaints from the ICU nursing staff about his poor communication skills and their perception of his ability. During his last on call duty he was paged by one of the ward nurses to review a patient, known normally to be hypertensive, on the ward who had undergone a liver biopsy earlier in the day. The patient had P 120 BP 100/70, urine output of 20mls/hr for the past 3 hours and was cold and clammy. He attributed the tachycardia to pain and prescribed the patient morphine and left the ward. He was called back after the patient had deteriorated further. At this point he recognized that the patient was bleeding (Hb 48). However he left the patient on the ward to be managed by the Critical Care Response Team RN, who was struggling, and returned to the ICU to admit an expected patient from the OR. The critical care outreach team then rang the ICU consultant on call who accepted the patient to SICU and arranged for the patient to undergo radiological embolisation to control the bleeding.

This week, he was asked to transfer a stable ventilated patient to another hospital but did not feel confident to do so. On further questioning he admitted that he had not transferred a patient in an ambulance for over 2 years and was not familiar with the procedures required to transfer a critically ill ventilated patient. You have now been asked to sign him off to have completed his ICU training. What would you do and how would you manage this?

General Principles

1. Early identification of the trainee with difficulties, the difficult trainee, or the trainee in difficulty is critical to their successful management. Like many clinical diagnoses it can be challenging to confidently determine this although some patterns of behavior are commonly seen:

Characteristic	Description of behaviour
Absent	Not answering calls; disappearing between clinic and ward; lateness; frequent sick leave
Slow	Slowness in doing procedures, clerking patients, dictating letters, making decisions; arriving early, leaving late and still not achieving a reasonable workload
Angry	"Ward-rage" or bursts of temper; shouting matches; real or imagined slights
Circumvented	Bypassed by junior colleagues or nurses who find ways to avoid seeking the doctor's opinion or help
Mired	Difficulty with exams; uncertainty about career choice; disillusionment with medicine
Oblivious	Lacks insight; rejection of constructive criticism; defensiveness; counter-challenges
Inflexible	Rigid; poor tolerance of ambiguity; inability to compromise; difficulty prioritising; inappropriate 'whistle blowing'

2. In the event of a problem, establish and clarify circumstances and facts as quickly and objectively as possible from a variety of appropriate sources

3. Poor performance is a symptom and not a diagnosis therefore it is essential to explore the underlying cause

Areas of difficulty	Underlying cause
Clinical performance	Knowledge, skills, communication
Personality and behavioural	Professionalism, motivation
Sickness and ill health	Personal/family stress, career frustrations, financial, drug and alcohol abuse
Environmental	Organisational, workload, bullying and harassment

4. Different problems require different solutions. Solutions that work for one individual or one situation may not work for others

Areas of difficulty	Potential solutions
Clinical performance	Focused training or retraining Extended period of clinical supervision Targeted task orientated training to a specific deficit Use of work based assessment tools (Case based discussions, clinical evaluation exercises)
Personality and behavioural	Use of multisource feedback Regular feedback with supporting examples and guidance Close 'clinical supervision' Dedicated 'developmental mentoring' Video or simulation based training to challenge behaviour Occupational and cognitive psychologists Career guidance Might need to limit practice
Sickness and ill health	Occupational health Mentoring Staff counseling services National support services Employers may be required to make adjustments to work pattern, content, and environment to cover disability
Environmental	Systems and processes failures might need to be addressed eg. lack of adequate resources, poorly maintained equipment, unrealistic work demands, poor clinical management, poor support and substandard working environments

5. Develop a professional development plan. Learning objectives need to be well-defined and in agreement with trainee and Program Education Committee. For example they can be based on the "SMART criteria":

SMART criteria	Considerations
Specific	Is it clear what the trainee needs to achieve and how?
Measurable	Are both parties clear what constitutes satisfactory performance and what supporting evidence will be accepted? Usually this will relate back to the relevant curriculum.
Achievable	Is there a realistic prospect of success in the time and learning environment available?
Resourced	Are the appropriate educational resources available to the trainee in order to support their attainment of the goals set?
Time-bounded	Are both parties clear as to when the completion of the target is expected? When will progress be reviewed?

6. Clear documentation
Records should clear, accurate, objective, fair and contemporaneous

7. Level of concern. Consider whether career progression needs to be delayed. Can the problem be resolved locally or does it need escalation?

Degree of concern	Minor concern	Major concern	Concern that threatens progression of training
Responsibility	Clinical Supervisor, Educational Supervisor	Clinical Tutor, Director of Medical Education	Director of Medical Education, Medical Director
Examples	Exam failure, poor knowledge and skills in a few areas, difficulty in demonstrating competencies	Persistent problems, poor knowledge and skills in a most areas, difficult relationships, inability to learn from experience	Complex longstanding issues, serious disciplinary or health problems, problems with progression of training

8. Issues of patient safety and the safety of the individual take precedence above all other considerations

References:

Paice E, Orton V. Managing the Trainee Doctor in Difficulty. In *Postgraduate Medical Education and Training*, eds Hastie A, Hastie I, Jackson N. Radcliffe 2005

Hickson GB, Pichert JW, Webb LE, and Gabbe SG. A Complementary Approach to Promoting Professionalism: Identifying, Measuring, and Addressing Unprofessional Behaviors. *Academic Medicine* 2007; **82 (11)**: 1040-1048.

Redfern B, Bartley C. Trainee and training issues. *Best Practice & Research Clinical Anaesthesiology* 2006; **20 (4)**: 619-635.

Speaker Presentations

Education Session III, continued

The Brand New Intensivist and the Real Challenges of the "First Job"

Speaker: Ashish Khanna, MD, FCCP

SOCCA 30th Annual Meeting and Critical Care Update
May 5, 2017 • Washington, DC

The Brand New Intensivist And The Real Challenges Of The "First Job"

Ashish K. Khanna MD
Staff Intensivist, Surgical ICU & Center for Critical Care
Staff Anesthesiologist, Department of General Anesthesiology
Assistant Professor of Anesthesiology
CCLCM, Anesthesiology Institute & Department of Outcomes Research
Cleveland Clinic Foundation, Cleveland, OH
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Cleveland Clinic

SOCCA 30th Annual Meeting and Critical Care Update
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DISCLOSURES

- Scientific Advisory Board MEDTRONIC
- Site PI ATHOS trial (La Jolla pharma)
- Site PI PRODIGY trial (MEDTRONIC)
- No conflict of interest with this educational activity

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The Perfect Staff Intensivist?

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Fellow as a Resident Teacher: The Journey from Supervision to Supervisor

The Society of Critical Care Medicine's (SCCM) In-Training Section is dedicated to assisting and guiding trainees as they progress through training into independent practice. It also aims to foster career development after this transition. To further this mission, members contribute articles addressing emerging issues in critical care training and career development; these submissions are authored by in-training professionals under the guidance of a mentor. For additional information about the In-Training Section or this project, please contact Section Chair Ashish Khanna, MD, FCCP (khannaa@ccf.org).

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An International Career Development Survey of Critical Care Practitioners

Critical Care Medicine. 42(4):e300-e303, April 2014.

Career Development Areas	All Respondents Frequency (% Column)	Critical Care Training Completed Frequency (% Column)	Critical Care Training Not Completed Frequency (% Column)
Continuing education in critical care (continuing medical education)	280 (26.7)	191 (26.8)	89 (26.5)
Leadership development	197 (18.8)	160 (22.4)	37 (11.1)
Research and scientific development	192 (18.3)	131 (18.4)	61 (18.2)
Work-life balance	135 (12.9)	96 (13.5)	39 (11.6)
Job placement	87 (8.3)	34 (4.8)	53 (15.8)
Teaching skill enhancement	82 (7.8)	49 (6.9)	33 (9.8)
Job promotion	35 (3.3)	30 (4.2)	5 (1.5)
Global health opportunities	21 (2.0)	7 (1.0)	14 (4.2)
Not listed	20 (1.9)	15 (2.1)	5 (1.5)
Total	1,049 (100)	713 (100)	336 (100)

What Aspect of Career Development Is Most Important for You?

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"My biggest concern…": transitioning from fellow to faculty

Crit Care Med. 2015 Dec;43(12 Suppl 1):166.

1. Competency
2. Logistics
3. New responsibilities
4. Administrative
5. End of life

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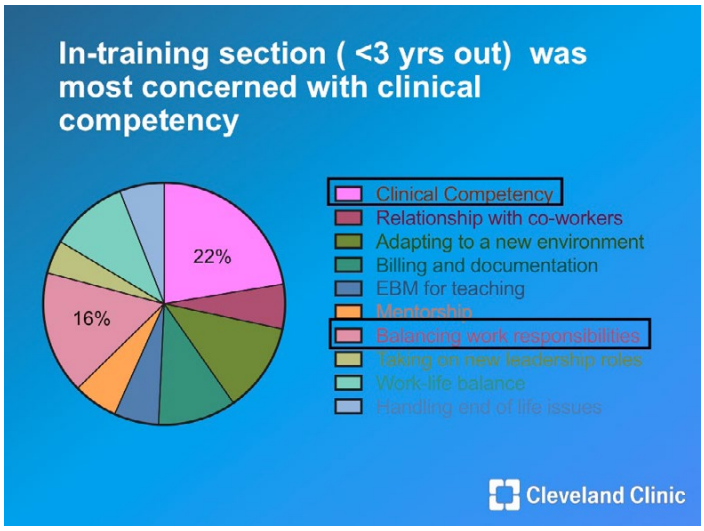
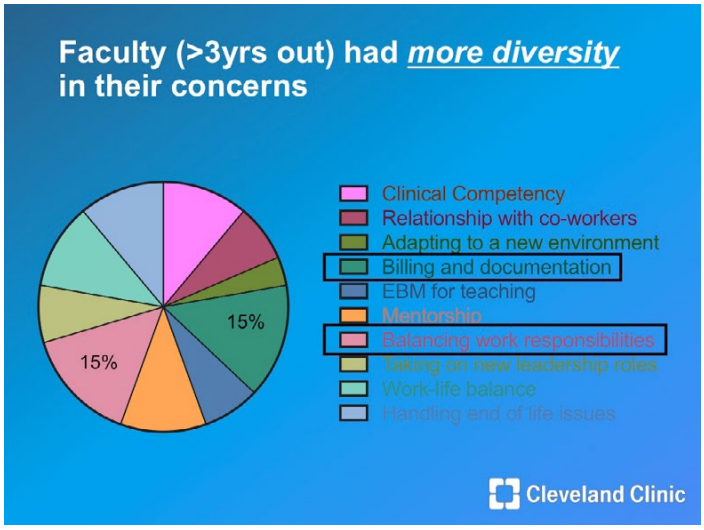
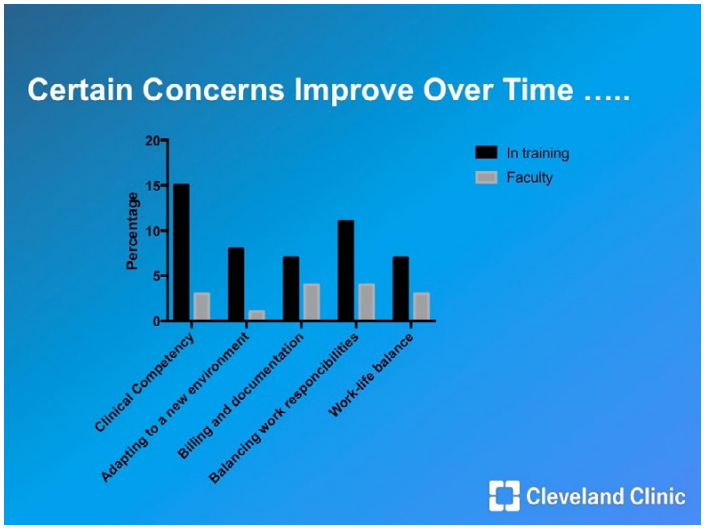
Education Session III, continued

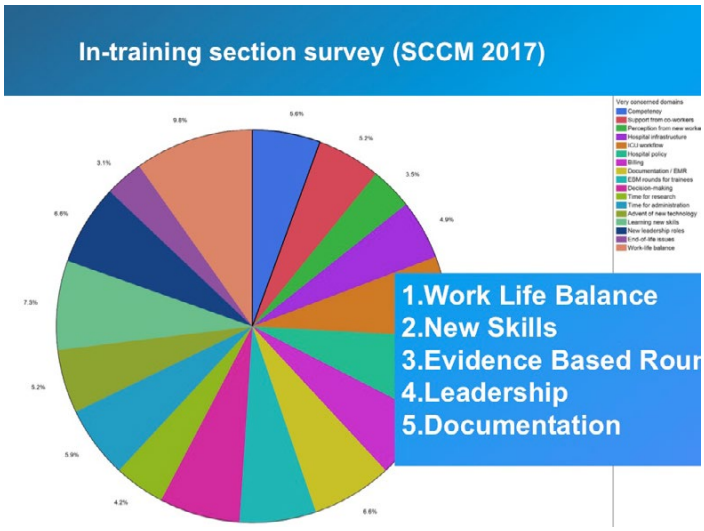
The Brand New Intensivist and the Real Challenges of the "First Job"

Speaker: Ashish Khanna, MD, FCCP









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Speaker Presentations

Education Session III, continued

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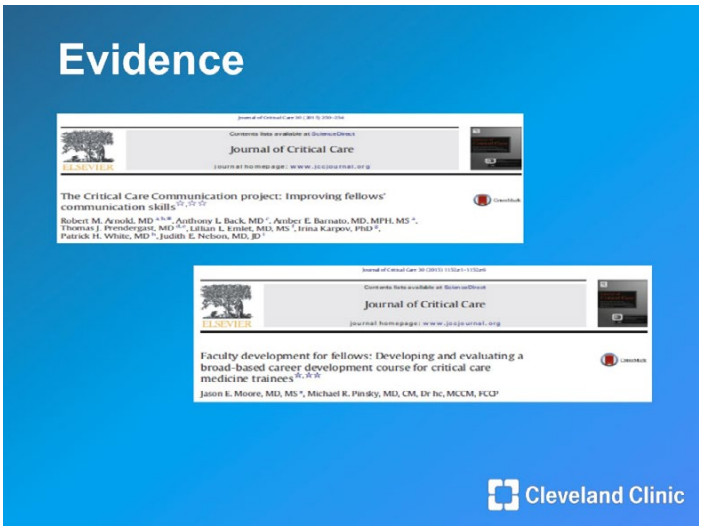

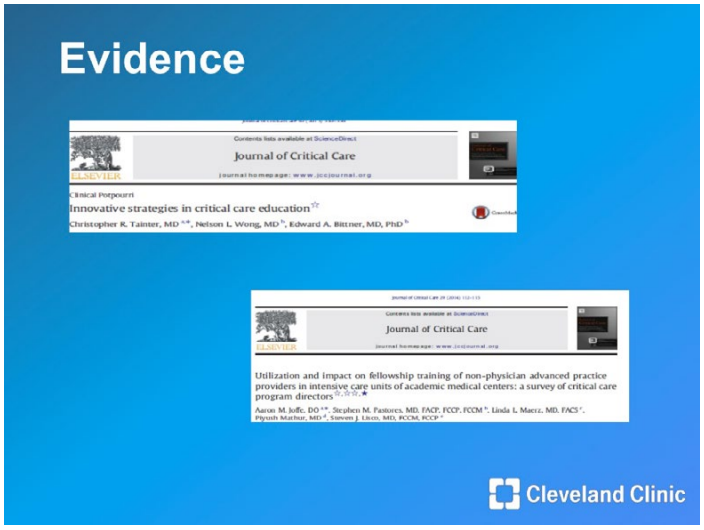

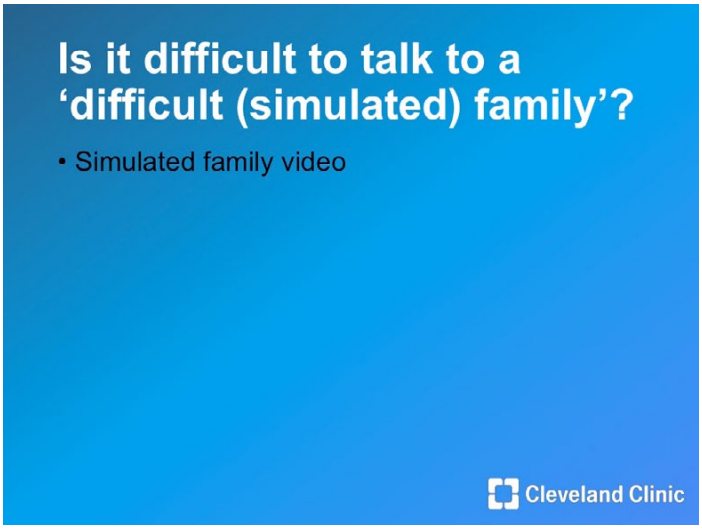

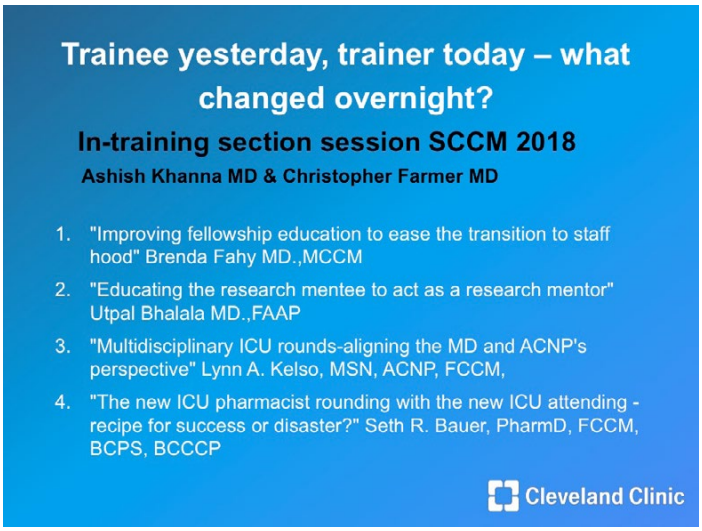

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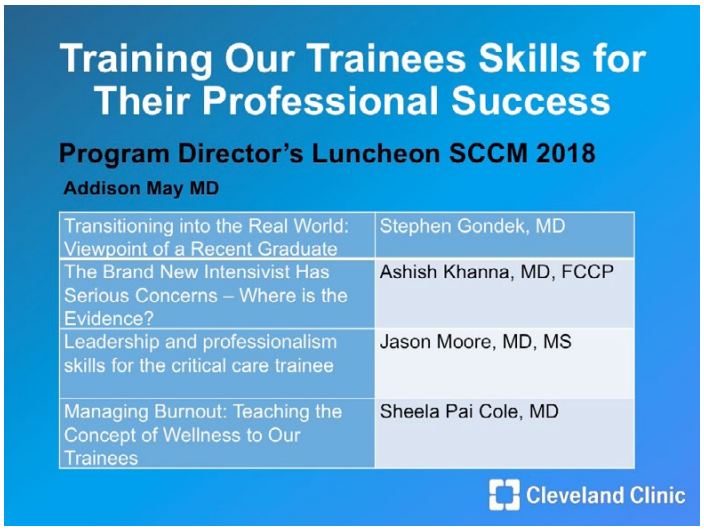

Education Session III, continued

The Art of Delivering Bad News: Teaching Compassion

Speaker: Erin Hennessey, MD

1 **The Art of Delivering Bad News: Teaching Compassion**

2 **Learning Objectives**

By the end of this presentation, attendees will be able to:

- Describe different teaching strategies, including simulation, to incorporate compassion training into critical care medicine training
- Discuss barriers to teaching compassion and barriers to evaluating trainees' competence in compassion
- Recognize the importance of improving compassion training to physicians beyond the level of the trainee

3 **Critical Care Medicine Training in Compassion: Why Is It Important?**

- Training Requirements: ACGME Milestones
- Patient Satisfaction Scores
- Physician self-compassion and wellness

4 **Can We Teach Compassion?**

1 Nature

3 Nurture

5 **Education Best Practices for the Art of Delivering Bad News and Compassionate Communication**

- Didactics
- Role Playing
- Simulated Patients
- Direct Observation

6 **Champions in Compassion**

- Role modeling
- Physician champions
- Multidisciplinary
- Interprofessional

7 **Training the trainee who is not yet empathically developed**

- Recognition
- Educational Model
- Evaluation and Feedback

8 ☐ **Barriers to Teaching Compassionate Care**

- Lack of role models
- Technology and EMR
- Institutional culture
- Lack of diversity
- Gender
- Stress and burnout

9 ☐ **Promoting Self-Compassion and Wellness as a Way to Encourage Compassionate Care**

10 ☐ **The Patient's Perspective**

- Expectations
- Perceptions
- Satisfaction
- Involvement in training

11 ☐ **Who Benefits from Compassionate Care Training?**

- Healthcare providers
  - Attendings
  - Fellows
  - Residents
  - Nurses
  - Staff
- Medical Students
- Patients
- Healthcare Systems
  - Reimbursements
  - Malpractice
  - Reputation

12 ☐ **Future Goals for Teaching Compassion in Anesthesia CCM Fellowship Programs and Anesthesia CCM Divisions**

Speaker Presentations

SOCCA Young Investigator Award Presentation

Young Investigator Award Winner
Multistate Perioperative Outcomes of Carotid Revascularization: Carotid Artery Stenting vs. Carotid Endarterectomy

Speaker: Abdullah Rasheed, MD

Introduction: Stroke is the fifth leading cause of death in the US, afflicting approximately 800,000 Americans annually.[1] To date, randomized trials almost unanimously agree that after the perioperative period, the rates of ipsilateral stroke do not differ significantly between carotid artery stenting (CAS) and carotid endarterectomy (CEA). However, immediate post-operative complications present significant morbidity and mortality, which should be considered before updating treatment guidelines.

Methods: Utilizing data from the State Inpatient Database, Healthcare Cost and Utilization Project, and the Agency for Healthcare Research and Quality, CAS or CEA hospitalizations of patients >18 years of age from 2007-2011 in California, Florida, and New York were retrospectively queried using ICD-9-CM codes for outcome measures. Baseline comorbidities were compared using the Elixhauser Comorbidity Index. Selection bias between CAS and CEA cohorts was corrected for with multivariable logistic regression models which adjusted for demographic characteristics and comorbidities associated with the outcome (p value ≤ 0.25) in the bivariate analyses. Bivariate analysis and multivariable logistic regression were performed with subgroup analysis stratified by symptomatology at clinical presentation.

Results: From 2007-2011, 15,944 patients (12.78%) underwent CAS, with increased CAS and decreased CEA utilization annually. Unadjusted bivariate analysis revealed that CAS, as compared to CEA, demonstrated significantly higher (p<0.001) in-hospital mortality (1.30% vs. 0.47%), post-operative stroke (3.42% vs. 1.68%), and combined stroke/mortality (4.26% vs. 1.98%). Multivariate logistic regression (Table 1), after correcting for confounders, identified CAS as a significant predictor of in-hospital mortality (OR 2.00, 95% CI 1.68-2.39), post-operative stroke (OR 1.82, 95% CI 1.65-2.02), and combined stroke/mortality (OR 1.86, 95% CI 1.70-2.05). Among symptomatic patients, CAS was a significant predictor of in-hospital mortality (OR 3.58, 95% CI 2.62-4.89), post-operative stroke (OR 1.86, 95% CI 1.49-2.32), and combined stroke/mortality (OR 2.35, 95% CI 1.94-2.84). Among asymptomatic patients, CAS was a significant predictor of post-operative stroke (OR 1.84, 95% CI 1.64-2.06) and combined stroke/mortality (OR 2.35, 95% CI 1.57-1.95).

Conclusion: After correcting for confounding factors in baseline demographics and comorbidities, for patients undergoing carotid revascularization, CAS demonstrated greater odds of morbidity and mortality as compared to CEA. These findings, in light of surmounting RCT evidence supporting clinical equipoise between CAS & CEA outside of the perioperative period, question whether greater effort must be placed on optimizing perioperative CAS outcomes, or whether the real world results of CAS fundamentally differ from those of an idealized RCT environment. Further observational research with longitudinal follow-up is necessary to ascertain definitive conclusions and aid in updating treatment guidelines.

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SOCCA Young Investigator Award Presentation

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Speaker: Abdullah Rasheed, MD

Reference(s):

1. Mozzafarian D, Benjamin EJ, Go AS, et al. on behalf of the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics–2016 update: a report from the American Heart Association. Circulation. 2016;133:e38-e360.

Table 1. Results of multivariate logistic regression models for overall population and by symptomatology.

Outcome	OR*	95% CI*	p-value
Mortality			
Overall	2.00	1.68-2.39	<0.0001
Symptomatic	3.58	2.62-4.89	<0.0001
Asymptomatic	1.50	1.20-1.89	0.0005
Stroke			
Overall	1.82	1.65-2.02	<0.0001
Symptomatic	1.86	1.49-2.32	<0.0001
Asymptomatic	1.84	1.64-2.06	<0.0001
Cardiovascular			
Overall	0.85	0.71-1.01	0.07
Symptomatic	1.43	0.99-2.06	0.05
Asymptomatic	0.72	0.58-0.89	0.002
Stroke/Mortality			
Overall	1.86	1.70-2.05	<0.0001
Symptomatic	2.35	1.94-2.84	<0.0001
Asymptomatic	1.75	1.57-1.95	<0.0001

*OR = Odds Ratio. Elevated OR indicates increase risk for outcome measures for carotid artery stenting (CAS) compared to carotid endarterectomy (CEA)

†95% Confidence Interval

SOCCA Young Investigator Award Presentation, continued

Young Investigator Award First Runner-Up

Night-Time Extubation Does Not Increase The Risk of Reintubation, Length of Stay, or Mortality: Experience of An Anesthesia-Based Airway Management Model in a Large Urban Teaching Hospital

Speaker: Kelly K. Everhart, MD, MS

Introduction: Extubation failure and need for reintubation is common in the intensive care unit (ICU) and has been reported to increase morbidity, resource consumption, length of stay (LOS), and mortality.[1] It has recently been reported that night-time extubation in patients requiring mechanical ventilation (MV) for more than 12 hours is associated with increased ICU and hospital mortality.[2] We hypothesized that, in a 24-7 anesthesia-based airway management model, night-time extubation would not increase the risk of reintubation, hospital LOS, or mortality.

Methods: This retrospective cohort study included adults >18 years of age who underwent MV in the ICUs of a large urban teaching hospital between July 1, 2015 and December 31, 2016. Night-time extubation was defined as occurring between 1900 and 0659 the following day. Routine post-operative MV was defined as those intubated for a procedure and extubated within 24 hours. All data were extracted from the electronic medical record using the hospital's Caradigm Intelligence Platform (Caradigm USA LLC, USA). Multivarible analyses were used to assess associations between the exposure (night-time extubation) and outcomes (reintubation rate, hospital LOS, and mortality) with adjustments for patient's age, sex, body mass index, and Charlson comorbidity index (CCI) using Poisson regression with robust standard error. Reintubation was additionally included as a covariate in models for hospital LOS and mortality. Analyses were performed using STATA v14 with significance defined as a p-value < 0.05.

Results: The cohort included 2,539 patients (mean age 52+19 years, 69% male, BMI 28+8 kg/m2, CCI 2 (0-15)). Overall, night-time extubation occurred in 219 (8.6%) patients; 334 (14.2%) patients were reintubated. Mean hospital LOS was 21+27 days with a mortality of 6.1%. After multivariable adjustment, the relative risk (RR) of reintubation was 1.03 (95% CI 0.65-1.64, p=0.89), hospital LOS was 0.78 (95% CI 0.65-0.93, p=0.006), and hospital mortality was 0.85 (95% CI 0.45-1.57, p=0.60) following night-time extubation. Similarly, the RR of reintubation was 1.14 (95% CI 0.70-1.93, p=0.58), hospital LOS was 0.75 (95% CI 0.62-0.89, p=0.001), and hospital mortality was 0.94 (95% CI 0.51-1.73, p=0.84) in the subset of patients whose ICU course did not include routine post-operative MV.

Conclusion: Within a care model in which experienced airway managers are available and responsible for all out-of-operating room airways, night-time extubation was not associated with an increased risk of reintubation or hospital mortality. It was, however, significantly associated with a shortened hospital LOS. In healthcare systems with care models similar to ours, night-time extubation appears safe and may improve resource utilization in select patient cases. Future prospective studies are needed to further characterize appropriate patient selection for safe night-time extubation.

Reference(s):

1. Predictors of reintubation in critically ill patients. Miu T, Joffe AM, Yanez ND, Khandelwal N, Dagal AH, Deem S, Treggiari MM.Respir Care. 2014 Feb;59(2):178-85.
2. Association Between Overnight Extubations and Outcomes in the Intensive Care Unit. Gershengorn HB, Scales DC, Kramer A, Wunsch H. JAMA Intern Med. 2016 Nov 1;176(11):1651-1660.

Speaker Presentations

SOCCA Young Investigator Award Presentation

Young Investigator Award Second Runner-Up
Multiple Biomarkers Improve Prediction for Infection in the SICU

Speaker: William M. White, MD

Introduction: Recent studies have shown that one or more admission biomarkers, such as procalcitonin, may improve prediction for culture-proven infection in the medical ICU. However, less is known in the post-surgical setting. This prospective observational study examined admission procalcitonin with other classical measures for suspected infection and the association of culture-proven infection in the surgical ICU.

Methods: Following IRB approval, admission procalcitonin levels, body temperature, white blood cell counts, absolute and percentage lymphocyte counts were obtained in 80 consecutive post-surgical patients admitted for suspected infection. Data were measured and expressed as counts (%) or medians [25-75% interquartile range: IQR] with analysis utilizing Wilcoxon rank sum test with statistical significance, set at P<.01, to reduce the incidence of false discovery rates. A decision tree with 5-fold internal cross-validation was generated for these admission variables with LogWorth values ≥2.0 to indicate statistical significance when P<.01. The diagnostic sensitivity of the recursive partitioning model was analyzed with c-index statistics.

Results: The admission incidence of culture-proven infection was 45%. Postoperative infection increased SICU length of stay from 3 [2-6] days to 5 [2-11] days, P=.0954, and hospital length of stay from 12 [7-22] days to 19 [8-25] days, P=.1804. When admission procalcitonin values were ≥2.9 ng/mL (LogWorth=5.4) and admission lymphocyte counts were <300/mL (LogWorth=2.7), all patients developed culture-proven infection (C-index = 0.79). Admission variables such as body temperature, WBC counts, and percentage lymphocyte counts were not predictive for culture-proven infection in this analysis.

Conclusion: This study suggests both admission procalcitonin levels and absolute lymphocyte counts provide important decision information in predicting culture-proven infection in the surgical ICU. This association, if confirmed by future studies, may improve antibiotic stewardship in the surgical ICU.

Reference(s):

1. Rivers et al. N Engl J Med. 2012.
2. De Jong et al. Lancet Infect Dis. 2016.
3. Billeter et al. World J Surg 2009.
4. Svoboda et al Hepatogastroenterology 2007.
5. Ruiz-Alvarez et al J Intensive Care Med 2009.
6. Liu Z J Surg Res 2016.
7. Ioannidis PLoS Med 2005.
8. Gilbot S, et al. Am J Respir Crit Care Med, 2012.

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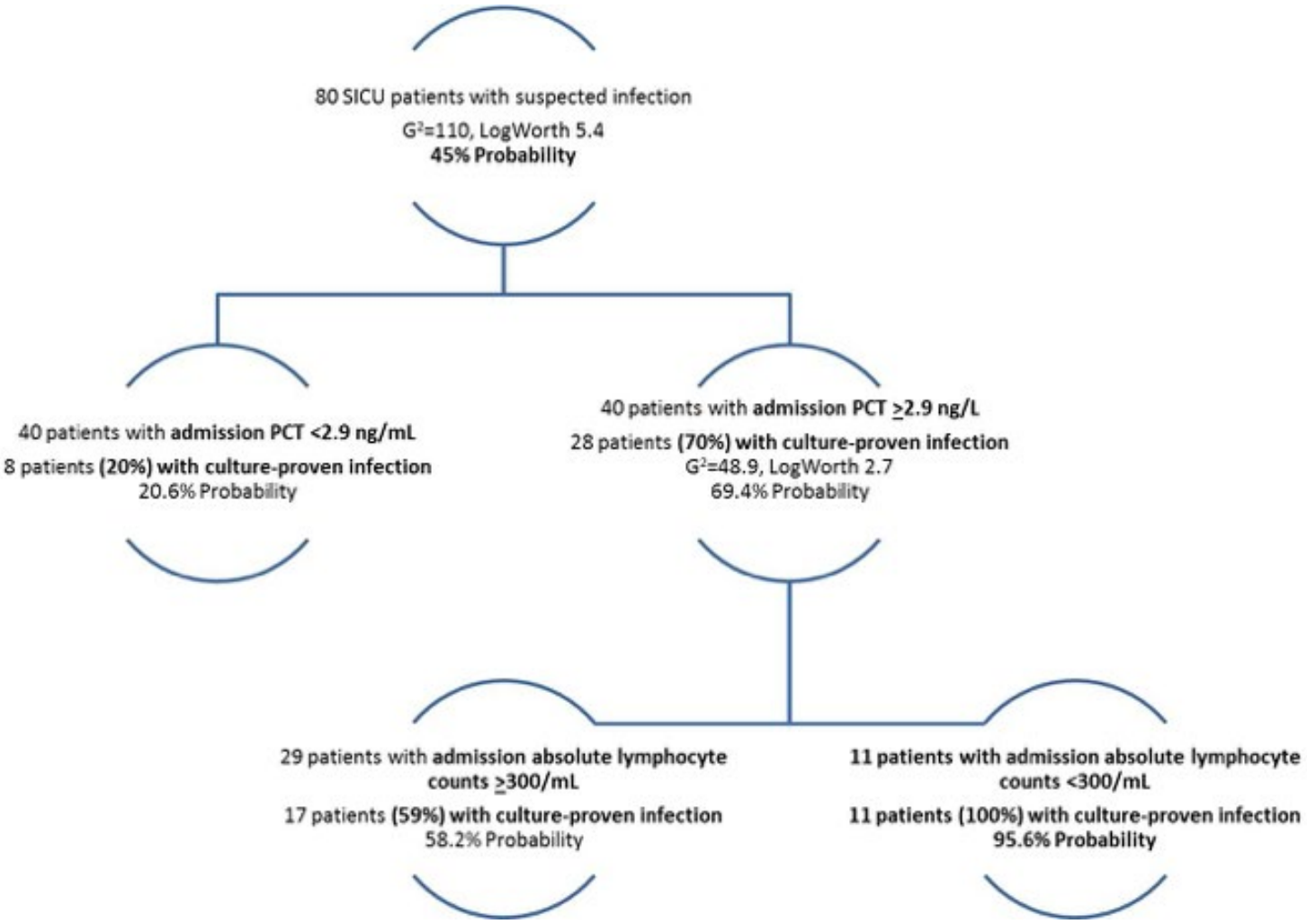
SOCCA Young Investigator Award Presentation

Young Investigator Award Second Runner-Up
Multiple Biomarkers Improve Prediction for Infection in the SICU

Speaker: William M. White, MD



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SOCCA Young Investigator Award Presentation

Young Investigator Award Second Runner-Up
Multiple Biomarkers Improve Prediction for Infection in the SICU

Speaker: William M. White, MD

Admission Parameters	Culture-Positive n=36	Culture-Negative n=44	P values
Gender, male (%)	21 (58%)	23 (52%)	.5878
Age, median [IQR]	62.5 [48-75]	64 [55-70]	.8389
Type of Surgery, number (%)			
Abdominal	25 (69%)	28 (64%)	.9185
Thoracic	2 (6%)	3 (7%)	
ENT/Ophthalmology	1 (3%)	1 (2%)	
Other	2 (6%)	5 (11%)	
Elective Surgery, yes %	11 (31%)	4 (9%)	.0412
Comorbidities, number (%)			
Diabetes	18 (50%)	14 (32%)	.0986
Reactive airway disease	6 (17%)	12 (27%)	.2584
Chronic renal disease	6 (17%)	5 (11%)	.4932
Liver disease	3 (8%)	4 (9%)	.9050
Cancer	11 (31%)	16 (36%)	.5847
Etiology of SICU Admission, number (%)			
Respiratory failure	8 (22%)	11 (25%)	.6036
Sepsis	14 (39%)	11 (25%)	
Shock	6 (17%)	10 (23%)	
Other	8 (22%)	12 (27%)	
Mechanical ventilation, yes (%)	25 (69%)	26 (59%)	.3379
Vasopressor use, yes (%)	19 (56%)	13 (30%)	.0190

Speaker Presentations

Education Session IV: Trauma and Mass Casualty – The Intensive Care Response

The Anesthesiologist as Prehospital Resuscitationist

Speaker: Samuel M. Galvagno Jr., DO, PhD, FCCM

Brief synopsis:

Anesthesiologists are uniquely poised for leadership roles in prehospital resuscitation. Historically, prehospital emergency medicine was founded by anesthesiologists, including Dr. Peter Safar. In the 21st century, anesthesiologists in the US have an extremely limited role in terms of medical direction, research, and operational participation in prehospital critical care. Examples from Europe and the US military will illustrate the many potential opportunities for anesthesiologists to become more involved as leaders in prehospital resuscitation.

General outline for talk:

I. Introduction
- A. Objectives
- B. Disclosures

II. Historical context
- A. Peter Safar's contributions
  1. Video showing CPR
  2. First ICU in the US

III. Comparisons with our European counterparts
- A. Paucity of practicing anesthesiologist-intensivists
- B. European practice model
- C. Video (helicopter EMS)

IV. Military models with anesthesiologist involvement/leadership
- A. MERT
- B. SOST
- C. John Hinds
  - i. Hinds protocol

V. Conclusion- leading the charge
- A. Prehospital research
- B. EMS medical direction / resuscitation leadership

VI. References

Speaker Presentations

Education Session IV: Trauma and Mass Casualty – The Intensive Care Response

Hysteria: Mass Casualty Through the Eyes of the Combatant

Speaker: Sasha Grek, MD

Anesthesiologists are uniquely poised for leadership roles in prehospital resuscitation. Historically, prehospital emergency medicine was founded by anesthesiologists, including Dr. Peter Safar. In the 21st century, anesthesiologists in the US have an extremely limited role in terms of medical direction, research, and operational participation in prehospital critical care. Examples from Europe and the US military will illustrate the many potential opportunities for anesthesiologists to become more involved as leaders in prehospital resuscitation.

The probability of healthcare workers, particularly those in critical care environments, to be exposed to mass casualty situations is real. Historically, mass casualty events have been attributed to large scale events (such as 9/11) but it should be recognized that other situations can paralyze healthcare facilities and public resources. Active shooter scenarios are becoming increasingly more common, and "targeted" scenarios can have critical impact on large scale and critical access resources.

Existing training of healthcare personnel is inadequate and critical care physicians will need to be proficient with concepts of triage and clinical resource management. In addition, critical care physicians should be trained to respond as crisis leaders, not only as clinical leaders, should these situations arise.

Speaker Presentations

Education Session IV, continued

Policy Considerations for Building Resilience in Our Health Care Response to Mass Killing and Terrorism

Speaker: Kevin B. Gerold, DO, JD, MA (Ed.), FCCM, FCCP

Notes

Moderated Poster Discussion Sessions
General Information

Abstract Presenter:

Presenters are required to attend the Moderated Poster Discussion Session. During the Moderated Poster Discussion Session, presenters should give a 3-5 minute summary of their most important findings. The poster moderator for your Moderated Poster Discussion Session will assist with facilitating the discussion.

Assigned Poster Board Identification and Location:

For identification purposes, a poster board ID is assigned to all presenting authors. The assigned IDs will be affixed to each poster board in the poster room. A staff member will be available to assist you with finding your poster board should you require assistance.

Poster Board ID Format and Abstract Key for Anesthesia Subspecialty Topics:

The Poster Board ID format is the following:

Poster Board Anesthesia Subspecialty Topic Abbreviation, Poster Board #, (Abstract #).

Example: AM 1 (230). See the Abstract Category Key for Anesthesia Subspecialty Topics below.

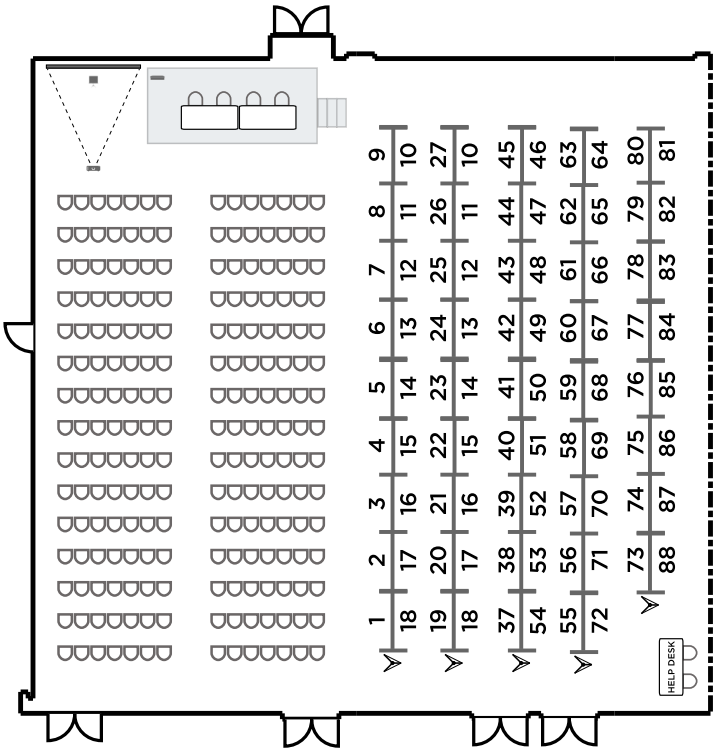
Abstracts Category Key for Anesthesia Subspecialty Topics

AM	Airway Management
AMB	Ambulatory Anesthesia
AP	Anesthetic Pharmacology
BLD	Blood Management
CA	Cardiovascular Anesthesiology
CC	Critical Care
EEP	Economics, Education and Policy
GA	Geriatric Anesthesia
GH	Global Health
L	Liver
MCC	Medically Challenging Cases
NR	Neuroscience in Anesthesiology and Perioperative Medicine
O	Obesity
OB	Obstetric Anesthesiology
PME	Pain Mechanisms
PM	Pain Medicine
PS	Patient Safety
PED	Pediatric Anesthesiology
PA	Perioperative Anesthesia
RA	Regional Anesthesia
RES	Respiration
SM	Sleep Medicine
TCSEM	Technology, Computing and Simulation, Equipment Monitoring
T	Trauma

SOCCA Young Investigator Award Presentation and Moderated Poster Discussion Session Rooms:

SOCCA Young Investigator Award Presentation Location: *Constitution A-B, Constitution Level*

Moderated Poster Discussion Session Room Location: *Constitution A-B, Constitution Level*



Constitution A-B
Constitution Level

SOCCA Young Investigator Award Presentation

2:15 pm – 3:00 pm

Young Investigator Award Winner

Multistate Perioperative Outcomes of Carotid Revascularization: Carotid Artery Stenting vs. Carotid Endarterectomy

Abdullah Rasheed, MD, New York Presbyterian Hospital, Weill Cornell Medical Center, New York, New York

First Runner-Up

Night-Time Extubation Does Not Increase the Risk of Reintubation, Length of Stay, or Mortality: Experience of an Anesthesia-Based Airway Management Model in a Large Urban Teaching Hospital

Kelly K. Everhart, MD, MS, University of Washington Medical Center, Seattle, Washington

Second Runner-Up

Multiple Biomarkers Improve Prediction for Infection in the SICU

William M. White, MD, Ochsner Clinic Foundation, New Orleans, Louisiana

CA 11 (2003)

Multistate Perioperative Outcomes of Carotid Revascularization: Carotid Artery Stenting vs Carotid Endarterectomy

Abdullah Rasheed, Robert S. White, Tiffany Peng, Xian Wu, Licia Gaber-Baylis, Gregory P. Giambrone, Kane O. Pryor

New York Presbyterian Hospital – Weill Cornell Medical Center, New York, NY

Introduction: Stroke is the fifth leading cause of death in the US, afflicting approximately 800,000 Americans annually (1). To date, randomized trials almost unanimously agree that after the perioperative period, the rates of ipsilateral stroke do not differ significantly between carotid artery stenting (CAS) and carotid endarterectomy (CEA). However, immediate post-operative complications present significant morbidity and mortality, which should be considered before updating treatment guidelines.

Methods: Utilizing data from the State Inpatient Database, Healthcare Cost and Utilization Project, and the Agency for Healthcare Research and Quality, CAS or CEA hospitalizations of patients >18 years of age from 2007-2011 in California, Florida, and New York were retrospectively queried using ICD-9-CM codes for outcome measures. Baseline comorbidities were compared using the Elixhauser Comorbidity Index. Selection bias between CAS and CEA cohorts was corrected for with multivariable logistic regression models which adjusted for demographic characteristics and comorbidities associated with the outcome (p value ≤ 0.25) in the bivariate analyses. Bivariate analysis and multivariable logistic regression were performed with subgroup analysis stratified by symptomatology at clinical presentation.

Results: From 2007-2011, 15,944 patients (12.78%) underwent CAS, with increased CAS and decreased CEA utilization annually. Unadjusted bivariate analysis revealed that CAS, as compared to CEA, demonstrated significantly higher ($p<0.001$) in-hospital mortality (1.30% vs. 0.47%), post-operative stroke (3.42% vs. 1.68%), and combined stroke/mortality (4.26% vs. 1.98%). Multivariate logistic regression (Table 1), after correcting for confounders, identified CAS as a significant predictor of in-hospital mortality (OR 2.00, 95% CI 1.68-2.39), post-operative stroke (OR 1.82, 95% CI 1.65-2.02), and combined stroke/mortality (OR 1.86, 95% CI 1.70-2.05). Among symptomatic patients, CAS was a significant predictor of in-hospital mortality (OR 3.58, 95% CI 2.62-4.89), post-operative stroke (OR 1.86, 95% CI 1.49-2.32), and combined stroke/mortality (OR 2.35, 95% CI 1.94-2.84). Among asymptomatic patients, CAS was a significant predictor of post-operative stroke (OR 1.84, 95% CI 1.64-2.06) and combined stroke/mortality (OR 2.35, 95% CI 1.57-1.95).

Conclusion: After correcting for confounding factors in baseline demographics and comorbidities, for patients undergoing carotid revascularization, CAS demonstrated greater odds of morbidity and mortality as compared to CEA. These findings, in light of surmounting RCT evidence supporting clinical equipoise between CAS & CEA outside of the perioperative period, question whether greater effort must be placed on optimizing perioperative CAS outcomes, or whether the real world results of CAS fundamentally differ from those of an idealized RCT environment. Further observational research with longitudinal follow-up is necessary to ascertain definitive conclusions and aid in updating treatment guidelines.

(continued)

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Table 1. Results of multivariate logistic regression models for overall population and by symptomatology.

Outcome	OR*	95% CI†	p-value
Mortality			
Overall	2.00	1.68-2.39	<0.0001
Symptomatic	3.58	2.62-4.89	<0.0001
Asymptomatic	1.50	1.20-1.89	0.0005
Stroke			
Overall	1.82	1.65-2.02	<0.0001
Symptomatic	1.86	1.49-2.32	<0.0001
Asymptomatic	1.84	1.64-2.06	<0.0001
Cardiovascular			
Overall	0.85	0.71-1.01	0.07
Symptomatic	1.43	0.99-2.06	0.05
Asymptomatic	0.72	0.58-0.89	0.002
Stroke/Mortality			
Overall	1.86	1.70-2.05	<0.0001
Symptomatic	2.35	1.94-2.84	<0.0001
Asymptomatic	1.75	1.57-1.95	<0.0001

*OR = Odds Ratio. Elevated OR indicates increase risk for outcome measures for carotid artery stenting (CAS) compared to carotid endarterectomy (CEA)

†95% Confidence Interval

AM 79 (1628)

Night-time Extubation Does Not Increase the Risk of Reintubation, Length of Stay, or Mortality: Experience of an Anesthesia-based Airway Management Model in a Large Urban Teaching Hospital

Kelly K Everhart[1], Sarah M Khorsand[1], Nita Khandelwal[2], Margaret Lind[1], Aaron M Joffe[2]

[1]University of Washington Medical Center, Seattle, WA, [2]University of Washington, Harborview Medical Center, Seattle, WA

Introduction: Extubation failure and need for reintubation is common in the intensive care unit (ICU) and has been reported to increase morbidity, resource consumption, length of stay (LOS), and mortality1. It has recently been reported that night-time extubation in patients requiring mechanical ventilation (MV) for more than 12 hours is associated with increased ICU and hospital mortality2. We hypothesized that, in a 24-7 anesthesia-based airway management model, night-time extubation would not increase the risk of reintubation, hospital LOS, or mortality.

Methods: This retrospective cohort study included adults >18 years of age who underwent MV in the ICUs of a large urban teaching hospital between July 1, 2015 and December 31, 2016. Night-time extubation was defined as occurring between 1900 and 0659 the following day. Routine post-operative MV was defined as those intubated for a procedure and extubated within 24 hours. All data were extracted from the electronic medical record using the hospital's Caradigm Intelligence Platform (Caradigm USA LLC, USA). Multivarible analyses were used to assess associations between the exposure (night-time extubation) and outcomes (reintubation rate, hospital LOS, and mortality) with adjustments for patient's age, sex, body mass index, and Charlson comorbidity index (CCI) using Poisson regression with robust standard error. Reintubation was additionally included as a covariate in models for hospital LOS and mortality. Analyses were performed using STATA v14 with significance defined as a p-value < 0.05.

Results: The cohort included 2,539 patients (mean age 52+19 years, 69% male, BMI 28+8 kg/m2, CCI 2 (0-15)). Overall, night-time extubation occurred in 219 (8.6%) patients; 334 (14.2%) patients were reintubated. Mean hospital LOS was 21+27 days with a mortality of 6.1%. After multivariable adjustment, the relative risk (RR) of reintubation was 1.03 (95% CI 0.65-1.64, p=0.89), hospital LOS was 0.78 (95% CI 0.65-0.93, p=0.006), and hospital mortality was 0.85 (95% CI 0.45-1.57, p=0.60) following night-time extubation. Similarly, the RR of reintubation was 1.14 (95% CI 0.70-1.93, p=0.58), hospital LOS was 0.75 (95% CI 0.62-0.89, p=0.001), and hospital mortality was 0.94 (95% CI 0.51-1.73, p=0.84) in the subset of patients whose ICU course did not include routine post-operative MV.

Conclusion: Within a care model in which experienced airway managers are available and responsible for all out-of-operating room airways, night-time extubation was not associated with an increased risk of reintubation or hospital mortality. It was, however, significantly associated with a shortened hospital LOS. In healthcare systems with care models similar to ours, night-time extubation appears safe and may improve resource utilization in select patient cases. Future prospective studies are needed to further characterize appropriate patient selection for safe night-time extubation.

(continued)

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CC 63 (1726)

Multiple Biomarkers Improve Prediction for Infection in the SICU

William M. White, Hussam Ghabra, Daniah Dhaifallah, Michael Townsend, Joshua Goldberg, Phillip Boysen, Bobby Nossaman

Ochsner Clinic Foundation, New Orleans, LA

Introduction: Recent studies have shown that one or more admission biomarkers, such as procalcitonin, may improve prediction for culture-proven infection in the medical ICU. However, less is known in the post-surgical setting. This prospective observational study examined admission procalcitonin with other classical measures for suspected infection and the association of culture-proven infection in the surgical ICU.

Methods: Following IRB approval, admission procalcitonin levels, body temperature, white blood cell counts, absolute and percentage lymphocyte counts were obtained in 80 consecutive post-surgical patients admitted for suspected infection. Data were measured and expressed as counts (%) or medians [25-75% interquartile range: IQR] with analysis utilizing Wilcoxon rank sum test with statistical significance, set at P<.01, to reduce the incidence of false discovery rates. A decision tree with 5-fold internal cross-validation was generated for these admission variables with LogWorth values ≥2.0 to indicate statistical significance when P<.01. The diagnostic sensitivity of the recursive partitioning model was analyzed with c-index statistics.

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Conclusion: This study suggests both admission procalcitonin levels and absolute lymphocyte counts provide important decision information in predicting culture-proven infection in the surgical ICU. This association, if confirmed by future studies, may improve antibiotic stewardship in the surgical ICU.

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6. Liu Z J Surg Res 2016.
7. Ioannidis PLoS Med 2005.
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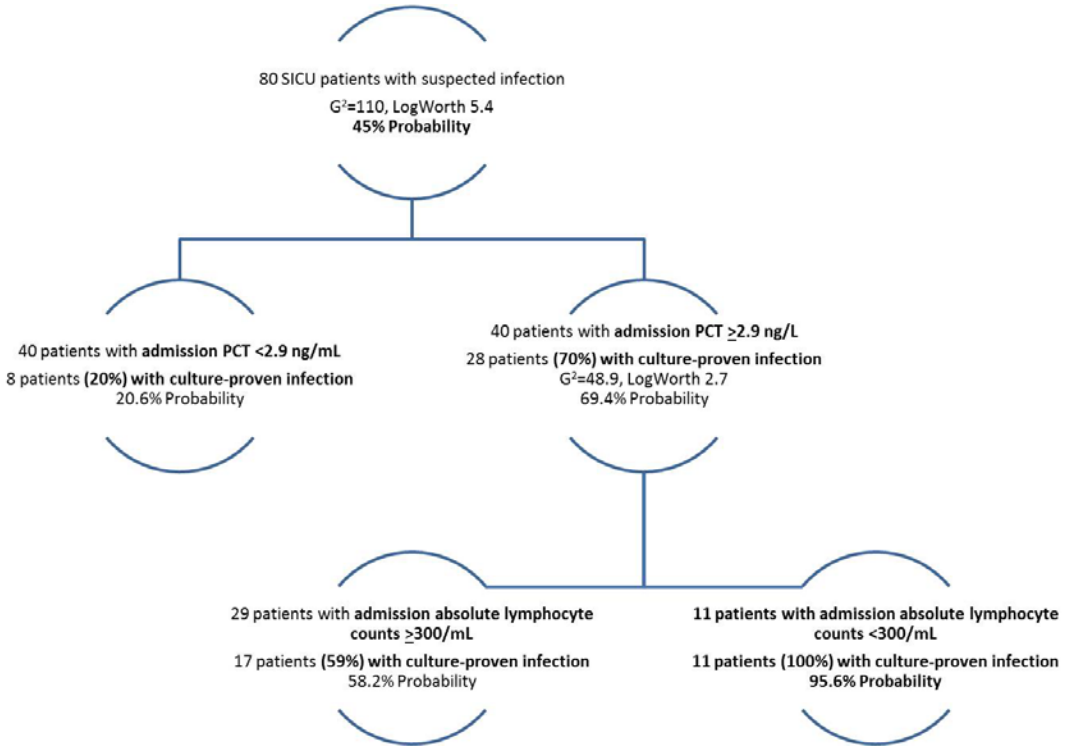

Admission Parameters	Culture-Positive n=36	Culture-Negative n=44	P values
Gender, male (%)	21 (58%)	23 (52%)	.5878
Age, median [IQR]	62.5 [48-75]	64 [55-70]	.8389
Type of Surgery, number (%)			.9185
Abdominal	25 (69%)	28 (64%)	
Thoracic	2 (6%)	3 (7%)	
ENT/Ophthalmology	1 (3%)	1 (2%)	
Other	2 (6%)	5 (11%)	
Elective Surgery, yes %	11 (31%)	4 (9%)	.0412
Comorbidities, number (%)			
Diabetes	18 (50%)	14 (32%)	.0986
Reactive airway disease	6 (17%)	12 (27%)	.2584
Chronic renal disease	6 (17%)	5 (11%)	.4932
Liver disease	3 (8%)	4 (9%)	.9050
Cancer	11 (31%)	16 (36%)	.5847
Etiology of SICU Admission, number (%)			.6036
Respiratory failure	8 (22%)	11 (25%)	
Sepsis	14 (39%)	11 (25%)	
Shock	6 (17%)	10 (23%)	
Other	8 (22%)	12 (27%)	
Mechanical ventilation, yes (%)	25 (69%)	26 (59%)	.3379
Vasopressor use, yes (%)	19 (56%)	13 (30%)	.0190

Poster Presentations

BLD 1 (1361)	**Clinical Safety & Efficacy of Pathogen Reduced RBCs in a Phase 3 RCT in Acute Anemia** Jeffrey Huxford, V. Brixner, AH Kiessling, K. Madlener, Nina Mufti, Christine Ernst, Laurence Corash
BLD 2 (1509)	**Quality Improvement in ICU Blood Utilization** William C. Wilson
OB 3 (2162)	**Parturient with Delta Granule Platelet Storage Pool Disorder** Ali Idrees, Teri Gray, Blair Herndon, Goran Ristev
EEP 4 (1151)	**A Perception Survey Of The Perceived Benefits Of Mentorship In SICU Fellowship** Ahmad Abou Leila , Ashish Khanna, Piyush Mathur
EEP 5 (2019)	**Ultrasonic Examination of the Underwater Spine: A Learning Technique to Enhance Acquisition of Basic Skills to Place an Epidural Catheter** Michael C. Scarbrough, Laurie Daste, Jacquelyn Paetzold, Phillip Boysen
EEP 6 (2030)	**CUSUM Analysis: An Application of Learning Curves to Ensure Basic Skills in Anesthetic Procedures** Michael C. Scarbrough, Laurie Daste, Jacquelyn Paetzold, Phillip Boysen
CA 7 (1670)	**Milrinone Infusion Improves One-Year Survival After Norwood Sano Procedure** Tomoyuki Kanazawa, Hiroshi Morimatsu, Tatsuo Iwasaki, Kazuyoshi Shimizu, Kentaro Sugimoto
CA 8 (2053)	**Plasma Free Hemoglobin, Oxidative Damage, and Acute Kidney Injury in Cardiac Surgery** Marcos G. Lopez, Mias Pretorius, Frederic T Billings
CA 9 (1340)	**Pulmonary Artery Pulsatility Index and Pharmacologic Support in RV Graft Dysfunction** George Plummer, Michael Gudejko, Navin Kapur, Michael Kiernan, John Adam Reich, Frederick Cobey, Andrea Tsai
CA 12 (1573)	**Change in Central Venous Pressure Following Passive Leg Raise Does Not Correlate with Transesophageal Echocardiography-Derived Indices of Right Ventricular Function** Kirsten R. Steffner, Aaron Mittel, May Hua,Jack Shanewise, Vivek Moitra, Jessica Spellman
NR 13 (2266)	**Incidence of Adverse Effects with Continuous Hypertonic Saline in Patients Treated for Cerebral Edema: Using a De-Identified Patient Database To Identify Problems for Future Study** Cash C. Sterling, Aaron N LacKamp
PS 14 (2037)	**The Growth of the ICU Daily Rounding Team and Its Impact on Distractions and Collaboration Efforts** David Luu, Pamela R Roberts, James M Rudkins, Amir Butt, Aaron Scifres, Gozde Demiralp
PS 15 (2022)	**Limitations and Failures of In-Line Filters** Jerra M. Lobozzo, Ihsan Haddad
PS 16 (2096)	**How Can We Safely Reduce 50% of Patient Monitor Alarms in the Surgical Intensive Care Unit** Samuel Galvagno, Peter Hu, Hsiao-chi Li, Shiming Yang, Samuel Tisherman, Peter Rock
GH 17 (1844)	**Institutionalizing Anti-Microbial Stewardship at Fortis Healthcare in India** Bishnu P Panigrahi
L 18 (1568)	**The Relationship between Postoperative Serum Albumin Level and Organ Dysfunction after Liver Transplantation** Kazumasa Hiroi, Takashi Matsusaki, Vika Lemoto, Ryuji Kaku, Hiroshi Morimatsu
MCC 19 (1302)	**Venovenous ECMO in the Anhepatic Liver Transplant Patient** Jill Yaung, Erik Dong, Irene Kim, Nicolas Nissen, Oren Friedman, Michael Nurok, Danny Ramzy
MCC 20 (2278)	**Maternal Sepsis and Acute Heart Failure - A Case Report** Nan Xiang, Babar Fiza
MCC 21 (1275)	**V-A ECMO as Bridge Therapy for Vital Organ Support in Unstable Ventricular Tachycardia Storm** Joshua Trester, Ravi Tripathi
MCC 22 (2128)	**Hyperkalemia Management in the Oncology Patient: A Case of Sodium Polystyrene Sulfate Induced Bowel Perforation** Kathleen Sullivan, Elena Mead, Meaghen Finan
MCC 23 (1765)	**Medically Challenging Cases: Severe Postoperative ARDS in the Lung Cancer Patient** Elise Sullivan, Shahzad Shaefi, Brian O'Gara

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MCC 24 (1828)	**Pheochromocytoma Diagnosed in a Burn Patient after Multiple Surgeries** Chirag K. Shah, Allison Dalton, Aalok Kacha
MCC 25 (1939)	**Case of a 56 Year-Old Postop CABG Patient with Hypoxemic Respiratory Failure and Subsequent Improvement with Methylprednisolone** Srinivasan Sathya, Cynthia Cely, Ricardo Martinez Ruiz, Arnaldo Vera-Arroyo
MCC 26 (1733)	**Bilateral Subpectoral Catheters for Post-sternotomy pain** Matthew J. Ritter, Erica D. Wittwer
MCC 27 (2267)	**Post-op Respiratory Failure in a Patient Taking Colistimethate: A Case Report** Uzma Rezvi, Aalok Kacha, Tariq Malik
MCC 28 (2041)	**LVAD and Prone Position for Non-cardiac Surgery** Kimberly Rengel, Bradley Kook, Christina J Hayhurst
MCC 29 (2001)	**Medically Challenging Case: Radial Artery Cannulation in VAD Patients and the Yoda Sign** Priya Rajdev
MCC 30 (2038)	**Serotonin Syndrome Following Cardiac Surgery** Julie Herzog, Emily T. Poynton, Francis T. Lytle
MCC 31 (1895)	**Veno-Venous Extracorporeal Membrane Oxygenation After Left Ventricular Assist Device** Emily T. Poynton, Francis T. Lytle
MCC 32 (1878)	**Unexpected Metabolic Acidosis During Low Dose Propofol Infusion in a Difficult to Ventilate Post-Operative Patient** Johann Patlak, Shahzad Shaefi, Stephen Odom, Sidhu Gangadharan, Puja Shankar, John Marshall, Todd Sarge
MCC 33 (1877)	**Ruptured Sinus of Valsalva Aneurysm Into the Right Atrium - A Rare Cause of Subacute Heart Failure** Samhati Mondal, Charles E Smith
MCC 34 (1935)	**Non-Surgical Management of a Patient With Prosthetic Aortic Valve Thrombosis Resulting From Hypercoagulability - A Case Report** Domagoj Mladinov, Tsuyoshi Kaneko, Dirk J. Varelmann
MCC 35 (1797)	**A Case Report of Milrinone Infusion for the Treatment and Prevention of Refractory Cerebral Spasm in Subarachnoid Hemorrhage** Ron Leong, Alisha Bhatia
MCC 36 (1123)	**TIA Following TAVR Secondary to Dynamic LVOT Obstruction** Michael F. Katz, James A. Osorio, Christopher W. Tam
MCC 37 (2099)	**Airway Management in a Patient with Tracheal Disruption Due to Penetrating Neck Trauma with Hollow Point Ammunition: A Case Report** Angela M. Johnson, Dave J. Zagorski, James L. Hill, Joseph M McClain, Nicole C. Maronian
MCC 38 (1409)	**Case Report: ARDS Secondary to Severe Varicella Pneumonia in Immunocompetent Patient** Sajjad Ibrar, John Denny
MCC 39 (2220)	**Post-infectious Vasculitis Complicating Sepsis: A Rare Clinical Presentation** Chantel Gray, Anoop Chhina, Madiha Syed, Roshni Sreedharan, Avneep Aggarwal, Ashish Khanna
MCC 40 (1893)	**Early Postoperative Tracheo-esophageal Fistula: A Masquerader in the ICU** Chantel Gray, Roshni Sreedharan, Sandeep Khanna
MCC 41 (1130)	**Intraoperative Vascular Access for Liver Transplantation in a Patient with SVC Thrombosis** Peter Downey, Ryan Chadha, Julia Sobol
MCC 42 (2287)	**Tacrolimus-Induced Coronary Vasospasm in a Lung Transplant Recipient** Todd A. Dodick, Bahaa Daoud, Oliver Panzer
MCC 43 (2033)	**Near-fatal Kinking of Mammary Graft due to Severe Emphysema** John Denny, Alexander Kahan, James Tse, Sajjad Ibrar, Benjamin R. Landgraf
MCC 44 (2265)	**Anticoagulation With Bivalirudin in a Complicated Patient with SMA Thrombosis Who Developed Heparin-Induced Thrombocytopenia and Thrombosis (HITT) and Failed Argatroban Therapy** Ivet T. Cordoba Torres
MCC 45 (1822)	**Pneumonectomy After Trauma and Complex Airway Management in the Critical Care Setting** Andrew Cook, Roman Dudaryk, Jack Louro

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MCC 46 (1192)	**Case Report: Metastatic Papillary Thyroid Carcinoma With Refractory Thyroid Storm** Chen T. Chau
MCC 47 (1846)	**Profound Hyponatremia Secondary to Severe Volume Depletion Following Diverting Loop Ileostomy** Joanna M. Brenneman, Roshni Sreedharan
MCC 48 (1195)	**Management of Multiple Rib Fractures/Flail Chest with Continuous Serratus Plane Block** Fathi Bashir, Vikas Kumar
MCC 49 (1449)	**Oxygen Consumption and Carbon Dioxide Production Monitoring to Facilitate Weaning From Veno-Arterial and Veno-Veno Extracorporeal Membrane Oxygenation: A Case Report** Christofer D. Barth
MCC 50 (1327)	**A Novel Approach to Hemostasis During Hemorrhagic Shock** Melinda L. Ball, Katharine Thompson, Nikki Koll, Michal Gajewski
MCC 51 (1821)	**Progressive Pulmonary Hypertension Status Post Trans-Septal Approach Mitral Valve Repair** Danielle E. Babb, Andrew Cook, Julio Benitez Lopez, Christina Matadial, Ricardo Martinez Ruiz
MCC 52 (1955)	**Safely Extending Indications for Bedside Percutaneous Tracheostomy with Innovative Hybrid Surgical Technique** Eric C. Amaro, Kenneth Stahl
MCC 53 (1688)	**Biventricular Assist Device and Extracorporeal Membrane Oxygenation for Giant Cell Myocarditis** Eric C. Amaro
MCC 54 (1046)	**Impella 2.5 for LV Support after STEMI: New FDA Approval for Cardiogenic Shock** John A. Vullo, Leila Hosseinian
CC 55 (2080)	**A Comparison of Basic vs In-depth Education for Families of ECMO Patients** John A. Vullo, Joel Zivot
CC 56 (1344)	**Venoarterial ECMO for Recovery From Right Ventricular Failure After Pericardiectomy** Joseph Sofia, Sean Kiley, Tiago N. Machuca
CC 57 (2066)	**Percutaneous Cannulation for Venovenous ECMO Without Fluroscopy** Leon Eydelman, Michael Connor
CC 58 (2088)	**Practical Management of Displaced Central Venous Catheters** Eric D. Lucas, Michael Chestnut, Phillip Mcardle, Ayesha Bryant, Jose C. Humanez, Marc A. Passman, Vinodkumar Singh
CC 59 (1533)	**Pathway for Surgical Intensive Care Unit Discharge--A Quality Improvement Initiative** Francis DiPierro, Anoop Chhina, Chantel Gray, Amanda Benson, Priscilla Clark, Piyush Mathur, Ashish Khanna
CC 60 (1541)	**Use of Dexmedetomidine in the Trauma Intensive Care Unit: Incidence of Failure and Associated Factors** Danielle B. Horn, Brittany Bissell, Gina Riggi, Paul Potnuru, Jack Louro, Miguel Cobas, Roman Dudaryk
CC 61 (1677)	**A Case of Fatal Calciphylaxis** Krish Sekar, James A. Osorio
CC 62 (1589)	**Incidence of Clostridium Difficile Infection in Patients with Severe Leukocytosis in the Adult Intensive Care Unit** Bijan Teja, Matthieu Komorowski, Brian O'Gara, Shahzad Shaefi
CC 64 (1122)	**The Impact of Fluid Management On Sepsis in the Intensive Care Unit** Jong-Chie Claudia Tien, Tsering Dhondup, Hon Liang Tan, Alberto Marquez, Kianoush Kashani
CC 65 (2035)	**Hypocalcemia, Calcium Supplementation, and Mortality in Sepsis** Jesse J. Kiefer, Adam King, Elliott Karren, YapingShi, Matthew Shotwell, Bret D. Alvis, Christopher Hughes
CC 66 (1405)	**Comprehension of Critical Care Issues by Proxies of Patients Undergoing Major Surgery** Stephen Cassidy, Gebhard Wagener
CC 67 (1798)	**Severe Traumatic Brain Injury in The Over 75s - Should We Admit to Critical Care?** Charlotte S. Cattlin, Vanesa Garnelo Rey

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CC 68 (1751)	**Motoric Subtype of Delirium and Global Cognition after Critical Illness** Christina J. Hayhurst, Mayur B. Patel, Jim Jackson, Annachiara Marra, Jennifer L. Thompson, Rameela Chandrasekhar, Christopher G. Hughes
CC 69 (2205)	**The Likelihood of Receiving Lung Protective Ventilation Depends on Type and Location of ICU Within a University Hospital System** Robert F. Groff, Craig Jabaley, Vanessa Moll, Jayashree Raikhelkar, James Blum
CC 70 (1984)	**Veno-Venous Extracorporeal Life Support May Be Considered for Patients With Acute Respiratory Failure Associated with Cardiac Arrest** Jacob Gutsche, Matthew L. Williams, William J. Vernick
CC 71 (2270)	**Modes of Mechanical Ventilation Vary Between Intensive Care Units Within a University Healthcare System** Craig S. Jabaley, Robert F. Groff, Jayashree Raikhelkar, Vanessa Moll, James Blum
CC 72 (2243)	**Frequency of Arterial, Central Venous and Pulmonary Artery Catheter Placement During Kidney Transplantation: A National Database Analysis** Alexander Nagrebetsky, Piotr Al-Jindi, Ned Nasr, Gennadiy Voronov, Richard Dutton, Richard Urman
CC 73 (2050)	**Presence of Heparin:Platelet Factor 4 Autoantibodies is Associated with Hypercoagulability** Aaron Mittel, Gebhard Wagener
CC 74 (1165)	**Anaphylactic Shock Following Isosulfan Blue Dye Injection During Breast Surgery** Ashley Szabo, Avneep Aggarwal
CC 75 (2215)	**Fatal Septic Shock Following an Outpatient Cystoscopy** Ashley Szabo, Roshni Sreedharan
CC 76 (1772)	**Initiating an Evidence Based Extubation Protocol Reduced the Incidence of Unintended Postoperative Intubations (UPIs)** Neilson V. Tran, Phillip Boysen, Stuart Hart
CC 77 (1467)	**Blinding, Randomization, and Power in Critical Care Medicine Animal Studies** Justin Merkow, Janine Hoerauf, Angela Moss, Ana Fernandez-Bustamante, Jason Brainard, Karsten Bartels
CC 78 (2104)	**Predicting Mortality In Stroke Population Within The First Few Hours Of Admission** Ozan Akca, Craig Ziegler, Benjamin S. Stewart, Rainer Lenhardt, Kerri Remmel
AM 80 (1866)	**Anterior Mediastinal Mass: To Bronch or Not to Bronch?** Vance B. Johnson, Brendan Wanta
TCSEM 81 (1711)	**Testing a Novel Manual Communication System for Mechanically Ventilated ICU Patients** Miriam A. Goldberg, Leigh R. Hochberg, Dawn Carpenter, Johnny Isenberger, Stephen Heard, J. M. Walz
TCSEM 82 (1718)	**Principles of Augmentative & Alternative Communication System Design in the ICU Setting** Miriam A. Goldberg, Leigh R. Hochberg, Dawn Carpenter, Johnny Isenberger, Stephen O. Heard, J. M. Walz
PA 83 (2271)	**Case Report: Laparoscopic Cholecystectomy in a Patient With a Heartmate II** Dominique Brundidge, Piyush Mathur
PA 84 (1423)	**2-Octylcyanoacrylate Adhesive for Prevention of Central Venous Catheter Infections** Aaron B. Dahl, Thomas Graetz, Zach Cohen
PA 85 (2227)	**Preoperative Hemodynamic Assessment with Point of Care Transthoracic Ultrasound: Feasibility of Routine Use and Effects on Operating Room Efficiency** Jack Louro, Amir Rowshanrad, Miguel Cobas, Roman Dudaryk
PA 86 (1297)	**Should We Give Continuous Epidural Local Anesthetic During Pancreatic Surgery?** Annette Rebel, Brooke Bauer, Christopher J. Mallard, Brad Withers, Sean Dineen, Paul A. Sloan
PA 87 (1948)	**Utility of Scoring Tools and Type of Surgery in Predicting Complications and 30 Day Readmission in a Urology Perioperative Surgical Home** J. M. Walz, Jaclyn K. Longtine, Dane Netherton, Arlene A. Ash, Khaldoun Faris, Mitchell Sokoloff, Shubjeet Kaur

SOCCA Poster Presentation Groups

3:00 PM – 4:15 PM

Group 1
Category: Cardiovascular Anesthesiology
Moderators: Peter Von Homeyer, MD, FASE, and Michael Wall, MD, FCCM

Group 2
Categories: Blood Management & Obstetric Anesthesiology & Economics, Education and Policy
Moderators: Emily Chanan, MD, and Vikas Kumar, MBBS

Group 3
Categories: Neuroscience in Anesthesiology and Perioperative Medicine & Patient Safety & Global Health & Liver
Moderators: Alisha Bhatia, MD, and Jean Charchaflieh, MD, MPH, DrPH

Group 4
Category: Medically Challenging Cases
Moderators: Ruben Azocar, MD, FCCM, and Dragos Galusca, MD

Group 5
Category: Medically Challenging Cases
Moderators: Jose Humanez, MD, and Piyush Mathur, MD

Group 6
Category: Medically Challenging Cases
Moderators: William Mulvoy, MD, MBA, and Ronald Pauldine, MD

Group 7
Category: Medically Challenging Cases
Moderators: George Frendl, MD, PhD, FCCM, and Julia Sobol, MD

Group 9
Category: Medically Challenging Cases
Moderators: Taylor Johnston, MD, and Sylvia Wilson, MD

Group 10
Categories: Medically Challenging Cases & Critical Care
Moderators: Jean-Francois Pittet, MD, and Madiha Syed, MD

Group 11
Category: Critical Care
Moderators: Michael Russell, MD, and Gebhard Wagener, MD

Group 12
Category: Critical Care
Moderators: Gozde Demiralp, MD, and Nicholas Sadovnikoff, MD

Group 13
Category: Critical Care
Moderators: Avneep Aggarwal, MD, and Miguel Cobas, MD, FCCM

Group 14
Categories: Critical Care & Airway Management & Technology, Computing and Simulation, Equipment Monitoring
Moderator: Erin Hennessey, MD

Group 15
Category: Perioperative Anesthesia
Moderators: Brenda Fahy, MD, MCCM, and Sean Josephs, MD

BLOOD MANAGEMENT & OBSTETRIC ANESTHESIOLOGY & ECONOMICS, EDUCATION AND POLICY

Posters: 1-6

Moderator: Emily Chanan, MD, and Vikas Kumar, MBBS

BLD 1 (1361)

Clinical Safety & Efficacy of Pathogen Reduced RBCs in a Phase 3 RCT in Acute Anemia

Jeffrey Huxford, MMSc[1], V Brixner, MD[2], AH Kiessling, MD[3], K Madlener, MD[4], Nina Mufti, PhD[1], Christine Ernst, PhD[1], Laurence Corash, MD[1]

[1]Cerus Corporation, Concord, CA, [2]German Red Cross Blood Donor Service, Frankfurt am Main, Frankfurt, [3]Johann Wolfgang Goethe University, Frankfurt, Frankfurt, [4]Kerckhoff-Klinik, Bad Nauheim, Bad Nauheim

Introduction: The INTERCEPT Blood System for Red Blood Cells (RBC) is being developed to improve blood transfusion safety by reducing the risk of transfusion transmitted infections and transfusion-associated graft versus host disease. The INTERCEPT technology for RBCs uses the small molecule amustaline to inactivate bacteria, viruses, parasites and white blood cells in RBC components for transfusion. The INTERCEPT Blood System for RBCs is currently in clinical development.

Methods: Patients undergoing coronary artery bypass grafting, and/or valve replacement or repair were randomized to receive amustaline treated or conventional RBC during a 7-day treatment period. Clinical outcomes reflective of tissue oxygenation were assessed: renal insufficiency, hepatic insufficiency; and cardiopulmonary function as assessed by the 6 Minute Walk Test. Adverse events (AE) were collected throughout the study. Immunogenicity was assessed by testing patient serum against amustaline treated RBCs using a gel card agglutination test prior to transfusion, at the end of the study (Days 28 40) and at 90 ± 5 days.

Results: Eighty-seven patients in two clinical centers were enrolled, and fifty-one patients (Test 25, Control 26) who received study RBC were evaluable. A total of 73 amustaline treated RBC and 75 control RBC components were transfused. Baseline characteristics and surgical variables were comparable between groups. Overall incidence of renal insufficiency was 15.7% (Test 5, Control 3; p=0.41). None of the renal insufficiency events occurred in relationship to an acute drop in hemoglobin levels or administration of study RBC units, so a correlation of the effect of transfusion episodes to renal organ perfusion could not be established. Incidence of hepatic insufficiency was 2% (Test 1, Control 0, p=0.37). Thirty-seven patients (Test 17, Control 20) were able to perform the 6MWT at the time of first ambulation. There were no differences in the mean [SD] distance walked in meters (m) between days 0-6 (Test 44.8 m [48.6], Control 53.1 m [41.8]; 95%CI -37.0, 26.6) or at day 13 or discharge (Test 95.5 m [69.7], Control 97.7 m [51.1]; 95%CI -30.8, 50.3). Most patients in both groups (84.3%) experienced an AE. There were no statistical differences in the overall incidence of AE rates (Test 22 vs. Control 21, p=0.412), or in possibly related AEs (Test 5 vs. Control 3, p=0.24). Overall, 22 (43.1%) patients experienced a serious adverse event (SAE), with similar distribution between groups (Test 13 vs. Control

9, p=0.20). Three SAEs were considered possibly related to the transfusion of study RBC (Test 1 vs. Control 2). Five patients died during this study (Test 3 vs. Control 2, p=0.53). Deaths were not considered related to the administration of study RBC components. Observed AEs were within the expected spectrum of co-morbidity and mortality for patients of similar age and with advanced cardiovascular diseases undergoing cardiovascular surgery requiring RBC transfusion. No patients exhibited an immune response to amustaline treated RBCs.

Conclusion: Clinical safety and efficacy variables following the transfusion of S-303 treated RBC were comparable to conventional RBC. Amustaline treated RBC appear to be safe to be transfused in support of acute anemia.

	Randomized patients with any study RBC exposure (n=51)		
	Test (n=25)	**Control** (n=26)	P-Value (95% CI) [1]
Baseline Variables			
Age (years)	73.9 (7.7)	74.3 (6.5)	0.861 (-4.3, 3.6)
Proportion of Females	11 (44.0%)	16 (61.5%)	0.192
Body Mass Index (kg/m^2)	27.8 (5.8)	26.4 (4.2)	0.317 (-1.4, 4.3)
Baseline Hgb (g/dL)	12.7 (0.8)	12.4 (1.2)	0.217 (-0.2, 0.9)
Surgical Variables from Patients ONLY with Valve Procedure Performed	10 (40.0%)	8 (30.8%)	
Proportion With Valves Repaired or Replaced	10 (100%)	8 (100%)	-
Aortic	6 (60.0%)	5 (62.5%)	-
Mitral	5 (50.0%)	3 (37.5%)	-
Tricuspid	3 (30.0%)	1 (12.5%)	-
Pulmonary	0	0	-
Proportion of Bypass Pump Use	10 (100%)	8 (100%)	-
Proportion of Aortic Cross Clamp Use	10 (100%)	8 (100%)	-
Proportion of Cell Saver Use	4 (40.0%)	2 (25.0%)	-
Surgical Variables from Patients ONLY with CABG Procedure Performed	12 (48.0%)	13 (50.0%)	
Vessels Bypassed	2.9 (0.9)	2.9 (1.0)	-
Grafts Placed	2.8 (0.5)	2.7 (0.8)	-
Proportion of Bypass Pump Use	9 (75.0%)	10 (76.9%)	-
Proportion of Aortic Cross Clamp Use	9 (75.0%)	10 (76.9%)	-
Proportion of Cell Saver Use	8 (66.7%)	10 (76.9%)	-
Surgical Variables from Patients with CABG and Valve Procedures Performed	3 (12.0%)	5 19.2%)	
Vessels Bypassed	1.7 (0.6)	1.8 (0.8)	-
Grafts Placed	1.7 (0.6)	1.4 (0.5)	-
Proportion with Valves Repaired or Replaced	3 (100%)	5 (100%)	-
Aortic	3 (100%)	3 (60.0%)	-
Mitral	0	4 (80.0%)	-
Tricuspid	0	0	-
Pulmonary	0	0	-
Proportion of Bypass Pump Use	3 (100%)	5 (100%)	-
Proportion of Aortic Cross Clamp Use	3 (100%)	5 (100%)	-
Proportion of Cell Saver Use	1 (33.3%)	3 (60.0%)	-
Overall Surgical Variables			
Overall Proportion of Bypass Pump Use	22 (88.0%)	23 (88.5%)	0.912
Overall Proportion of Aortic Cross Clamp Use	22 (88.0%)	23 (88.5%)	0.912
Overall Proportion of Cell Saver Use	13 (52.0%)	15 (57.7%)	0.781
Est Vol of Surgical Bld Loss (L)	1.57 (2.13)	1.32 (0.93)	0.63 (-0.82, 1.34)
Proportion With Surgical Complications Leading to Additional Blood Usage	1 (4.0%)	2 (7.7%)	0.631
Transfusion Variables			
Number of Study RBC Units Transfused	2.9 (1.7)	2.9 (2.0)	0.87 (-1.0, 1.1)
Age of Transfused Study RBCs (days)	18.1 (8.6)	19.6 (8.1)	0.253 (-4.3, 1.1)
Est Vol of Non-Study RBCs Transfused (L)	3.17 (4.62)	1.14 (0.64)	0.625 (-8.38, 11.83)
Proportion With Platelet Exposure	7 (28.0%)	8 (30.8%)	0.91

[1] For continuous variables, the confidence intervals (CI) and P-Values for the treatment difference (T-C) in LS means are based on ANOVA (controlling for the Treatment and Cardiac Procedure performed). For categorical variables, the P-Values are based a CMH test of general association (controlling for Treatment and Cardiac Procedure performed).

BLD 2 (1509)

Quality Improvement in ICU Blood Utilization

William C Wilson, MD, MA

University of California, Irvine Medical Center, Orange, CA

Introduction: Increasing scrutiny has been placed upon transfusion practices. Recognizing and reducing unnecessary transfusions addresses parallel goals of improving both quality and cost-effectiveness while reducing transfusion-associated risks. Furthermore, blood utilization in general is subject to significant heterogeneity in practice patterns. In the ICU, where as many as 44.1% of patients can require transfusion1, we sought to homogenize transfusion practices in an effort to improve quality of care.

Methods: A multi-disciplinary task force was formed under the leadership of our Intensive Care Unit Director. Representation from acute-care surgery, neurosurgery, neuro-critical care, pulmonary-critical care specialists, critical-care pharmacy, transfusion medicine, and nursing staff ensured highest likelihood for buy-in and clinician adoption. The literature was reviewed and incorporated, specialty-specific best-practices reviewed, and input from experts sought in the development of an ICU Blood Utilization Guideline. Drafts received additional reviews at multiple levels through key hospital committees thus arriving at final approval through critical care committee, medical executive committee, and governing body advisory committee. The guideline was rolled out in August of 2014 and became the basis for transfusion decisions in ICU patients thereafter. Efforts were applied in a top-down manner through decision-making during clinical rounds.

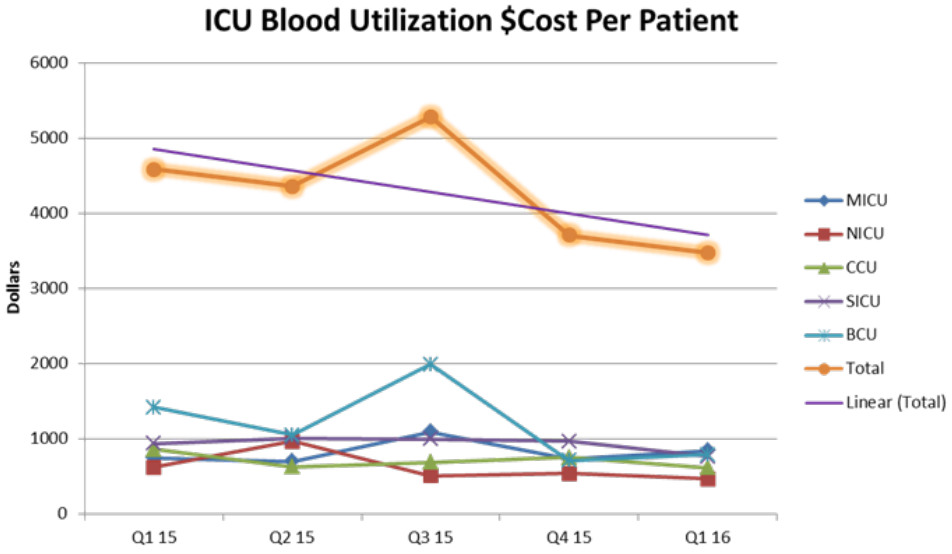
Results: Data on blood utilization were obtained through decision support. All charges associated with any blood component transfusion taking place in any adult ICU were tabulated as Cost/Patient and analyzed over a 15-month period (Q1 15 through Q1 16) following implementation. The results demonstrate steady reduction in blood utilization across all intensive care units, culminating in nearly a 25% reduction cost/patient for blood products throughout the analyzed period (see Figure 1).

Conclusion: Murphy and colleagues report results of a multi-faceted quality improvement program designed to decrease, among other things, RBC utilization in ICU. Through dissemination of best-practices and financial incentives to the units for meeting predefined targets. RBC utilization declined by 17% in the post-implementation period. Wahl and colleagues3 report results following implementation of a transfusion guideline in a trauma-burn ICU. Prior to implementation, a 26% rate of blood transfusions was observed during a 9-month prospective observation period (8/03 - 4/04). To judge sustainability of their intervention, the proportion of patients transfused during 2005 was assessed, yielding an 18% rate, or 31% reduction. In our study, we used hospital financial reporting as a surrogate for blood utilization. We feel this is a reasonable methodology given that hospital cost per unit and mix of vendor derived vs internally collected units was relatively constant throughout the analyzed period.

Reductions realized following implementation of our guideline are therefore in line with achievements published by other groups. In addition, reduced blood utilization did not adversely impact mortality rates or ICU length of stay.

Reference(s):

1. Crit Care Med, 2004 Jan; 32(1):39-52.
2. Crit Care Med, 2016 Jan; 44(1):162-170.
3. Am J Surg, 2008 Jun; 195(6):803-806.



OB 3 (2162)

Parturient with Delta Granule Platelet Storage Pool Disorder

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The Ohio State University Wexner Medical Center, Columbus, OH

Introduction: An 18 y.o. G1P0, 40w0d parturient presented for obstetric anesthesia consultation for history of delta platelet storage pool disorder and hypermobility type Ehlers-Danlos syndrome. Significant bleeding with prior surgical procedures was documented. Hematology consultation and workup resulted in a diagnosis of 'very severe deficiency' of delta granules. Platelet storage pool disorder (PSPD) is a group of inherited defects in platelet granules associated with a wide spectrum of bleeding diathesis and reduced platelet aggregation (2). Granules are the small sack-like bodies inside platelets that contain adhesive proteins (alpha granules), or ADP, ATP, pyrophosphate, serotonin and calcium (delta granules) (4). Platelet activation causes release of the granular proteins, allowing further platelet recruitment and aggregation. In PSPD, the granules can be absent, reduced in number, contain an inappropriate ratio of the above compounds, or fail to release their contents into the bloodstream (2). Patients typically present with excessive bleeding in the setting of normal PT, aPTT, and platelet count (2). PSPD is diagnosed based on the following laboratory findings: decreased or absent dense granules on electron microscopy, prolonged bleeding time, abnormal platelet aggregation studies, and abnormal ADP/ATP ratio (4).

Methods: This case presentation is on an 18 year old parturient with both delta platelet storage pool disorder and hypermobility type Ehlers-Danlos syndrome.

Conclusion: Few reports of safety with neuraxial anesthesia in PSPD patients exist. Hematology assessment of the severity of the patient's PSPD is vital to plan for labor and delivery. Prophylactic administration of desmopressin and platelet transfusions are frequently required prior to a scheduled surgery or invasive procedure. Post operative antifibrinolytics are also used (2). In our patient, hematology recommended one unit of platelets prior to cesarean delivery, and transexamic acid 1300 mg po TID x 5-7 days postpartum. Parturients diagnosed with PSPD create challenges for the obstetric anesthesiologist. Due to the small numbers of published case studies in patients with this disease, there exists an unknown risk of bleeding. Prominent bleeding can also be seen with Ehlers-Danlos Type 3 or hypermobility type (5). Our patient was scheduled by the obstetricians for induction of labor at 40w+0d. Remifentanil PCA was used for pain control during her labor contractions. Cesarean delivery via general anesthesia was ultimately performed due non-reassuring fetal wellbeing. This parturient had an uncomplicated perioperative course and delivered a baby girl infant with APGAR scores of 9 and 9.

Reference(s):

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4. Blood Reviews. Vol 29, Iss 3. Pages 153-162
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EEP 4 (1151)

A Perception Survey of the Perceived Benefits of Mentorship in SICU Fellowship

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Introduction: Mentorship programs are essential component in academic medicine. The proposed benefits for of mentorship programs includes clinical skills enhancements and professional development. However, the perceived influence of mentorship programs may differ between the trainee and the mentors. Understanding the gap in perception is essential to identify the weaknesses of mentorship programs and guides for improvement.

Methods: We sent separate electronic survey to 11 mentors and 10 fellows at our surgical ICU fellowship. The two surveys included same 10 questions based on the ACGME milestones. The survey queried about demographics , then asked the mentors and the fellows to answer on scale from 0 to 10 (0 has no benefits, 10 very beneficial) how they find the benefits of mentorship program on the following areas 1-patinet care 2- patient safety 3- improving medical knowledge 4-scholarly activity and self-directed learning 5- communication skills 6-professional development 7-fatigue management 8-quality improvement projects 9-healthcare economics awareness 10- multiple choice question on which area was mentorship beneficial in patient care A)patient assessment and planning B)crisis management C) procedural skills D)management of respiratory failure E)palliative medicine F) none. A comment section was left at the end of the survey. The Survey will be sent again for at the end of the academic year to reevaluate the proposed solutions for minimizing the gap and improving the mentorship program.

Results: 10 mentors and 10 fellows completed the survey. We calculated the means of the answers of each question. The benefits of mentorship was as the following, on patient care (mentors 4/10,fellows 6/10),patient safety (mentors 2/10,fellows 5/10), improving medical knowledge (mentors 3/10,fellows 5/10),scholarly activity (mentors 5/10, fellows 6/10),communication skills (mentors 4/10,fellows 6/10),Professional development (mentors 6/10, fellows 7/10), fatigue management (mentors 3/10, fellows 5/10), quality improvement projects (mentors 4/10,fellows 5/10), health care economics (mentors 2/10, fellows 5/10). Answering the MCQ question on which area the mentorship benefits the most in patient care, mentors answers (patient assessment 2, Crisis management 2,Procedural skill 0, respiratory failure management 0, palliative medicine1 , None 6). Fellows answers (patient assessment 4, Crisis management 2, Procedural skill 0, respiratory failure management 1,palliative medicine 4, None 1)

Conclusion: The survey findings can be summarized as 1-The fellows valued the mentorship program more compared to mentors. They scored higher in all areas, the difference ranges from 1 to 3 points. The Comments suggested that fellow's positive perception stems from the utilization of the available of mentorship program without the need of one to one mentor. Low scoring on mentor's side is the product of the absence of specific objectives of mentorship and the lack of regular meeting with the assigned mentee. 2- the highest impact of mentorship program was on professional development. This area showed the narrowest gap in the perception between the two groups. 3- The two groups agree on that mentorship has no benefits on procedural skills development 4- The benefits mentorship program on patient care showed the gap of perception, 54% of mentors answered no benefit, compared to 20% of fellows. Fellows answers revealed the value of mentorship program in improving patient assessment and palliative medicine.

Reference(s):

1. Mentorship in anesthesia: a survey of perspectives among Canadian anesthesia residents.Can J Anaesth. 2017 Jan 13. doi: 10.1007/s12630-017-0816-1. [Epub ahead of print]
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3. Medical Student Mentorship in Plastic Surgery: The Mentee's Perspective.Plast Reconstr Surg. 2016 Jun;137(6):1934-42
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EEP 5 (2019)

Ultrasonic Examination of the Underwater Spine: A Learning Technique to Enhance Acquisition of Basic Skills to Place an Epidural Catheter

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[1]Ochsner Clinic Foundation, New Orleans, LA, [2]Tulane University School of Medicine, New Orleans, LA

Introduction: We used a sequential analysis technique (CUSUM) to assess individual learner acquisition of the skill to place an epidural catheter. We observed that anatomic assessment of the back and spine by palpating landmarks was the most difficult step for the learner, often due to obesity or difficulty establishing the midline of the spine. We separated this initial skill to provide a learning technique which depended on the combination of ultrasonic examination of a submersed model of the human spine, proceeding to ultrasound examination of patient anatomy.

Methods: We employed a GE Venue 50 Ultrasound device, with a low frequency curvilinear probe, and depth set to 8 - 10 cm. We submerged an acrylic model of the human spine to an appropriate depth and ran the probe over the surface of the water to obtain an image. A longitudinal paramedian approach was used to examine the sacrum, moving cephalad to examine each interspace and to ascertain the approximate position of the ligamentum flavum and posterior dura. Switching to the transverse plane the bony structures including the spinous processes, articular and transverse processes, and vertebral bodies are identified. An ultrasound examination of a patient is then performed, and in addition to spinal anatomy, the dorsal dura mater, ligamentum flavum, ventral dura mater, and posterior longitudinal ligament are imaged. The ideal insertion point is determined, depth to the epidural space is measured, and best angle of approach is noted. The image is frozen, captured, and printed, and the learner is asked to mark each anatomical entity on the print.

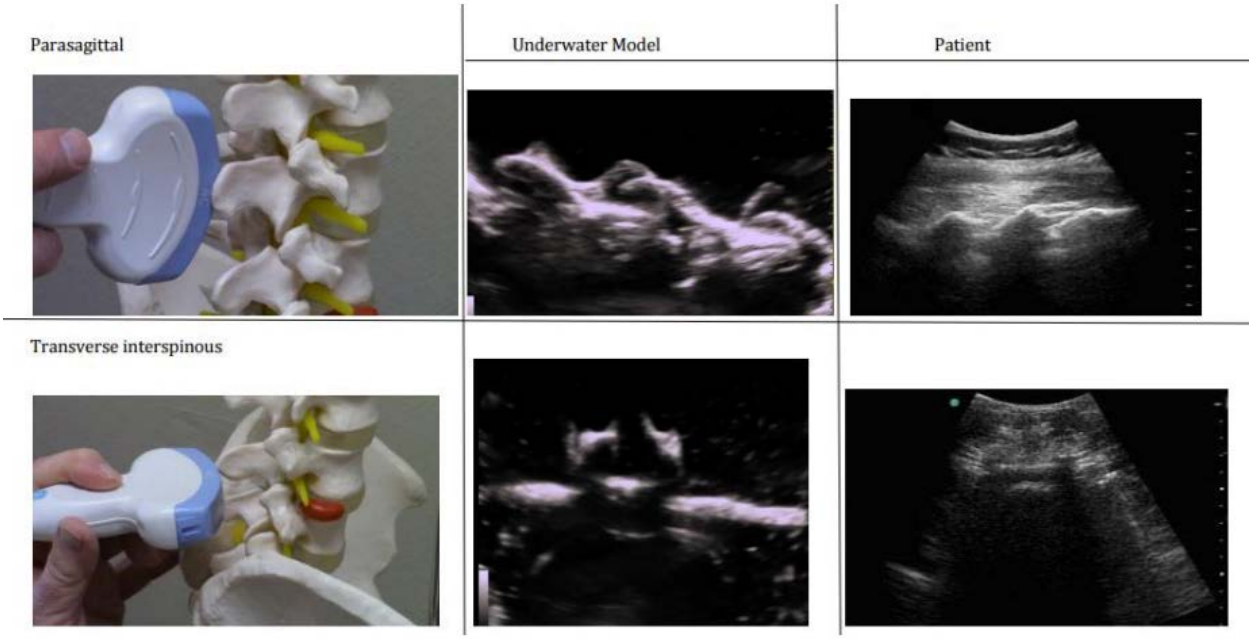
Results: Skilled anesthesiologists can complete the spinal ultrasound examination in 2 - 3 minutes, including verbal confirmation of the anatomy. Using our checklist, 10 learners were able to reach this target after 10 - 12 patient examinations.

Conclusion: We conclude that using our underwater spine simulation enhances transition to the actual patient examination. It identifies the best interspace for access, the angle of needle introduction, and the distance from skin to epidural space. It will identify spinal abnormalities such as scoliosis, and establish the midline when often not appreciated by palpation of the back. As an approach to the

assessment of learning this skill we can shorten the overall time to epidural placement, increasing patient safety and comfort.

Reference(s):

1.
http://www.pie.med.utoronto.ca/obanesthesia/OBAnesthesia_content/OBA_spinalUltrasound_module.



EEP 6 (2030)

CUSUM Analysis: An Application of Learning Curves to Ensure Basic Skills in Anesthetic Procedures

Michael C Scarbrough, MD[1], Laurie Daste, MD[1], Jacquelyn Paetzold, DO[2], Phillip Boysen, MD[1]

[1]Ochsner Clinic Foundation, New Orleans, LA, [2]Tulane University School of Medicine, New Orleans, LA

Introduction: The cumulative sum control chart (CUSUM) is a sequential analysis technique developed to monitor change detection. It is a process control chart that identifies deviation from an expected or standardized mean. It has been used to monitor acquisition of clinical skills as a formative and summative evaluation (1,2). We concentrated on formative skills for a learner to place labor epidurals, with the aim of identifying and intervening to assist a struggling learner.

Methods: We followed six learners over a six month period. All learners underwent an initial didactic and simulation curriculum which involved video presentations, lectures, and introduction to spinal anatomy with ultrasonic examination of an underwater spine model, culminating in observing a staff anesthesiologist placing an epidural. We defined epidural placement as successful if placement resulted in effective analgesia without the assistance of a staff anesthesiologist. Failed epidural placement was recorded if dural puncture occurred or if physical assistance from a staff anesthesiologist was necessary. We further determined that once the skill of ultrasound examination of spinal anatomy was mastered, residents and staff anesthesiologists could complete successful epidural insertion in 18 - 20 minutes. We recorded CUSUM statistics vs. number of attempts at insertion and plotted the results. We arbitrarily set the control limits as +/- 10% of the mean.

Results: In all six learners' movement toward process control occurred at approximately 10 attempts. In 5/6 learners, they achieved process control in 25 - 30 attempts. Figure 1 shows two resident CUSUM charts, one with the desired continued movement toward the desired process control range, and one showing erratic deviation and stagnation in process improvement. This resident required intervention and focused instruction.

Conclusion: Individuals learn skills at a different rate. Formative instruction can avoid failure when summative evaluation is conducted with a pass/fail rating. Check-off lists, which only identify the number of procedures attempted without actually analyzing the desired skill set, are commonly reported. Process control charts and CUSUM evaluation can be used for a variety of anesthetic procedures including peripheral venous cannulation, central venous cannulation, tracheal intubation, spinal and epidural anesthesia. Learning curves provide a graphic display of the educational process.

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2. Can J Anaesth 2003;50:694-698
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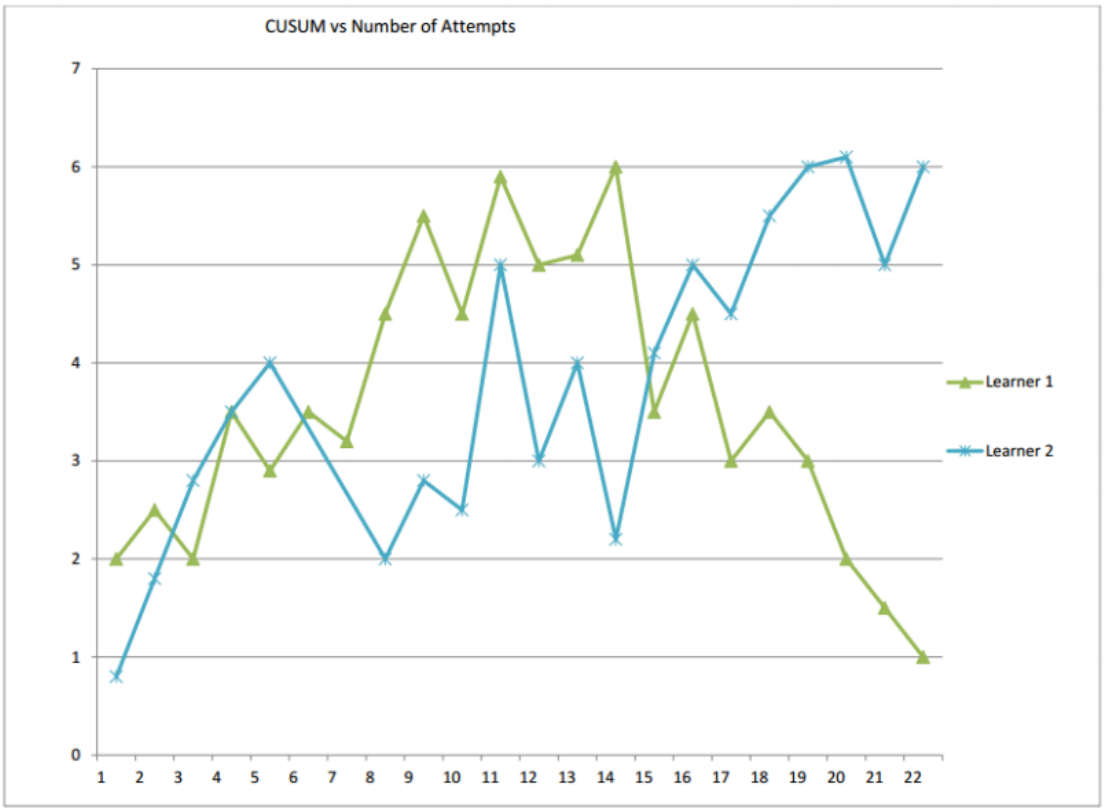

Control range +/- 10%. Graph rises by value of 0.9 (1-f) with failure and declines by 0.1 (f) with success. Graph falls to "control" or within for given boundaries[3].

CARDIOVASCULAR ANESTHESIOLOGY

Posters: 7-12

Moderator: Peter Von Homeyer, MD, FASE, and Michael Wall, MD, FCCM

CA 7 (1670)

Milrinone Infusion Improves One-Year Survival After Norwood Sano Procedure

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Introduction: It was reported that milrinone infusion might improve mortality in adult cardiac surgery. However, there is no evidence to support milrinone infusion improve mortality in pediatric cardiac surgery. Cochrane review (2015) shows that milrinone infusion for congenital heart disease patients does not improve mortality, and it might be harm in postoperative period of increased risk of arrhythmia. The effect of milrinone is to decrease systemic vascular resistance and improve diastolic filling. The pharmacological effect of milrinone seems to be useful for the patients who have single ventricle physiology because single ventricle patients have diastolic dysfunction. Norwood stage 1 palliation is one of the most difficult pediatric cardiac surgery and its mortality is still high. We changed inotropic support protocol from routine epinephrine use to routine milrinone infusion after June 2011 for children who received Norwood sano procedure. The aim of this study is to investigate that milrinone infusion for Norwood sano procedure improves patient's one-year survival or not.

Methods: This is the before-after study approved by our local ethics committee. The patients who received Norwood sano procedure during Jan 2008 to Dec 2014 were included. They were separated before and after Jan 2011 that we changed the inotropic support protocol from routine epinephrine use (GroupE) to routine milrinone infusion (GroupM). The data collection of age (day), weight, diameter of ascending aorta, severity of tricuspid valve regurgitation, preoperative mechanical ventilation, preoperative inotropic support, the duration of CPB, cross clamp time, bilateral pulmonary artery banding before Norwood sano procedure, risk of mortality by PIM2 score were compared both two groups. Primary outcome was one-year survival after surgery. It was compared by log-rank test using Kaplan-meier survival curve. We did multivariate analysis using cox proportional hazard model to investigate the independent relationship between milrinone infusion and one-year survival.

Results: Forty-five children received Norwood sano procedure during study period. GroupE has 23 patients and GroupM was 22 patients. The age of GroupE was significantly lower than that of GroupM (GroupE 3.5(2.75, 4.5) vs GroupM 7(3, 64), p=0.02). However, bilateral pulmonary arterial banding before Norwood sano procedure had no difference between GroupE and GroupM (17.8% vs 6.7% p= 0.1). Other data did not show statistically significant differences between two groups. The comparison of one-year survival using log rank test from Kaplan-meier survival curve (figure.1) shows that one-year survival of GroupM was significantly higher than GroupE (95.7% vs 72.7%, p=0.04). In multivariate

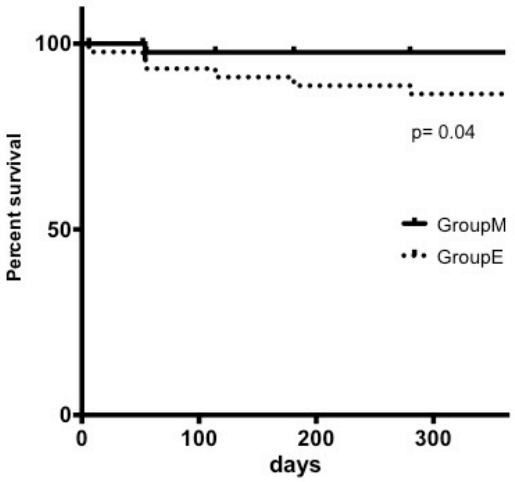
analysis, there is no independent relationship between milrinone infusion and one-year mortality (hazard ratio 0.8 (0.44-1.46), p=0.6)

Conclusion: Milrinone infusion may improve one-year survival for children who received Norwood sano procedure.

Reference(s):

1. The Cochrane Library 2015, Issue 3

Figure1. The comparison of one-year survival



CA 8 (2053)

Plasma Free Hemoglobin, Oxidative Damage, and Acute Kidney Injury in Cardiac Surgery

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Vanderbilt University Medical Center, Nashville, TN

Introduction: Acute kidney injury (AKI) occurs in up to 30% of patients who undergo cardiopulmonary bypass (CPB) during surgery.(1,2) CPB lyses erythrocytes, and free hemoglobin (Hb), similar to other hemeproteins, is nephrotoxic.(3,4) In a rat model, hemeprotein-induced AKI was mediated by oxidative damage, and we have recently demonstrated that increased oxidative damage is an independent predictor of AKI following cardiac surgery.(5, 6) We tested the hypothesis that increased plasma free Hb concentrations in patients undergoing cardiac surgery are associated with AKI and that this association is mediated by oxidative damage.

Methods: We measured plasma free Hb 30-minutes into CPB, immediately after CPB, and at ICU admission in Statin AKI cardiac surgery RCT participants. We measured plasma concentrations of isofurans, stable products of arachidonic acid peroxidation, at ICU admission to quantify intraoperative oxidative damage. AKI was defined using Acute Kidney Injury Network criteria. To isolate the association between peak free Hb and AKI we performed multiple logistic regression adjusted for age, estimated glomerular filtration rate, statin treatment, and baseline hematocrit (βHb1, model 1, **Figure 1**). To assess any mediation by oxidative damage, we added isofurans to the model and examined βHb and the independent association between isofurans and AKI (βHb2 and βisofuran, model 2), and we measured the association between peak free Hb and isofurans, adjusted for the same covariates (βHb3, model 3). A decrease in the association between free Hb and AKI in model 2, an association between isofurans and AKI, and an association between free Hb and isofurans are required to demonstrate any evidence of oxidative damage mediating an association between intraoperative plasma free Hb and postoperative AKI.

Results: Sixty-five of 259 patients (25.1%) developed AKI within 72 hours of cardiac surgery. The median (10th, 90th percentile) free Hb concentration was 0.0 mg/dl (0.0, 75.0) 30 minutes into CPB, 69.8 mg/dl (0.0 to 295.0) immediately following CPB, and 60.0 mg/dl (0.0, 234.8) at ICU admission. Median isofurans concentration at ICU admission was 65.4 pg/ml (33.4, 141.6). The peak median plasma free Hb concentration in AKI patients was 48.6 mg/dl higher than in non-AKI patients, and in adjusted analyses, a 50 mg/dl increase in peak free Hb was independently associated with a 16% increase in the odds of AKI (βHb1 OR, 1.16 [95% CI, 1.02 to 1.33]; P=0.02; **Figure 2**). When isofurans were added to the model, this association was reduced (βHb2 OR, 1.13 [95% CI 0.99 to 1.30) and no longer significant (P=0.06). A 25 pg/ml increase in peak isofurans was independently associated with an 18% increase in the odds of AKI (βisofuran OR, 1.18 [95% CI, 1.03 to 1.33]; P=0.03, **Figure 3**), and a 50 mg/dl increase in peak plasma free

Hb was independently associated with a 4.8 pg/ml [95% CI, 2.0 to 7.5; P=0.001] increase in plasma isofurans (**Figure 4**).

Conclusion: Intraoperative plasma free Hb concentrations were independently associated with AKI following cardiac surgery, and this association may be partially mediated by increased oxidative damage. Increased free Hb was associated with increased oxidative damage, and increased oxidative damage was independently associated with AKI. Interventions to decrease intraoperative hemolysis, scavenge plasma free Hb, and decrease oxidative damage during cardiac surgery should be studied to decrease AKI and subsequent patient morbidity.

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2. Clin J Am Soc Nephrol 2006;1:19-32.
3. Kidney Int 2010;77:913-20.
4. J Cardiovasc Surg 1996;37:153-9.
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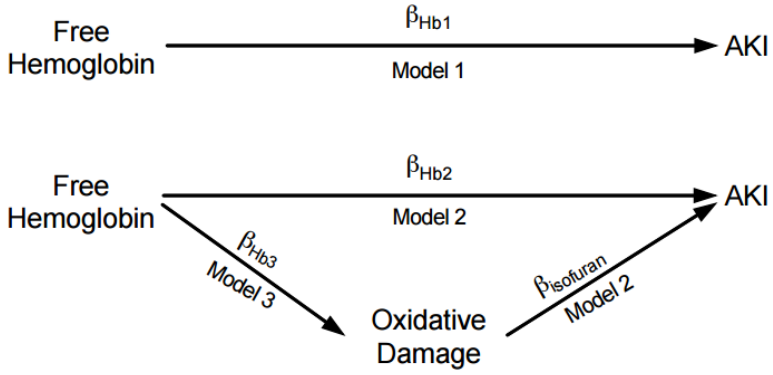
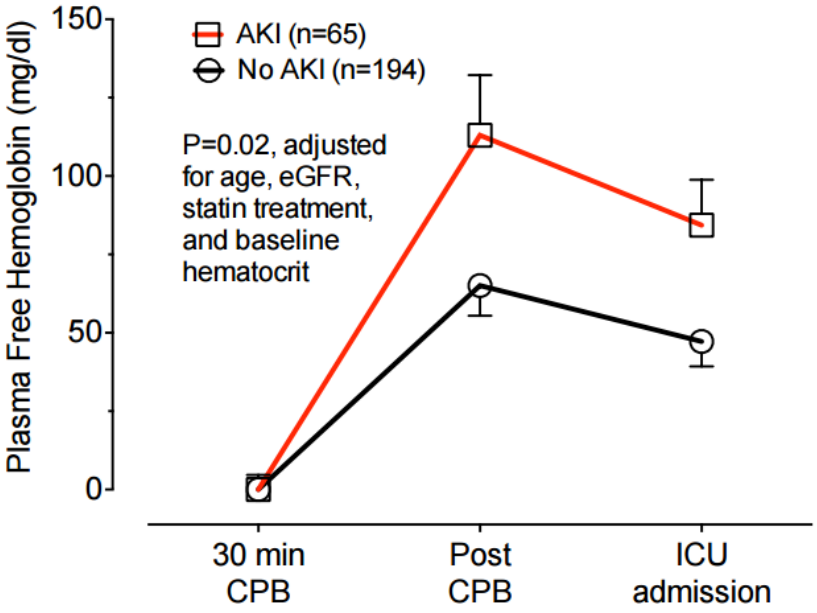
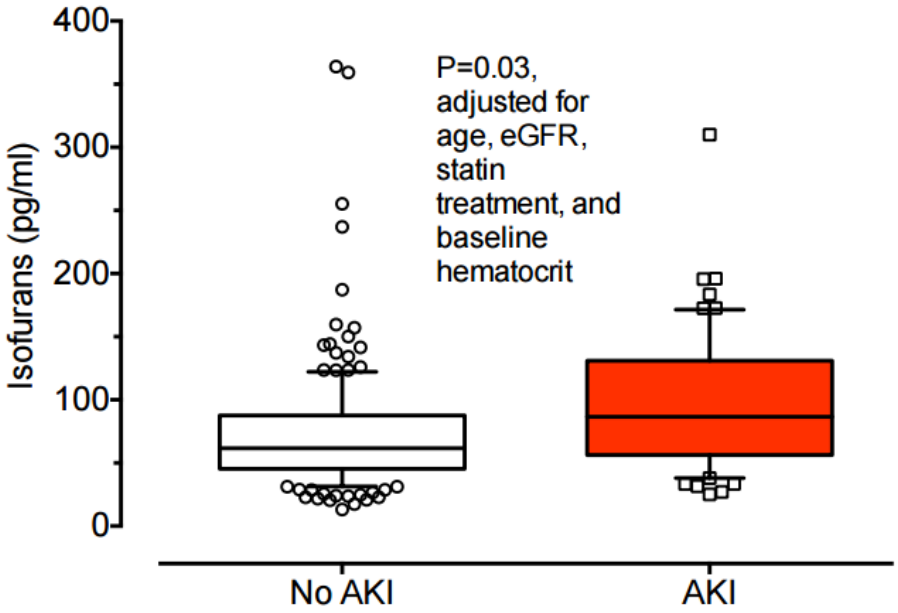
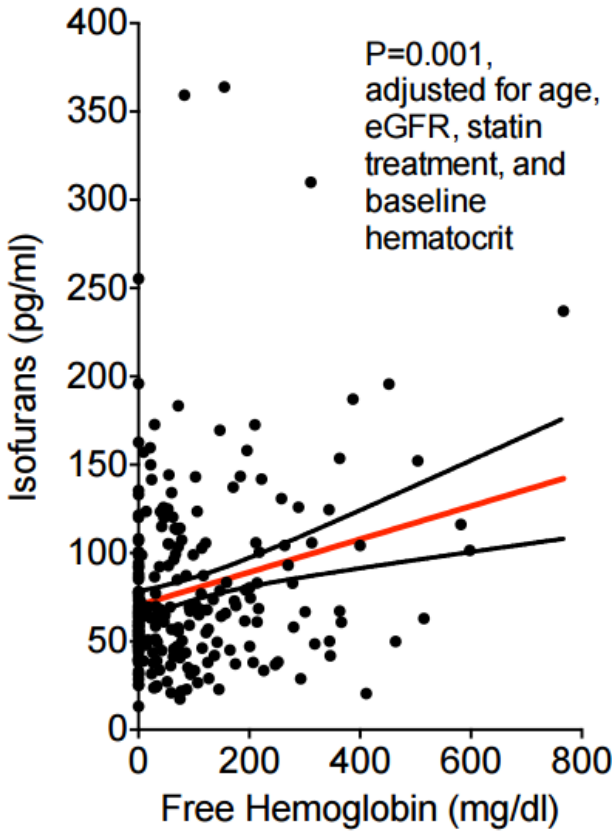



Plasma Free Hemoglobin (mg/dl)
150
100
50
0
AKI (n=65)
No AKI (n=194)
P=0.02, adjusted for age, eGFR, statin treatment, and baseline hematocrit
30 min CPB
Post CPB
ICU admission


Isofurans (pg/ml)
400
300
200
100
0
P=0.03, adjusted for age, eGFR, statin treatment, and baseline hematocrit
No AKI
AKI


P=0.001,
adjusted for age,
eGFR, statin
treatment, and
baseline
hematocrit
Isofurans (pg/ml)
Free Hemoglobin (mg/dl)
0
50
100
150
200
250
300
350
400
0
200
400
600
800

CA 9 (1340)

Pulmonary Artery Pulsatility Index and Pharmacologic Support in RV Graft Dysfunction

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[1]Tufts University School of Medicine, Boston, MA, [2]Tufts Medical Center, Boston, MA

Introduction: The pulmonary artery pulsatility index (PAPi) is a novel parameter for evaluating right ventricular (RV) dysfunction (1, 2). Ventricular dysfunction following orthotopic heart transplantation (OHT) has been reported to be as high as 26% (3). We investigated whether PAPi post-OHT was associated with duration of pharmacologic support for RV graft dysfunction. We hypothesized that the mean 24 hour PAPi on ICU arrival following OHT would be negatively correlated with duration of pharmacologic support for patients with RV graft dysfunction, while no association would exist for patients with no graft dysfunction.

Methods: We reviewed charts of patients who underwent OHT between July 2013 and October 2016. Patients with ISHLT rejection grade >1 were excluded. PAPi was calculated as (systolic pulmonary artery pressure-diastolic pulmonary artery pressure)/central venous pressure. Values were from ICU flow sheets of the first 24 postoperative hours. Linear regression was used to test the association of PAPi with duration on pharmacologic support (milrinone, dobutamine, sildenafil, epoprostenol and/or epinephrine). RV graft dysfunction was defined as a cardiac index (CI) <2 liters/min/m2 for more than 1 hour, a pulmonary capillary wedge pressure (PCWP) <18 mmHg. If PCWP was not available, diastolic pulmonary artery pressure <20 mmHg was used. Linear regression was performed using the fitlm function in Matlab 2016b.

Results: Of the 101 adult OHT patients reviewed, 78 met inclusion criteria. 3 patients had left ventricular graft dysfunction (CI <2 liters/min/m2 for more than 1 hour and PCWP >18 mmHg). Linear regression of duration on pharmacologic support to PAPi for patients with RV graft dysfunction (n=11) had regression coefficient of -3.40 (adjusted r^2=0.211, p=.0877) (Figure 1). Linear regression of duration on pharmacologic support to PAPi for patients with no graft dysfunction (n=64) had regression coefficient of -.512 (adjusted r^2=0.006, p=0.245) (Figure 2).

Conclusion: Although not significant at a 0.05 cut off with this sample size in this population, there is a negative trend between PAPi following OHT and duration on pharmacologic support in patients with RV graft dysfunction. Patients with no graft dysfunction show an even weaker association between PAPi and duration on pharmacologic support. The duration of pharmacologic support was influenced by multiple clinical factors including differences in clinical management. These preliminary results are

hypothesis generating and suggest a possible role of PAPi as an easily calculated metric in risk-stratifying patients with RV graft dysfunction post-OHT. Prospective investigation of these results is warranted.

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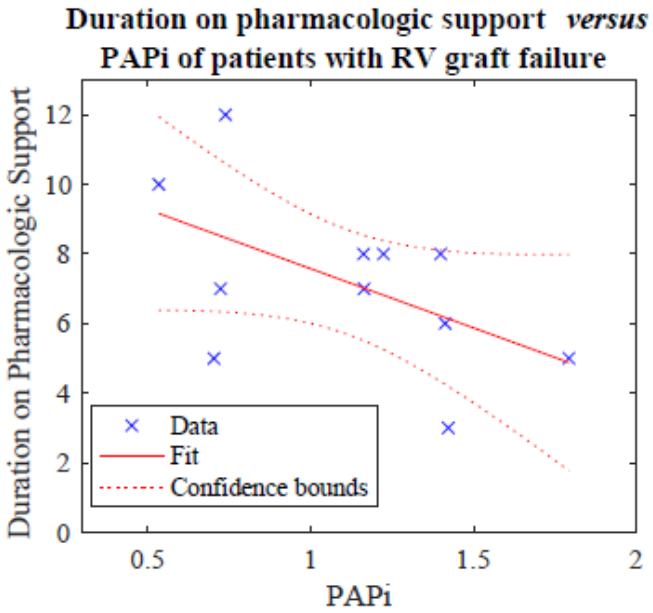

Figure 1. Duration on pharmacologic support *versus* 24 hour mean PAPi of patients with RV graft failure. Confidence bounds are 95% of the fitted model. Regression coefficient=-3.40 (adjusted r^2 =0.211, p=.0877).

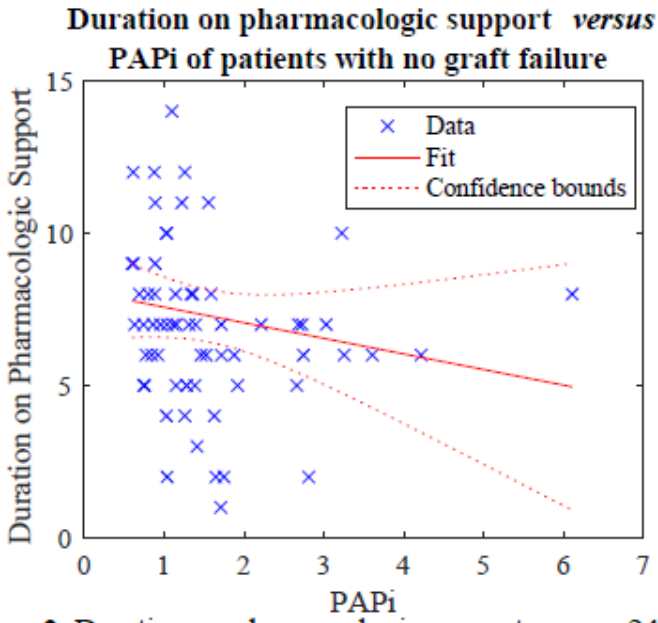

Figure 2. Duration on pharmacologic support *versus* 24 hour mean PAPi of patients with no graft failure. Confidence bounds are 95% of the fitted model. Regression coefficient=-.512 (adjusted r^2 =0.006, p=.245).

CA 12 (1573)

Change in Central Venous Pressure Following Passive Leg Raise Does Not Correlate with Transesophageal Echocardiography-Derived Indices of Right Ventricular Function

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Columbia University, New York, NY

Introduction: Despite the evidence demonstrating that central venous pressure (CVP) cannot be used to predict 'fluid-responsiveness' or improvement in cardiac performance in response to a fluid challenge, the use of CVP in clinical practice has not been abandoned[1-4]. CVP is often used as a proxy for right ventricular (RV) function, based on the assumption that right atrial pressure will be elevated in the setting of RV dysfunction or failure[3, 5-6]. Our aim was to evaluate whether a correlation exists among CVP, the change in CVP in response to a fluid challenge (in the form of a passive leg raise or 'PLR'), and RV function as observed with transesophageal echocardiography (TEE).

Methods: We conducted a prospective, observational study of adult (age > 18 years) patients undergoing elective coronary artery bypass graft (CABG) or combined CABG-valve surgery. Following induction of anesthesia, a baseline CVP and TEE exam were recorded. A PLR was performed by lifting the patient's legs from supine to 45° and holding this position for two minutes. A second CVP measurement and TEE exam were then recorded. Off-line analyses of the TEE images were performed by an independent echocardiographer who was blinded from the corresponding CVP data and loading conditions. We chose RV fractional area change (RV FAC) and RV systolic excursion velocity (RV S') as the primary indices of RV function, based on the strength of the available literature supporting their clinical utility[7-8]. We then used Pearson correlation to determine the association between CVP and measurements of RV function. Correlation coefficients were calculated for baseline, PLR, and 'delta' measurements ('delta' representing the change from baseline to after PLR).

Results: Forty patients were enrolled in our study. Complete study data was collected for 33 patients; 28 were male; all underwent CABG; 10 had a combined CABG-valve procedure. Figure 1 shows the overview of patient enrollment. There was no significant association between baseline RV function and CVP [baseline RV FAC and baseline CVP (r = -0.10, p=0.59), baseline RV S' and baseline CVP (r = 0.02, p=0.91)]. Correlations between baseline RV FAC and delta CVP (r = -0.19,p=0.31) and baseline RV S' and delta CVP (r = 0.18, p=0.34) were also not significant. Indices of RV function did not account for a substantial amount of the variation in CVP [baseline RV FAC and baseline CVP (r^2 = 0.01), baseline RV S' and baseline CVP (r^2 = 0.0005), baseline RV FAC and delta CVP (r^2 = 0.04), baseline RV S' and delta

CVP (r^2 = 0.03)]. The scatter plots in Figure 2 illustrate the absence of correlation between baseline RV function and CVP.

Conclusion: We found no correlation among CVP, the change in CVP in response to PLR, and echocardiographic measurements of RV function in patients undergoing elective cardiac surgery. Our findings suggest that CVP may not be an accurate marker of RV function. Future studies should examine the relationship between CVP and RV function parameters in specific patient populations with a propensity for RV dysfunction and failure, such as patients receiving left ventricular assist devices or orthotopic heart transplants.

Reference(s):

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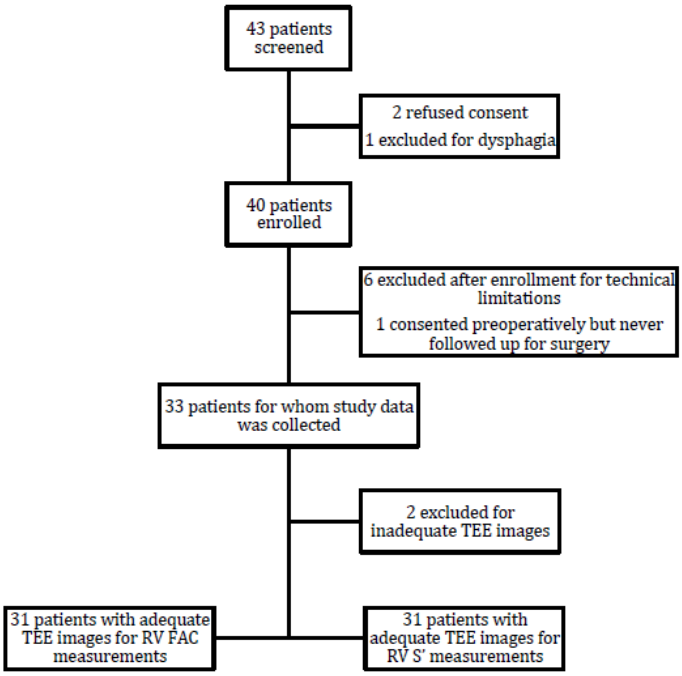

Figure 1. Overview of patient enrollment. Six patients were excluded after study enrollment for technical limitations (e.g. TEE machine not available, study echocardiographer not available, passive leg raise performed prior to completion of baseline TEE exam). Thirty-one patients had TEE images suitable for RV FAC and RV S' analysis, though these patients were not identical in each set.

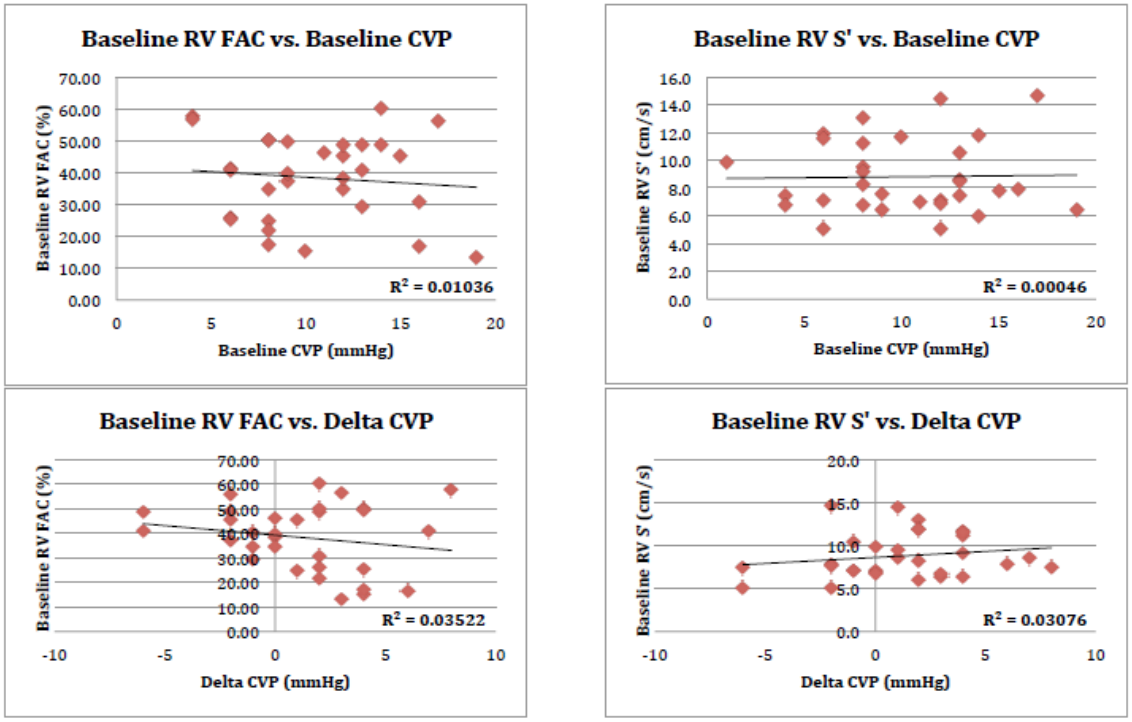

Figure 2. Baseline RV function versus CVP. The scatter plots demonstrate no correlation between baseline RV function and baseline CVP measurements, as well as no correlation between baseline RV function and the change in CVP following PLR ("delta" CVP). *CVP = central venous pressure. RV = right ventricle. FAC = fractional areal change. S' = systolic excursion velocity.*

NEUROSCIENCE IN ANESTHESIOLOGY AND PERIOPERATIVE MEDICINE & PATIENT SAFETY & GLOBAL HEALTH & LIVER

Posters: 13-18

Moderator: Alisha Bhatia, MD, and Jean Charchaflieh, MD, MPH, DrPH

NR 13 (2266)

Incidence of Adverse Effects with Continuous Hypertonic Saline in Patients Treated for Cerebral Edema: Using a De-Identified Patient Database to Identify Problems for Future Study

Cash C Sterling, BSc, Aaron N LacKamp, MD

University of Kansas, Kansas City, KS

Introduction: Cerebral edema is a common problem after diverse types of brain injury. Cerebral edema may be treated by escalating therapies, including: head of bed elevation, maintaining the neck in a midline position, hyperventilation, osmotic agents to withdraw cellular and extracellular fluid from the edematous and non-edematous regions of the brain, in extreme cases reduction of metabolic rate by means of induced hypothermia or induced barbiturate coma, investigational agents to combat neuroinflammation, and decompressive surgery. The timing and priority of these interventions is an active area of investigation. Within the subject of osmotic therapy alone there is paucity of data on the best means of administering the hyperosmolar therapy: hypertonic saline as bolus or continuous infusion, or bolus administration of mannitol. The therapy of hypertonic saline is commonly used on a nation-wide basis as a continuous infusion of 2% or 3% saline either as NaCl, or as a buffered solution of 1:1 NaCl and Na-acetate. Hypertonic saline infusions are not without consequences and numerous complications may arise as a result of salt and water overload. These consequences may be unavoidable for severely ill patients who require maximal therapy for cerebral edema.

Methods: HERON is a database constructed of de-identified patient information at the University of Kansas Hospital which is searchable by a diverse range of variables including diagnoses, procedures, abstracted physician note documentation, and abstracted nursing documentation. In order to estimate the frequency of harms from hypertonic saline therapy. a list of plausible adverse outcomes after administration of hypertonic saline was generated, including: volume overload, pulmonary edema, respiratory failure, congestive heart failure, atrial fibrillation, supraventricular tachycardia, hyperchloremic metabolic acidosis, hypernatremia, hyperchloremia, acute kidney injury, and increased length of stay. A sequence of expanding searches was performed against the HERON database to identify the largest obtainable sample of patients diagnosed with cerebral edema who were treated with 3% hypertonic saline over the same billing visit. The sample of patients with cerebral edema who were treated with 3% hypertonic saline was thus generated, and this sample was then used for a series of nested searches to identify a subset of the treated patients who were also associated with one of the plausible complications of treatment. Estimates of the rates of expected complications of treatment were obtained as percentage of the total number treated.

Results: We obtained a sample of 244 subjects who were diagnosed with cerebral edema and received the 3% hypertonic saline treatment. Of these patients 132 had respiratory failure of any cause (54%).

Conclusion: A large proportion of patients with cerebral edema who were treated with hypertonic saline were diagnosed with complications that may be expected of salt and water overload. Cause and effect cannot be demonstrated based upon the association of two variables. It is noted that approximately half of the patients receiving continuous hypertonic saline therapy for cerebral edema suffered respiratory failure. Further analysis will be performed to determine if the adverse effects detected by HERON are more strongly-associated with the treatment or more strongly-associated with disease severity.

Reference(s):

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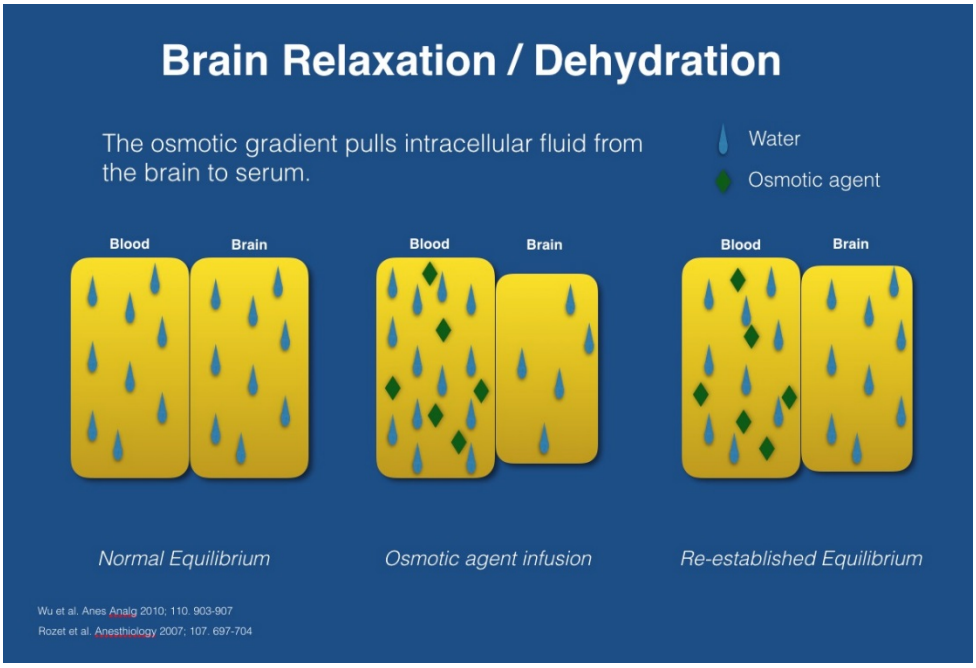

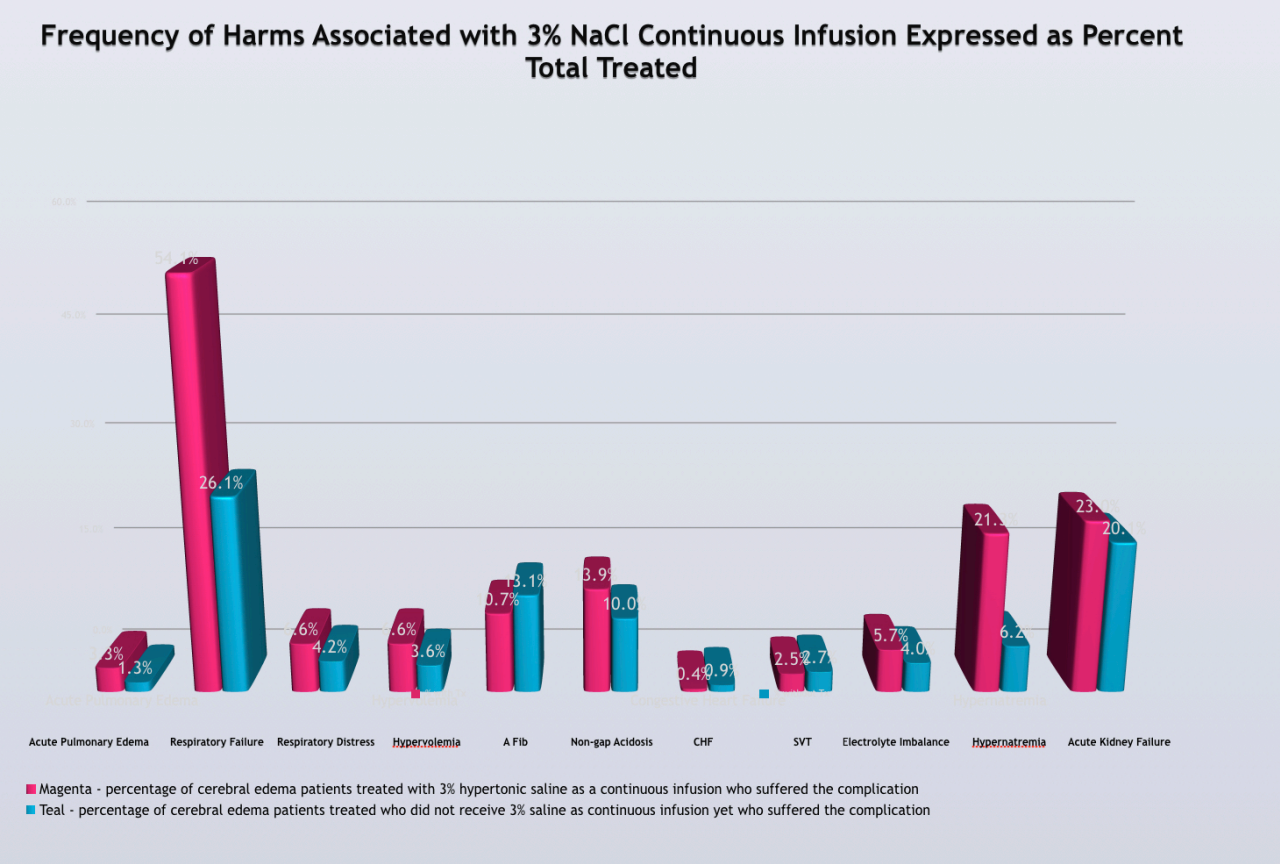
Frequency of Harms Associated with 3% NaCl Continuous Infusion Expressed as Percent Total Treated
26.1%
1.3%
4.2%
3.6%
10.0
0.4%
0.9%
5.7%
Acute Pulmonary Edema
Respiratory Failure
Respiratory Distress
Hypervolemia
A Fib
Non-gap Acidosis
CHF
SVT
Electrolyte Imbalance
Hypernatremia
Acute Kidney Failure
Magenta - percentage of cerebral edema patients treated with 3% hypertonic saline as a continuous infusion who suffered the complication
Teal - percentage of cerebral edema patients treated who did not receive 3% saline as continuous infusion yet who suffered the complication

PS 14 (2037)

The Growth of the ICU Daily Rounding Team and Its Impact on Distractions and Collaboration Efforts

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[1]University of Oklahoma College of Medicine, Oklahoma City, OK, [2]University of Oklahoma Health Sciences Center, Oklahoma City, OK

Introduction: Multidisciplinary ICU rounds aim to improve communication and collaboration between all members of the patient care team, including the patient and their family members. As part of the ABCDEF Bundle Improvement Collaborative, the Trauma ICU at the University of Oklahoma Medical Center (OUMC) began a more organized rounding style. Due to large numbers of providers on the care team, distractions were observed, causing the success of collaboration efforts to be questioned. A prospective observational study to detect and identify distractions during ICU rounds was conducted. In addition to this, at the end of the observational study period, a survey was distributed to the members who contributed to team rounds, in order to identify and address perceptions about team collaboration and distractions during rounds.

Methods: Both the observational study and survey were approved by the University of Oklahoma Institutional Review Board. The observational study was conducted for 17 days and distractions as defined by the research team were observed. At the same time, noise levels were also measured during daily rounds. We received professional guidance through the National Institute of Occupational Health and Safety (NIOSH), on detection of noise levels. Both a professional caliber noise meter and smart phone application for noise detection were used to discretely record noise levels during daily rounds. Upon completion of the observational study, survey was distributed to ICU team members. This survey was sent via Qualtrix to attending and resident physicians and it was provided as paper survey to the rest of ICU staff. The survey was open for one week to allow a plan-do-study-act rapid cycle of improvement. Survey responses were tabulated using descriptive statistics and comparisons between the perceptions of hospital staff and physician groups were made using uni-variate analysis.

Results: The observational study detected 174.2 distractions per day, per round. The total number of individuals rounding as a team, did not influence the number of distractions (p= 0.204).However, the number of residents (p= 0.047) within the rounding team, as well as the number of work stations on wheels (p=0.025) influenced the number of distractions. Design limitations of the ICU, smart phone activities and concurrent conversations among team members during the presentations were three major sources of observed distractions. Noise levels during daily ICU rounds were consistently above allowable limits, venturing into hazardous territory as defined by WHO and NIOSH. Interestingly, the

survey analysis showed only 44% of the ICU team thought ICU sound levels were somewhat above average. A total of 50 surveys were completed and analyzed. Attending and resident physicians defined ICU staff as the major source of noise and distractions. In contrast, non-physician staff rated equipment-related noise as the most significant source for same consideration. 53.9 % of responders thought there was moderate degree of collaboration within the Multidisciplinary ICU Team. There were no significant differences in perceptions of collaboration effort between physicians and staff (p= 0.38).

Conclusion: The survey as well as the observational study displayed the clear presence of distractions during rounds. ICU Team values the multidisciplinary rounds and the degree of collaboration. This process will require long term, persistent follow-up and reinforcement by intensivists who will lead by example.

PS 15 (2022)

Limitations and Failures of In-Line Filters

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ClearLine MD, Woburn, MA

Introduction: Use of in-line filters is a common practice to remove endotoxins, particulates, bacteria and air from intravenous solutions. The positive impact of these filters has come into question in recent studies stating there is no statistical data proving the efficacy in neonates. Even in the adult population, the Centre for Disease Control and Prevention promotes filtration of all infusates during manufacturing instead of in-line filters that can be costly to hospitals. Clinical concerns focus on the reduction in flow rate and potency of drugs while using these filters. Explorations into back-siphoning and bolusing effects due to changes in filter height are reporting alarming results. In this study, the limitations and failure points of commonly used in-line filters is explored.

Methods: Bench work was conducted using diverse infusates, multiple flow rates, different brands of in-line filters and changing the height of the filter relative to the 'patient' to determine those limitations. Data collected for each run included starting flow rates, amount of air injected, changes in flow rate, and height of filter. Data was analyzed to determine the effect of filters on flow rates, how injected air affects the performance of filters, any air that passed the filter and entered patient line, and the height differences that create bolusing or back-siphoning in IVs.

Results: Data is consistent with previous studies. Filters greatly limit the flow rates of infusates, quickly delivering fluid is not feasible and injecting critical medication above a filter may introduce air in the IV line thus slowing down critical medication even further. Bolusing and back-siphoning effects were produced at differing heights, validating concerns for unknown flow rates while using in-line filters.

Conclusion: While concerns for particulate, bacteria, and endotoxins generate a need for in-line filters, these must be weighed against their limitations. Severe restrictions in flow rates, bolusing and back-siphoning effects, and the further slowing down of flow rates when air is introduced (via medication injection) are just a few issues explored in this study. Relying on in-line filters for strictly air removal is not recommended; while use for removing particulates must be heavily regarded with filter restrictions.

Reference(s):

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3. Centers for Disease Control and Prevention 2011;http://www.cdc.gov/hicpac/BSI/BSI-guidelines-

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PS 16 (2096)

How Can We Safely Reduce 50% of Patient Monitor Alarms in the Surgical Intensive Care Unit

Samuel Galvagno, MD, Peter Hu, PhD, Hsiao-chi Li, PhD, Shiming Yang, PhD, Samuel Tisherman, MD, Peter Rock, MD

University of Maryland Baltimore, Baltimore, MD

Introduction: Alarm fatigue has been recognized as a critical patient safety concern in the modern hospital setting. Better characterization of alarm types and thresholds may reduce the burden of alarms and improve staff responsiveness. We tested the hypothesis that a significant reduction in the number of monitor alarms could be achieved by instituting a short delay (seconds) in activating the alarm to eliminate brief, transitory alarms, and by changing specific vital signs (VS) alarm limits based on analysis of the patient monitor alarms.

Methods: We retrospectively analyzed patient VS in a 24- bed Surgical Intensive Care Unit (SICU) and collected alarm data between October 12, 2015, and February 15, 2016, from networked patient VS monitors (GE Solar) using the BedMasterEX (Excel Medical LLC, FL) system. Alarm VS name, four industry defended alarm classifications, duration, and frequency were recorded and analyzed. Most alarms were found to be brief and transitory lasting just a few seconds. Specific duration (seconds) was analyzed to achieve 25% and 50% alarm reduction. To reduce individual VS alarms, different alarm limit settings were compared with the default settings of hypoxia (SpO2 low ≤ 90%,) and tachycardia (heart rate: HR, high HR ≥ 130 bpm).

Results: There were 426,647 alarms recorded during the 4-month study period resulting in 148 alarms per bed per day in the 24 bed SICU. In the four industry pre-defined alarm classifications, the majority of the alarms were classified as 'C1: and System Warning' (66,300, 15.5%); 'C2: Patient Advisory' alarms (n = 245,779, 57.6%); 'C3: Patient Warning' (98,024, 23%). Only 3.9% were in the 'C4: Patient Crisis' alarm category. The top ten alarm events in each of the four alarm classification are listed in Table 1. In each of the above alarm classifications 25% of alarms were less than 28 seconds (C1), 4 seconds (C2), 2 seconds (C3), and 4 seconds (C4). 50% of alarms were less than 322 seconds (C1), 10 seconds (C2), 13 seconds (C3), and 12 seconds (C4). Changing from the current default alarm threshold settings of SpO2 low (≤90%) to SpO2≤88% (Figure1), and tachycardia (HR ≥ 130 bpm to HR≥135 bpm could reduce alarms by 41%, and 40% (Figure 2).

Conclusion: Alarm fatigue from physiologic alarms in SICU is well recognized but a safe solution to safely reduce alarms has not been established. Our study suggests that by delaying all alarms for 4 seconds we could reduce 25% of the total alarms. By lowering alarm thresholds of SpO2 LO by 2% and increasing the tachycardiac threshold by 5 bpm could reduce an additional 40% of alarms in SICU. Further study is

needed to determine what impact such changes would have upon the safety of patients being cared for in the SICU. (This study is funded by University of Maryland School of Medicine, Department of BioEngineering and Department of Anesthesiology)

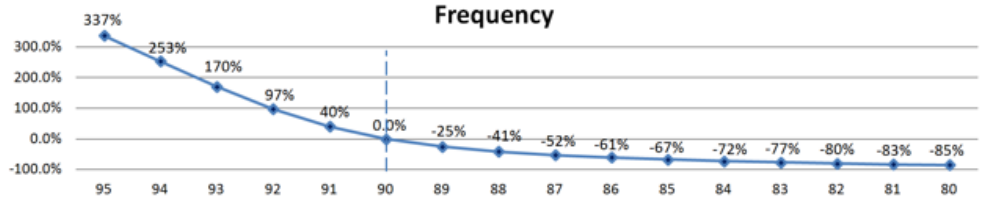

Figure 1: SpO2 LO alarm percentage changes from default (SpO2 LO ≤90%) using different alarm thresholds.

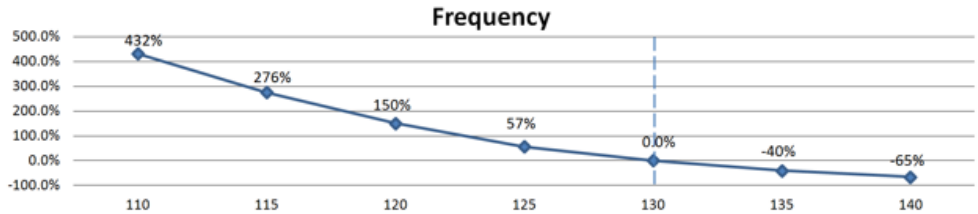

Figure 2: HR HI alarm percentage changes from default (HR HI ≥ 130 bpm) using different alarm thresholds.

Table 1: Top ten alarm events in each of four alarm classifications

Alarm (Top 10)		Total N	1	2	3	4	5	6	7	8	9	10
Level	Category											
3 (C1)	System Warning	66300 (15.5%)	SPO2 PROBE	NO ECG	CONNECT PROBE	NBP MAX TIME	SENSOR	ARRHY SUSPEND	SPO2 SENSOR	NBP FAIL	RR LEADS FAIL	NBP OVER PRES
			33.4%	23.6%	16.2%	14.7%	5.8%	4.6%	1.0%	0.4%	0.4%	0.4%
5 (C2)	Patient Advisory	245779 (57.6%)	ART S LO	PVC	CHECK ADAPTER	ART S HI	NBP S LO	ART M LO	CO2 RSP HI	NBP S HI	ART D HI	ART M HI
			25.7%	15.7%	13.6%	13.3%	6.2%	4.7%	4.2%	3.5%	3.4%	2.7%
6 (C3)	Patient Warning	98024 (23.0%)	SPO2 LO	ART DISCONN	V TACH	VT > 2	NO BREATH	FEM2 DISCONN	HR HI			
			93.4%	2.8%	1.8%	1.1%	0.9%	0.0%	0.0%			
7 (C4)	Patient Crisis	16544 (3.9%)	VT > 2	LEADS FAIL	HR HI	HR LO	BRADY	V TACH	ASYSTOLE	V BRADY	VFIB/VTAC	
			27.1%	25.0%	14.9%	12.4%	11.8%	6.5%	1.4%	0.6%	0.3%	

GH 17 (1844)

Institutionalizing Anti-Microbial Stewardship at Fortis Healthcare in India

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Fortis Healthcare, Faridabad, Haryana

Introduction: Across the globe, the rise of superbugs has been witnessed in the medical profession. Due to this growing menace the WHO has declared, the phenomena of Anti-Microbial Resistance as a Global Public emergency. For healthcare facilities, tracking and monitoring Anti Microbial Resistance continues to remain a challenge. Fortis Healthcare Limited is one of the largest, for-profit private healthcare services delivery provider in India. The planning and implementation of the AMS program across Fortis, started in 2013. The Drug Resistance Index (DRI) was selected as an epidemiological tool for monitoring the AMS program and conveying trends in drug resistance. The attached figures and charts share and compare the DRI data in the period 2014 and 2015 for 13 units across the organization. The preliminary trends which have emerged from the data have been encouraging.

Methods: The Fortis Healthcare network encompasses diverse healthcare facilities. It includes large Multi-specialty tertiary care hospitals as well as standalone secondary care hospitals. The scope for DRI data included all the ICU and Non ICU In-Patients admitted in the 13 hospitals. The AMS protocol was developed in consultation with all stakeholders including Clinicians, Intensivists, Anesthetists, Pharmacists and Microbiologists. The program was piloted and tested initially at 2 locations. Subsequently after appropriate modifications it was implemented at 13 of our network hospitals in 2013. All hospitals were sensitized and trained for preparing their Antibiograms following globally accepted protocol (CLSI guidelines). The DRI was calculated for common micro-organisms and frequently used Antimicrobials including the restricted group of antimicrobials.

Results: All patients admitted in the ICU as well as Non-ICU areas were included in the DRI calculation groups. The Outpatients and Daycare patients were excluded from the purview.

Conclusion: Measurement is the first step that leads to control and eventually to possible improvement. As an Epidemiological tool, the DRI aggregates information about both antibiotic resistance and antibiotic use into a common metric. Improvements in the DRI further strengthens the AMS program implemented across the organization. As a Communication tool, the DRI quantifies antibiotic effectiveness and conveys trends in drug resistance. These trends are able to facilitate Internal Advocacy among the Clinician fraternity as well as the Policymakers towards successful AMS strategies.

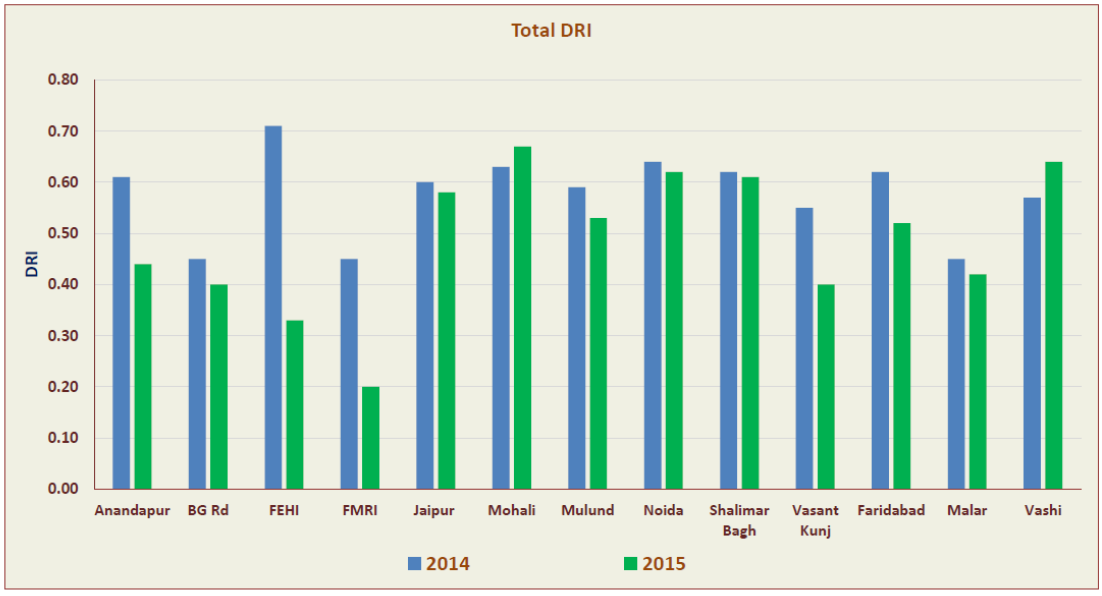
FORTIS DRI Comparison

Hospital	Total DRI		Restricted	
	2014	2015	2014	2015
Hospital A	0.61	0.44	0.41	0.16
Hospital B	0.45	0.40	0.14	0.05
Hospital C	0.71	0.33	0.46	0.19
Hospital D	0.45	0.20	0.10	0.11
Hospital E	0.60	0.58	0.27	0.15
Hospital F	0.63	0.67	0.35	0.23
Hospital G	0.59	0.53	0.22	0.16
Hospital H	0.64	0.62	0.34	0.27
Hospital I	0.62	0.61	0.26	0.15
Hospital J	0.55	0.40	0.16	0.13
Hospital K	0.62	0.52	0.24	0.11
Hospital L	0.45	0.42	0.14	0.10
Hospital M	0.57	0.64	0.41	0.33

*Values > 0.5 are highlighted in Red

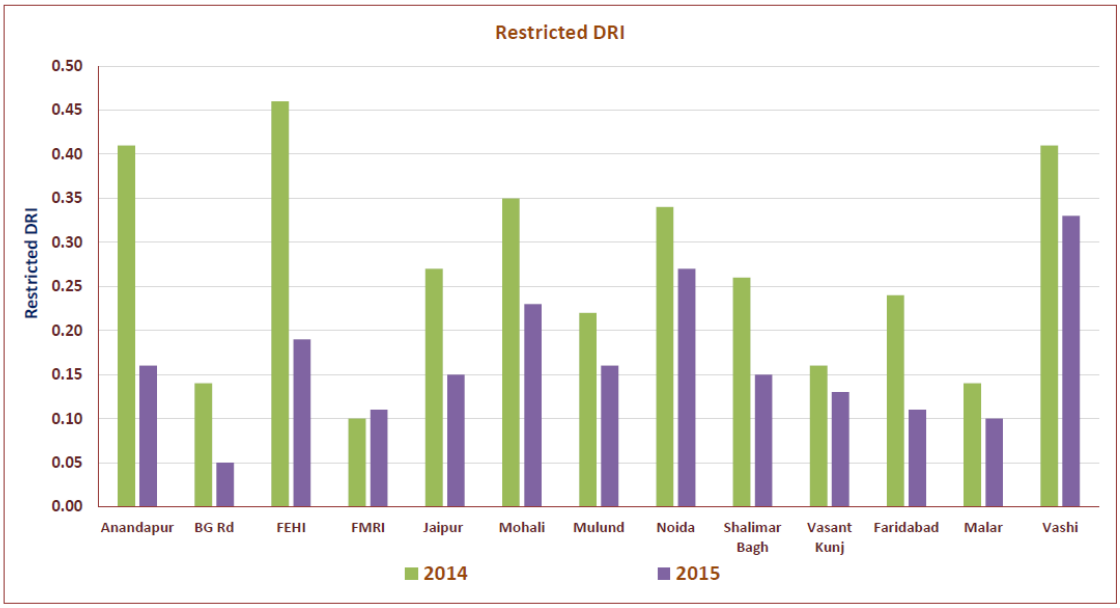
Fortis

FORTIS DRI Comparison



Fortis

FORTIS DRI Comparison



L 18 (1568)

The Relationship between Postoperative Serum Albumin Level and Organ Dysfunction after Liver Transplantation

Kazumasa Hiroi, Masters[1], Takashi Matsusaki, MD, PhD[2], Vika Lemoto, MD[2], Ryuji Kaku, MD, PhD[2], Hiroshi Morimatsu, MD, PhD[2]

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Introduction: Some studies have shown that postoperative hypoalbuminemia is associated with adverse events such as increased pleural fluids and ascites, acute kidney injury, longer intensive care unit (ICU) stay and death, especially following liver transplantation (1,2). Correction of postoperative hypoalbuminemia would prevent such postoperative complications; however, there is one question regarding what level of serum albumin to be maintained postoperatively. The present study investigated the relationship between postoperative albumin level and organ failure (assessed via the Sequential Organ Failure Assessment [SOFA] score), which has been the standard index for evaluating the severity of organ failure in ICU patients.

Methods: This was a retrospective study of 40 patients admitted to the ICU after undergoing liver transplantation from 2014 to 2016. Our institution did not have a definite protocol for the supplementation of human albumin, but the traditional procedure was to administer albumin to ameliorate ascites without any definite index. The data collected included the patients' pre-, intra-, and postoperative information during the first postoperative week. The study patients were divided into two groups: the higher albumin (HA) group (n=20) and the lower albumin (LA) group (n=20) according to serum albumin level >3 g/dL during the first postoperative week. As the primary endpoint, the SOFA score representing organ dysfunction after liver transplantation was compared between the two groups. The secondary endpoints were complications (ascites amount, rejection, reintubation, abdominal re-operation, thrombosis), additional treatment (dialysis, pleural effusion drainage), and length of ICU stay.

Results: No differences were found between groups in pre-and intraoperative data (Table). The average serum albumin level in the HA group was higher than in the LA group (3.5±0.25 vs. 3.1±0.26 g/dL, $P<0.05$); however, the albumin infusion amount in the HA group was not larger than in the LA group during the first postoperative week (8576±5500 vs. 7441±3284 mL, $P=0.44$). There were no significant differences in the mean daily SOFA scores between the HA and LA groups (8.1±2.2 vs. 7.5±2.0, $P=0.39$) (Figure 1). The HA group had a lower mean cardiovascular SOFA sub-score than the LA group (0.4±0.5 vs. 1.0±1.2, $P<0.05$) (Figure 2). There were no significant differences between groups in the complication rates (ascites amount, rejection, reintubation, abdominal re-operation, thrombosis), need for additional treatment (dialysis, pleural effusion drainage), or length of ICU stay.

Conclusion: The study results suggest that serum albumin level may not influence cumulative organ function (as measured by the SOFA score), but may preserve cardiovascular function in patients following liver transplantation.

Reference(s):

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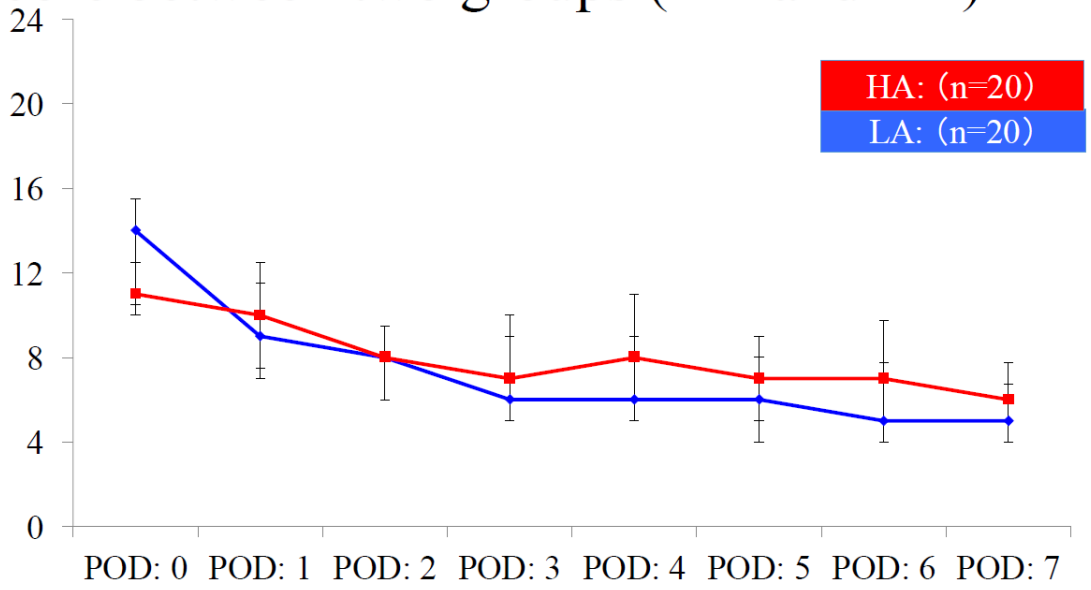
Patient Characterisitc

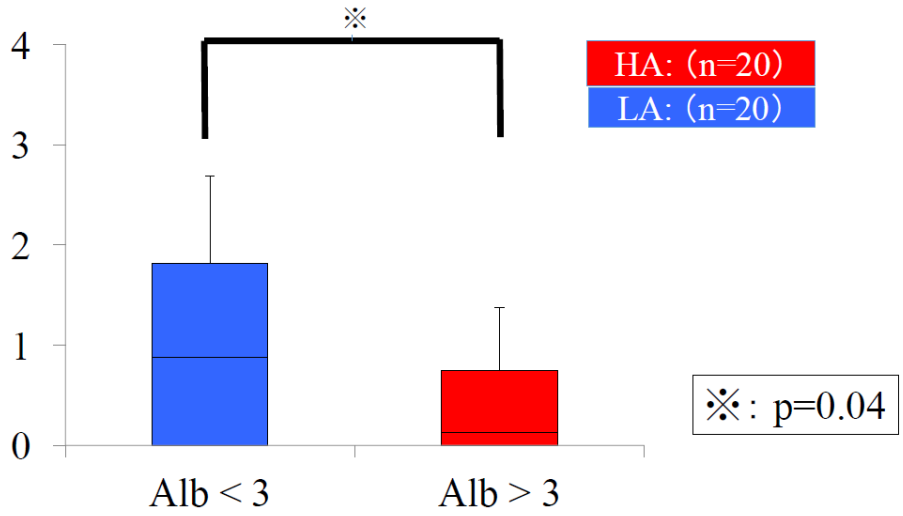
	HA（n=20）	LA（n=20）	P value
Age (years)	51.5 ± 13.9	52.4 ± 10.3	0.74
Gender（Male）	9（45%）	9（45%）	1.00
Body Mass Index	24.2 ± 3.1	24.8 ± 5.8	0.69
Child Score	10.7 ± 1.9	11.1 ± 1.6	0.47
MELD Score	20.0 ± 7.5	17.7 ± 6.8	0.42
Cold Ischemic Time	97.6 ± 133.9	197.9 ± 205.4	0.11
Graft Body weight	1.1 ± 0.4	1.4 ± 0.4	0.09
Surgical Time	560.0 ± 10.6.6	550.4 ± 73.6	0.76
Blood Loss	5579.8 ± 3541.8	7193.4 ± 5248.7	0.27
Colloid (mL)	1272.2 ± 778.5	1255.6 ± 673.5	0.94
Albumin (mL)	2444.4 ± 1621.4	3072.2 ± 1889.2	0.30
Red Blood Cell (mL)	2380.0 ± 1413.1	2381.1 ± 2142.4	0.47
Fresh Frozen Plasma (mL)	3020 ± 1811.2	3253.3 ± 1582.4	0.69
Plateret (mL)	266.7 ± 200.0	333.3 ± 298.1	0.45

Figure 1: The comparison of Daily SOFA score between two groups (HA and LA)



Higher albumin (HA) group : serum albumin level ≧ 3 g/dL during the first postoperative week.
Lower albumin (LA) group: serum albumin level < 3 g/dL during the first postoperative week.

Figure 2:The comparison of Daily sub-SOFA score (Cardiovascular)between two groups (HA and LA)



Higher albumin (HA) group : serum albumin level ≧ 3 g/dL during the first postoperative week.
Lower albumin (LA) group: serum albumin level < 3 g/dL during the first postoperative week.

MEDICALLY CHALLENGING CASES 1

Posters: 19-24

Moderator: Ruben Azocar, MD, FCCM, and Dragos Galusca, MD

MCC 19 (1302)

Venovenous ECMO in the Anhepatic Liver Transplant Patient

Jill Yaung, MD, Erik Dong, DO, Irene Kim, MD, Nicolas Nissen, MD, Oren Friedman, MD, Michael Nurok, MBChB, Danny Ramzy, MD, PhD

Cedars-Sinai Medical Center, Los Angeles, CA

Introduction: ECMO is used as rescue therapy for patients with acute cardiac or pulmonary failure . Liver transplant patients are at high risk for respiratory failure due to fluid overload, volume shifts, infection, hepatopulmonary syndrome, reperfusion syndrome, and acute graft rejection. There have been reports of liver transplant patients supported on ECMO for respiratory failure with varying success (1-6). Here we present a case of a liver transplant patient supported on ECMO while anhepatic for over 12 hours.

Methods: A 55-year-old male with HBV cirrhosis, HCC (MELD with tumor exception points 29, native MELD 18), CKD, and HTN received a dual orthotopic liver transplant (right trisegmentectomy allograft) and deceased donor kidney transplant. Intraoperatively, he developed hyperacute rejection of the kidney as evidenced by graft ischemia (no explainable technical source), followed by explant. Over the next 24 hours, he developed profound lactic acidosis (>23.3 mmol/L) and fulminant liver failure (AST>8000 u/L, ALT>6000 u/L) from primary nonfunction of the liver graft. He was emergently taken back to the OR for transplant hepatectomy, where he developed massive pulmonary edema with hypoxemic and hypercapnic respiratory failure requiring VV-ECMO.

Results: He returned to the ICU anhepatic and on VV-ECMO requiring vasopressor support, plasmapheresis, bicarbonate/glucose/calcium infusions, massive blood product transfusion and CRRT. He was relisted Status 1A and remained anhepatic for over 12 hours until he received a second dual liver/kidney transplant. The patient was supported on VV-ECMO for 101.15 hours in total with flows 3.8-4.2 L/min at 3110-3280 rpm. His postoperative course was complicated by ventilator dependence, delayed renal graft function, altered mental status, and persistent leukocytosis. The patient was discharged home after a 50-day hospital course.

Conclusion: Liver transplant patients with primary nonfunction exhibit a 'toxic liver syndrome' characterized by severe multiorgan failure. Removal of the liver allograft has been shown to improve hemodynamic instability and metabolic derangements (7-11). The anhepatic state has its own challenges, including coagulopathy, renal insufficiency, acidosis, hypoglycemia, hypocalcemia, hypothermia, and neurologic dysfunction. Liver transplant patients may be temporarily supported with VV-ECMO for treatment of respiratory failure during the perioperative period. To our knowledge, this is the first reported case of an anhepatic patient with ARDS treated with VV-ECMO. The etiology of ARDS

was multifactorial and likely included acute graft rejection, blood transfusions, and volume overload. VV-ECMO was used successfully in this anhepatic patient as a bridge to redo transplant and discharge home.

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MCC 20 (2278)

Maternal Sepsis and Acute Heart Failure - A Case Report

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Introduction: Sepsis is the second leading cause of all maternal deaths in the United States. Diagnosis of sepsis in the pregnant population can be challenging and can be confounded by normal physiologic changes, hemodynamic alterations from epidural analgesia, placental abruption, or bleeding. Rapid decompensation is a possibility and may prove to be life threatening to both the patient and the fetus. In this case report, we describe a case of a parturient suffering from septic shock and cardiomyopathy requiring Veno-Arterial Extracorporeal Membrane Oxygenation (VA-ECMO) support.

Results: A 42 year-old G3P0 woman who is 18 weeks pregnant is admitted to the labor and delivery service for abdominal pain, chills, and vaginal discharge. Her past medical history includes a spontaneous abortion and infertility requiring in vitro fertilization. On admission, the patient's hemodynamics were unremarkable and physical exam was notable for bulging membranes with feet extending out of the cervical os. Given concern for chorioamnionitis in a pre-viable fetus, the obstetrics team recommended initiation of antibiotics and induction of labor in order to terminate the pregnancy. The patient wished to continue her pregnancy, so induction of labor was postponed until hospital day 3, when she had preterm premature rupture of membranes, became febrile, and developed pain and rigors. The patient subsequently delivered a deceased fetus, complicated by persistent bleeding and a retained placenta. She was quickly taken to the operating room, where she underwent a rapid sequence induction with ketamine, removal of retained placenta, and repair of a perineal laceration. A right internal jugular central line was placed but multiple efforts for an arterial line were unsuccessful. The patient became progressively hypotensive with diminishing response to phenylephrine, vasopressin, and norepinephrine. The patient suffered a pulseless electrical activity arrest and ACLS was initiated. Significant blood-tinged fluid output from the endotracheal tube was also noted at this time. The ECMO team was paged immediately, with the cardiothoracic surgeon arriving 17 minutes later and ECMO initiated 15 minutes following his arrival. In total, the patient received chest compressions for 45 minutes and had a total of 11 liters of fluid suctioned from her lungs. A transesophageal echocardiogram showed an ejection fraction < 10%. Her postoperative course included placement of an intra-aortic balloon pump, development of acute kidney injury and shock liver, concern for hypoxic brain injury, and monitoring for limb ischemia. She was eventually decannulated from ECMO after her ejection fraction recovered to 25% and extubated after gradual improvement in mental status. She was discharged to a skilled nursing facility on postoperative day 34.

Conclusion: While limitations exist in the Sepsis-3 criteria in identifying sepsis in a parturient, criterion such as the Sepsis in Obstetrics Score and warning systems such as the Maternal Early Warning Criteria

can alert the clinician to early changes in vitals to prompt an expedited evaluation for sepsis. In general, the goals for managing maternal sepsis remain unchanged, including prompt initiation of antibiotics, fluid resuscitation, and obtaining source control as early as possible. Here we report successful use of VA-ECMO as a rescue therapy in a patient suffering from septic shock and related cardiomyopathy.

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MCC 21 (1275)

V-A ECMO as Bridge Therapy for Vital Organ Support in Unstable Ventricular Tachycardia Storm

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Introduction: Veno-arterial extracorporeal membrane oxygenation (V-A ECMO) is gaining widespread adoption in large centers as a means for multiorgan support in patients with advanced cardiopulmonary failure (1). Here, we describe a case of refractory unstable ventricular tachycardia (VT) storm in a patient with advanced heart failure for whom our institution used bi-femoral V-A ECMO as a bridge to maintain vital organ function while the patient was extubated awaiting heart transplantation.

Case Review: A 67 year old man with a past medical history of NYHA III heart failure with reduced ejection fraction (EF), coronary artery disease status-post coronary artery bypass grafting times three vessels, an implantable cardiac defibrillator (ICD) in place, and paroxysmal atrial fibrillation presented to an outside hospital with acute pulsatile VT, chest pain, and recent firing of his ICD. There, the patient underwent left heart catheterization that revealed patent coronary grafts. He had no evidence of acute myocardial infarction, and a transthoracic echocardiogram revealed a left ventricular EF of 15%. He was started on a lidocaine infusion, converted to sinus rhythm, and was transferred to our institution for further management. On arrival, the patient had recurrent episodes of unstable VT. His ICD fired multiple times with recurrence of unstable VT. The patient initially was not started on intravenous amiodarone therapy given a previous intolerance and elevated liver function tests while on amiodarone. His ICD was deactivated, and he was intubated to allow for continuous sedation and cardioversion as needed to terminate VT episodes. He underwent an ablation procedure by cardiac electrophysiology that was unsuccessful at terminating VT. After weighing the risks/benefits of intolerance to amiodarone therapy versus refractory VT, the patient was started on an amiodarone infusion without conversion to sinus rhythm. After the need for multiple emergent cardioversions accompanied by severe hemodynamic instability, a multidisciplinary team made the decision to place him on V-A ECMO with bi-femoral cannulation. The patient was listed for heart transplantation following a multidisciplinary evaluation of eligibility. The patient was extubated on ECMO day one. While on ECMO, the patient continued to have multiple episodes of unstable VT each with near loss of arterial pulsatility. During each event, we were able to increase his ECMO flow to maintain mean arterial pressure above 55 mmHg. He required multiple cardioversions despite administration of sotalol, IV amiodarone, and lidocaine. On ECMO, he remained neurologically intact and oriented requiring minimal respiratory support without needing re-intubation. The patient's renal and hepatic function remained at baseline. Due to successful bridge therapy with V-A ECMO, he was taken to the operating room for heart transplantation when a suitable organ became available on ECMO day six.

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MCC 22 (2128)

Hyperkalemia Management in the Oncology Patient: a Case of Sodium Polystyrene Sulfate Induced Bowel Perforation

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Introduction: Hyperkalemia is a condition commonly encountered in medical and surgical patients and can induce life-threatening cardiac arrhythmias if left untreated. Sodium polystyrene sulfate (SPS) is a cation-exchange resin frequently used to treat this condition. Although rare, there is a known relationship between SPS administration and bowel necrosis and it is therefore important to consider this in a patient with abdominal pain who has been treated with oral SPS (i,ii). We present a case of a surgical oncology patient who developed spontaneous bowel perforation in the setting of SPS administration.

Methods: The patient is a 60 year old male with medical history significant for hypertension, hyperlipidemia, diabetes mellitus type II requiring insulin and complicated by diabetic nephropathy (baseline creatinine 1.0), congestive heart failure with ejection fraction 30-40%, non-obstructive coronary lesions, moderate pulmonary hypertension and locally advanced left renal cell carcinoma. He underwent a left radical nephrectomy with significant intra-op findings of left colon ischemia requiring left segmental colectomy with primary anastomosis. His postoperative course was significant for severe sepsis requiring initiation of vasopressor support, new onset atrial fibrillation, and acute kidney injury resulting in hyperkalemia. Hyperkalemia was treated with oral SPS 15 grams, of which the patient received six doses over the course of postoperative days #3-5. On postoperative day #7, the patient developed acute abdominal pain and was found to have feculent output from the surgical drains. He was taken back to the operating room for exploratory laparotomy and left colectomy. Pathology of the left colon specimen revealed transmural necro-inflammation, exudative serositis and serosal fibrosis, as well as basophilic crystalloid particles consistent with SPS at the site of perforation, proximal to the prior viable-appearing anastomosis. Thus, a diagnosis of SPS-induced colon ischemia and necrosis was made.

Results: SPS is a cation-exchange resin which was approved by the Food & Drug Administration in 1958 (iii). It can be administered orally or rectally, and works by exchanging bound sodium with potassium in the colon to promote potassium excretion in stool. Although the mechanism of SPS induced bowel necrosis is unknown, one suspected mechanism involves the elevated renin levels seen in patients with renal failure who develop hyperkalemia. Renin activates angiotension II which causes splanchnic vasoconstriction and can predispose the colon to non-occlusive ischemia, especially following dramatic electrolyte and fluid shifts (iv). Norepinephrine, the initial vasopressor indicated in septic shock, is also known to reduce the splanchnic blood flow which can worsen intestinal vasoconstriction. However, bowel necrosis and perforation described in cases of SPS administration is distinguished from ischemic

necrosis by the pathological presence of SPS crystals in the bowel wall. Basophilic crystals with a mosaic pattern on Hematoxylin & Eosin stain is pathognomic for the presence of SPS (v).

Conclusion: We present this case to raise clinical suspicion of bowel perforation in a patient with abdominal pain, particularly in a surgical oncology patient where this complication has been less frequently documented, after the administration of oral or rectal SPS. Early diagnosis and prompt surgical intervention is critically important in this rare yet devastating complication of SPS administration.

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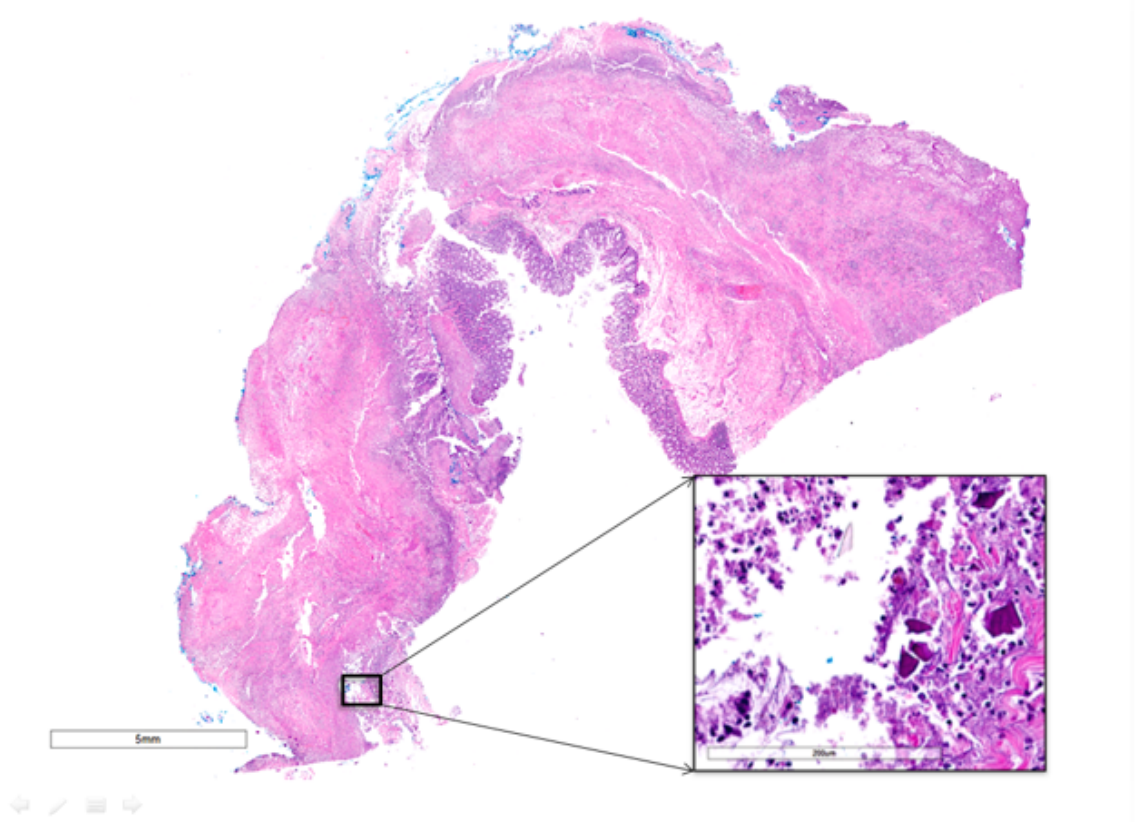

Figure legend:
Scanning view of full thickness of bowel wall showing areas of transmural necrosis (lower left portion) with necrotic and degenerated tissue replacing normal mucosa and muscularis propria. Insert represents a higher power view of the necrotic tissue, and demonstrates the presence of Kayexalate crystals. These crystals appear violet and have a typical mosaic pattern that resembles fish scales (Hematoxylin and eosin stain, scale bar provided).

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Multistate Perioperative Outcomes of Carotid Revascularization: Carotid Artery Stenting vs. Carotid Endarterectomy

Multiple Biomarkers Improve Prediction for Infection in the SICU

Night-Time Extubation does not Increase the Risk of Reintubation, Length of Stay, or Mortality: Experience of an Anethesia-Based Airway Management Model in a Large Urban Teaching Hospital

MCC 23 (1765)

Medically Challenging Cases: Severe Postoperative ARDS in the Lung Cancer Patient

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Introduction: Case Presentation: JL is a 73M with a 15+ pack year smoking history who presented for lobectomy for stage IIIA lung adenocarcinoma. After neoadjuvant chemoradiation, JL underwent a left upper lobectomy via thoracotomy. Notably, intraoperative pulmonary artery injury resulted in total blood loss of 2.5 liters. Post-operatively, the patient was transferred to the surgical ICU. He was extubated on post-operative day 3, but required re-intubation and cardioversion for ventricular tachycardia. Over the next 24 hours, the patient developed severe respiratory failure. CTA of the chest demonstrated moderate pulmonary edema and multifocal consolidations predominantly on the right side (see figure 1). His PaO2/FiO2 ratio was 58, signifying severe ARDS. Potential etiologies for this occurrence included aspiration pneumonitis and retraction injury. He was started on ARDSnet ventilation settings, inhaled pulmonary vasodilator therapy, and was chemically paralyzed.1 Despite these efforts, the patient's condition continued to deteriorate. After consideration of the patient's mortality risk, inadequacy of rescue therapy, and confirmation of preserved cardiac function, the decision was made to institute veno-venous extracorporeal membrane oxygenation (VV ECMO) through a dual staged jugular venous cannula. Over the course of the next 4 days, the patient exhibited improved oxygenation, ventilation and organ perfusion. His cannula was removed on POD 9. After decannulation, fibroproliferative ARDS resulted in persistent difficulties with maintaining adequate oxygenation. However, after a prolonged weaning period and tracheostomy, he was discharged to long term ventilator rehabilitation on post-operative day 43.

Conclusion: Discussion: This case highlights the ongoing discussion of appropriate application of ECMO therapy. In deciding whether a patient is a viable candidate for ECMO, numerous factors must be taken into account. Proposed exclusion criteria include elevated peak inspiratory pressures, high FiOÃ¢â€šâ€š for more than 7 days, intracranial bleeding, contraindication to heparinization or to continuation of active treatment.2 Its use comes at significant financial and physical cost, with multiple risks including hemorrhage, thrombosis and thromboembolism, gas embolism, infection, and vessel injury.3 Therefore, judicious and selective use this of this invasive therapy is imperative. Data have shown at least one significant complication occurs in greater than 50% of all patients on ECMO.4 JL's history of cancer, risk of bleeding from his recent operation, pulmonary artery injury, and age were concerning risk factors which argued against the use of ECMO. His mortality was determined to be greater than 50% at the time of cannulation. In contrast, JL's estimated 60% estimated 5 year survival from an oncologic standpoint argued that he could recover to a reasonable quality of life. Ultimately, the use of VV ECMO was life-saving without the occurrence of a debilitating complication, but it is unclear whether he will be able to

regain independent functional status. After his extended ICU course, JL was discharged to long term rehabilitation in close proximity to his wife, three children and multiple grandchildren. He requires significant physical rehabilitation but is neurologically intact. His case therefore demonstrates 'successful' use of ECMO but the long term morbidity of this technology is currently understudied.

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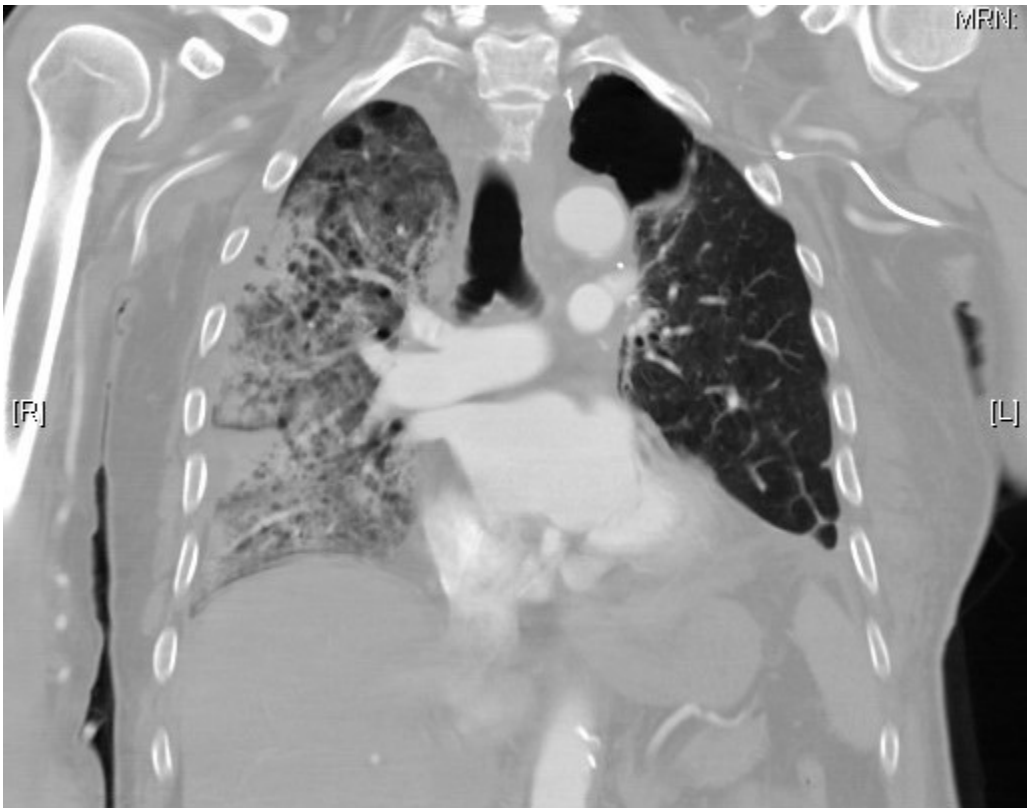

MCC 24 (1828)

Pheochromocytoma Diagnosed in a Burn Patient after Multiple Surgeries

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Introduction: Pheochromocytoma is a catecholamine secreting neuroendocrine tumor originating from the chromaffin tissue in the adrenal medulla that leads to hypertension, tachycardia, diaphoresis and palpitations. Prevalence is only 0.1-0.6% in patients with hypertension (1). Since the symptoms are non-specific and include a broad differential, as well as the fact that many tumors may be subclinical, there is usually a 42 month time period between development of initial symptoms and diagnosis (2).

Methods: Our patient was a 51 year old African American Female whose past medical history was significant for type 2 diabetes, hypertension and anxiety who presented with 30% burns of her trunks and extremities. She also endorsed a long standing history of paroxysmal dyspnea. The patient underwent three debridements and skin grafting procedures during her 21 day hospital stay (all during the first week of her hospitalization). An arterial line was placed prior to her first debridement for blood pressure and laboratory monitoring in the OR and ICU. In the ICU, she complained of transient dyspnea and dizziness, most frequently at night. These episodes correlated with blood pressures recorded by arterial line at 239/120, 264/99, 230/90, 241/101. The monitoring system and waveform were confirmed to be working properly. A hypertension work up was performed with a clinical suspicion of pheochromocytoma.

Results: Pheochromocytoma is a tumor that often remains undiagnosed during life, as autopsy studies show a high prevalence of the tumor (0.05%) (1). We only suspected a pheochromocytoma after a week into her ICU admission. She had complained of transient episodes of dizziness in conjunction with diaphoresis and hypertension that were self-limited, lasting a few minutes. Our differential for this patient included pheochromocytoma, hyperthyroidism, menopausal symptoms, pain and anxiety. Her blood pressure during her multiple surgical procedures was not persistently elevated or unusually variable, although she did demonstrate hypertension on emergence. Patients with suspected pheochromocytoma should undergo biochemical testing. Our workup consisted of plasma free metanephrines, plasma catecholamines, and urinary catecholamines. Plasma free metanephrines testing has a high sensitivity, as production of O-methylated metabolites are independent of the variable release of catecholamines (3). In our patient these were elevated: normetanephrine 22 nmol/L (normal <0.90 nmol/L) and metanephrine 11 nmol/L (normal <0.50 nmol/L). Her plasma catecholamines and urine catecholamines were similarly elevated. Endocrinology was consulted and a CT scan showed a right adrenal gland mass that measured 5.5 x 5.0 x 6.1 cm and displacing the liver and right kidney.

Endocrine surgery was consulted and the patient was referred to the anesthesia perioperative medicine clinic for pre-operative alpha-blockade management.

Conclusion: Although we could have pursued genetic testing, hereditary pheochromocytoma is rare in patients that are over 40, have a unilateral non-multifocal mass, as well as no significant family medical history of pheochromocytoma. During robotic assisted laparoscopic resection, the adrenal tumor was readily visible as it was large and protruding from the retroperitoneum above the kidney. Pathology examination reported that the tumor cells were diffusely positive for synaptophysin and chromogranin with S100 focally highlighting the sustentacular cells, confirming the diagnosis of pheochromocytoma.

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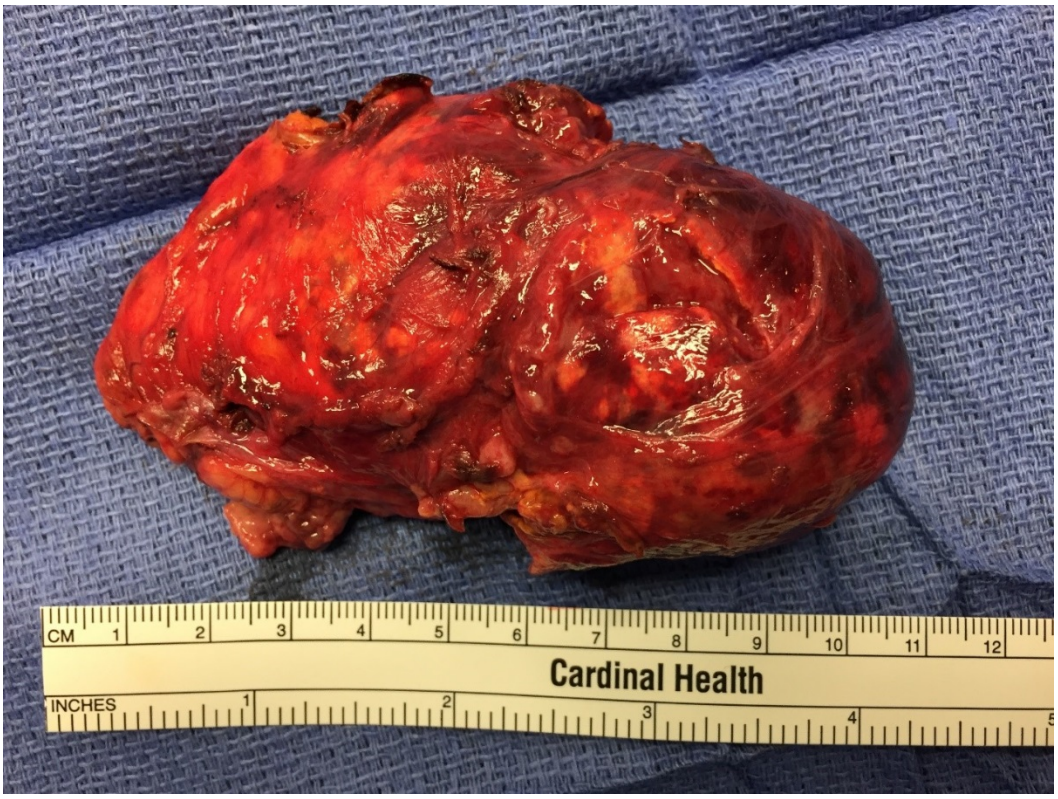

MEDICALLY CHALLENGING CASES 2

Posters: 25-29

Moderator: Jose Humanez, MD, and Piyush Mathur, MD

MCC 25 (1939)

Case of a 56 Year-Old Postop CABG Patient with Hypoxemic Respiratory Failure and Subsequent Improvement with Methylprednisolone

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Introduction: This is a medically challenging case involving a patient in the ICU who developed hypoxemic respiratory failure after a CABG. Despite treatment for a severe ARDS clinical picture, the patient's clinical course did not improve. However, administration of steroids for presumed amiodarone-induced lung toxicity resulted in a drastic improvement in the patient's oxygenation, and the patient was subsequently discharged uneventfully. This medically challenging case can provide ICU physicians an example of the challenges and management of a patient with hypoxemic respiratory failure. Furthermore, it emphasizes the importance of considering amiodarone-induced lung toxicity early before irreversible lung injury occurs.

Methods: The patient is a 56 y.o. male with a past medical history of CAD, HTN, HLD, and COPD who presented with angina. 2-D echo showed akinesis of the basilar and mid inferior wall, LVEF of 40%, and grade I diastolic dysfunction. Cardiac catheterization identified triple vessel disease. The patient was optimized for surgery, and underwent an uneventful CABG x 3 (LIMA-LAD, SVG-Ramus, SVG-RPL). After the surgery, the patient was transferred to the ICU, and extubated uneventfully within 6 hours of arrival. On POD#1, the patient was on nasal cannula saturating 93-94% and hemodynamically supported with norepinephrine. Post-operative CABG medications, including amiodarone infusion, metoprolol, and statin were administered. Patient continued to progress well on POD#2. However, on POD#3, the patient's O2 saturation dropped into the 80's, and a chest x-ray showed bilateral pulmonary edema. The ICU team considered CHF exacerbation versus ARDS in the differential diagnoses. The patient was aggressively diuresed with furosemide, and placed on BIPAP. To evaluate for possible CHF exacerbation, 2D echo was performed but did not show significant changes from preop-echo results. CT of the thorax without contrast showed diffuse groundglass opacities throughout both lungs. Despite multiple days of 2-3 liters negative fluid balance from aggressive diuresis, the patient continued to require very high ventilatory support, including BiPAP, high-flow nasal cannula, and non-rebreather mask to maintain oxygen saturation in the 90's. Repeat ABGs displayed a severe ARDS picture (PaO2/FiO2 ratio less than 100). Despite the severe ARDS picture, the patient did not require intubation at any time during the ICU course.

Conclusion: After multiple days of no improvement from diuresis, the ICU team decided to discontinue amiodarone and attempt a trial of steroids. The patient was administered 125 mg of methylprednisolone on POD#6, and the patient showed marked improvement. Patient was administered 30 mg of IV methylprednisolone BID on POD#7 and POD#8. The patient began ambulating without difficulty and was saturating nearly 100% on room air. Given the clinical course, the ICU team treating this patient believes that the underlying cause of the patient's respiratory difficulties was amiodarone-induced lung toxicity, commonly considered a diagnosis of exclusion. In conclusion, the patient's clinical course showed the challenges that intensivists face in the diagnosis and treatment of cardiogenic versus intrinsic versus drug-induced respiratory failure. Considering the long half-life and possible irreversible lung damage caused by amiodarone, it is crucial that ICU physicians consider amiodarone-induced lung toxicity in similar clinical presentations.

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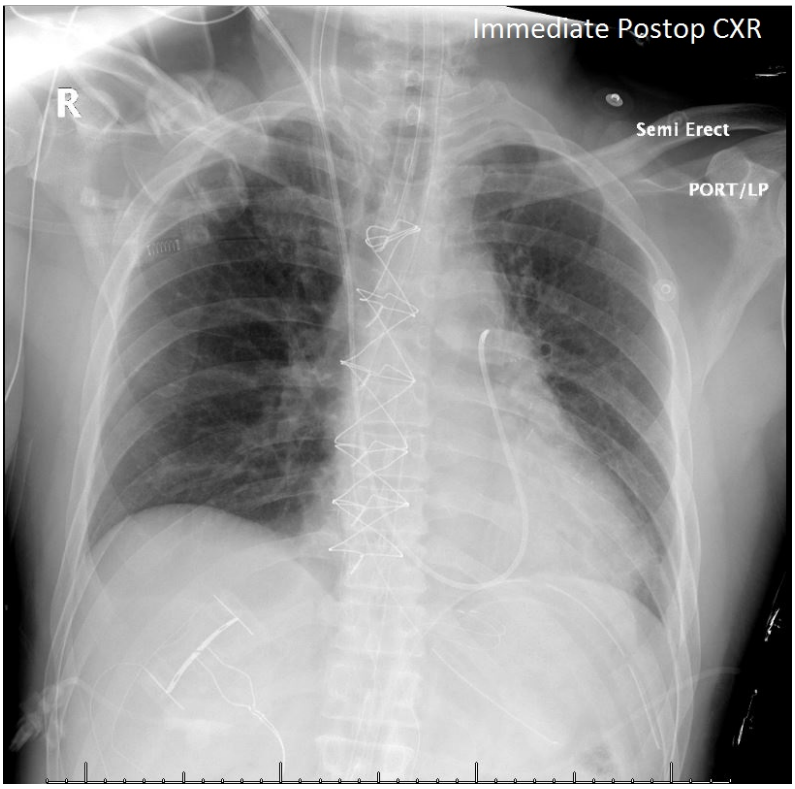

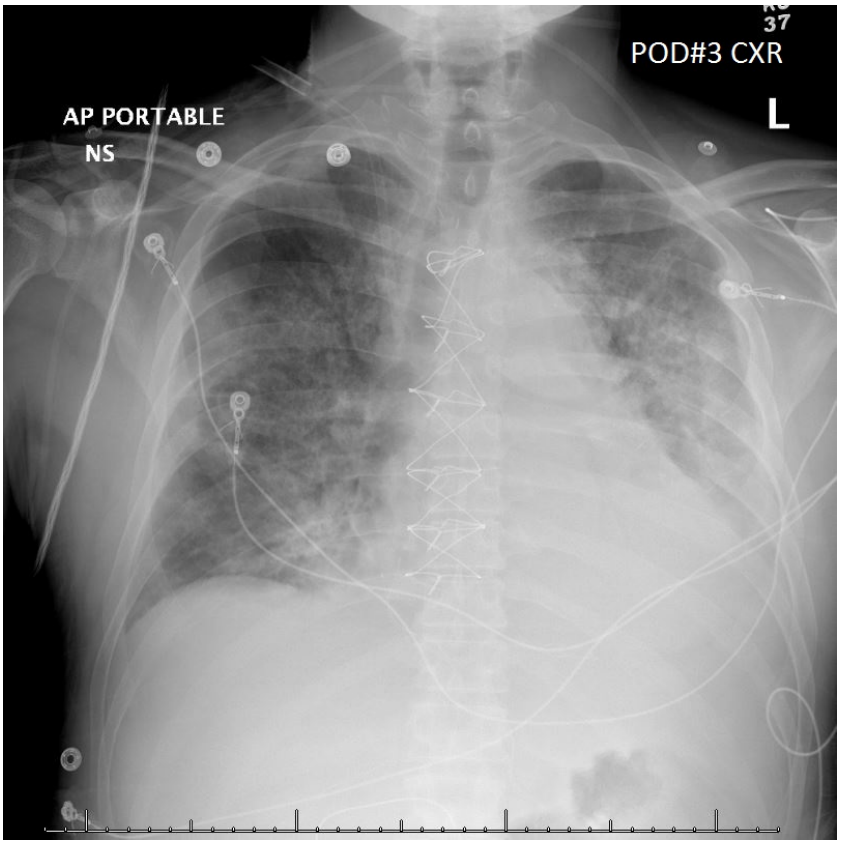
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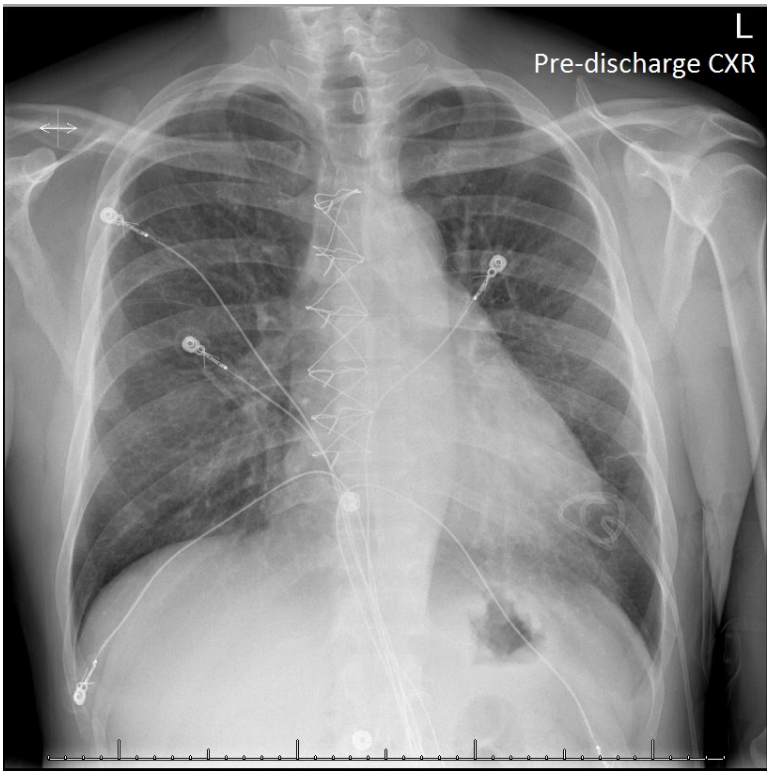
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Pre-discharge CXR

MCC 26 (1733)

Bilateral Subpectoral Catheters for Post-sternotomy Pain

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Introduction: Pain following sternotomy can be severe and result in impaired gas exchange, poor pulmonary hygiene, atelectasis and pneumonia.(1) We present the case of a patient with severe post-operative pain and pulmonary complications successfully treated with bilateral subpectoral local anesthetic infiltration.

Methods: A 67-year-old male presented to the hospital with rest angina and was diagnosed with a non-ST-elevation myocardial infarction. Coronary angiography demonstrated severe multi-vessel disease. The patient underwent CABG x 4, which was initially uneventful. Prior to leaving the operating room, however, the patient experience ventricular fibrillation and required multiple defibrillations. Graft flow was adequate, so an intra-aortic balloon pump was placed and he was taken for emergent coronary angiography. An acute plaque rupture in the LAD, distal to the LIMA graft insertion site, was identified and stented. Hemodynamics gradually improved, the balloon pump was removed on post-operative day (POD) 3 and the patient was extubated on POD 5. The patient experienced significant post-operative pain that was not controlled with oral or IV opioids. Further, the patient had delirium and would not tolerate non-invasive positive pressure ventilation. The patient was ultimately re-intubated on POD 7 due to hypoxia and agitation. We then elected to perform bilateral subpectoral injections with 0.25% bupivacaine. Using an ultrasound (SonoSite M-Turbo) with linear array transducer (13-6 MHz) in a sagittal plane 3 cm lateral to the sternal edge, the pectoralis major muscle was identified. Beneath it was the 3rd and 4th costal cartilage with the internal intercostal muscle between them. Using an in-plane approach, an 18 ga Tuohy needle was inserted in a caudal-to-cranial direction to the fascial plane between pectoralis major and internal intercostal muscles. (Figure) 20 mL of 0.25% bupivacaine with epinephrine 1:200,000 was injected and then an epidural catheter was inserted 5 cm into the space. This process was repeated on the contralateral side. The patient's pain completely resolved and he was extubated less than 3 hours later. He remained pain free for nearly 48 hours. All sedating medications and oral opioids were discontinued and his delirium resolved. When his pain returned, he received another bolus (15 mL each side of 0.375% bupivacaine with epi). Pain resolved completely again and the catheters were removed at that point. He remained pain free for another 36 hours. At that point, once his pain returned, it was minimal. The remainder of his recovery was uneventful.

Results: Bilateral subpectoral catheters have been reported for the treatment of sternal fracture pain.(2) Our patient had severe pain following sternotomy, complicated by pain-sedation mismatch, impaired gas exchange and delirium. His pain was successfully managed with local anesthetic injection in the subpectoral interfascial plane and catheters were left in place to re-dose the local anesthetic once pain

returned. This allowed for successful extubation and discontinuation of sedating medications. He was able to cooperate with deep breathing and coughing exercises and had no further respiratory complications. This is the first report of post-sternotomy pain successfully managed with subpectoral interfascial plane catheters.

Conclusion: Bilateral subpectoral interfascial plane block with local anesthetic is effective for treating pain from sternotomy.

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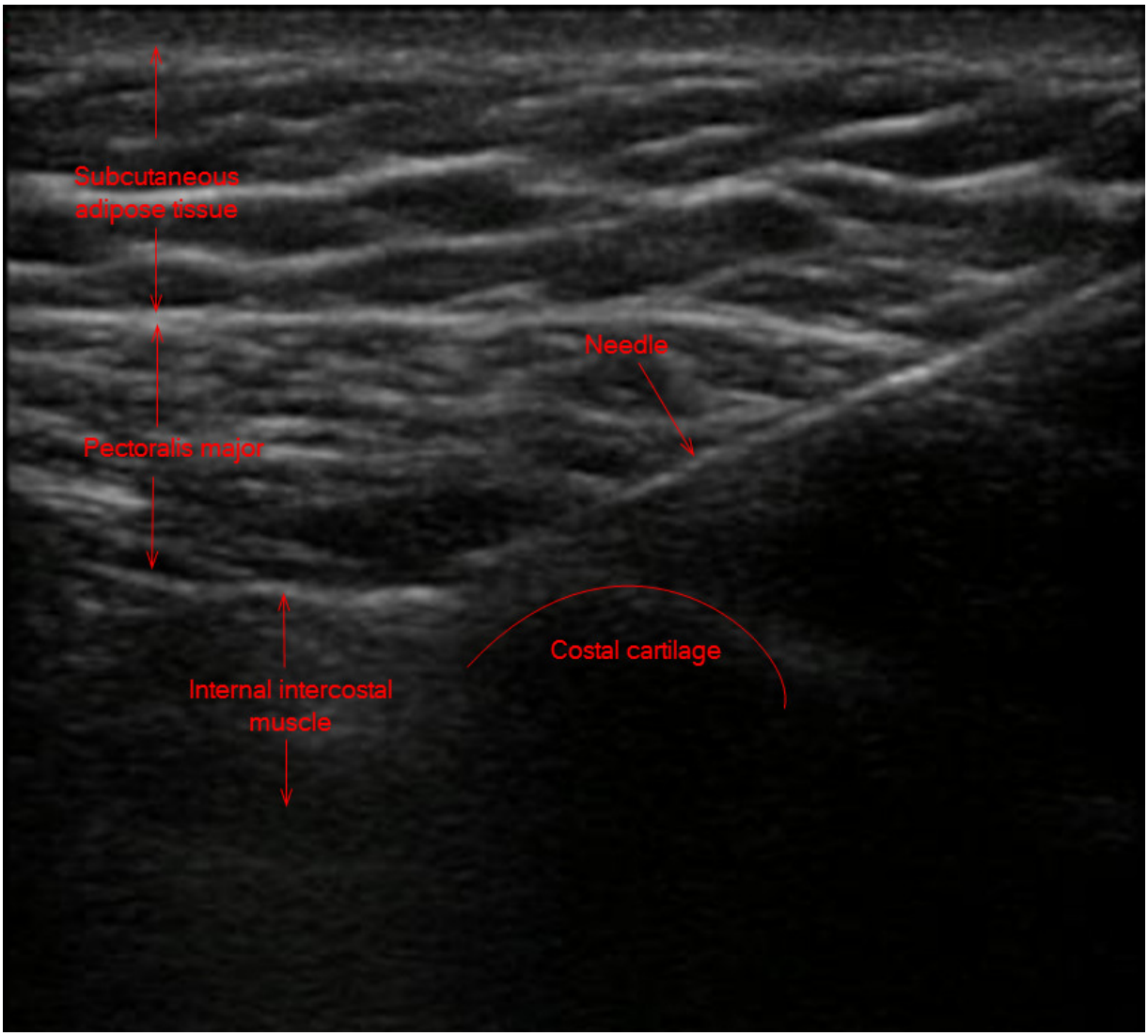

MCC 27 (2267)

Post-op Respiratory Failure in a Patient Taking Colistimethate: A Case Report

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Introduction: The patient is a 67 year old, 80 kilogram female presenting for laser lithotripsy of staghorn calculus causing recurrent urinary tract infections with multi-drug resistant Klebsiella being treated with colistimethate and meropenem. Her medical history includes multiple myeloma, acute myeloid leukemia, pancytopenia, breast cancer, Lynch syndrome, lumbar spinal stenosis, and cholecystitis.

Methods: General anesthesia was induced intravenously with propofol 100 mg, fentanyl 50 mcg, and rocuronium 40 mg. Prior to emergence, she had regained four twitches on qualitative train of four monitoring of the facial nerve. Neostigmine 3 mg and glycopyrrolate 0.4 mg were given 54 minutes after the intubating dose of rocuronium. Despite reversal, the patient had low tidal volumes on spontaneous ventilation. She received sugammadex 2 mg/kg i.v. Tidal volumes improved to >6 cc/kg with sustained head lift and hand grip. She underwent a laparoscopic cholecystectomy four days later. Her induction medications were propofol 80 mg and a single dose of rocuronium 40 mg. Prior to reversal with neostigmine 4 mg and glycopyrrolate 0.6 mg, she had four twitches without fade along the facial nerve 116 minutes after rocuronium was given. On spontaneous ventilation she had tidal volumes > 300 ml and was extubated. She developed progressive lethargy and was reintubated. A previously sent arterial blood gas showed hypercapnia.

Results: Neuromuscular blockade is subject to potentiation by various medications and anesthetic agents. Colistimethate is a pro-drug belonging to the polymyxin B and E subgroup of anti-bacterials. Colistin, the active drug, has largely been replaced by newer generation antibiotics due to nephrotoxicity and neurotoxicity but remains in use today for multi-drug resistant bacterial infections. Therapeutic levels of colistin can be associated with respiratory muscle paralysis, especially with reduced renal function. Our patient had a normal creatinine clearance(86 mL/min) but was hypocalcemic (ionized calcium of 4.21 mg/dL) and hypoalbuminemic (serum albumin 2.7 g/dL). The combination of volatile anesthetics, non-depolarizing neuromuscular blockade, and colistin may have potentiated neuromuscular blockade necessitating sugammadex administration in one instance and a failed trial of extubation in another.

Conclusion: Rocuronium has variable duration of action due to patient characteristics and drug interactions. Judicious use of rocuronium is prudent in a patient on colistin. Regaining twitches on qualitative train of four monitoring may overestimate the degree of receptor availability and give providers a false sense of security regarding neuromuscular reversal. Our case highlights a clinically

significant adverse effect of colistin therapy in peri-operative patients. The potential for neuromuscular blockade with colistin and the interaction with standard anesthetic medications may become more important with the emergence of more drug resistant infections requiring colistin therapy.

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MCC 28 (2041)

LVAD and Prone Position for Non-Cardiac Surgery

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Introduction: Advancement of technology in cardiac surgery has led to an increasing number of patients with ventricular assist devices (VAD) presenting for non-cardiac surgery. Limited information is available regarding anesthetic considerations for nonpulsatile VADs in the prone position.

Methods: 59yo male with a history of heart failure (EF 15%), morbid obesity and prostate cancer presented for VAD placement. Post-operatively, he developed hematuria from radiation cystitis in the setting of anticoagulation. Clot burden caused obstruction and acute kidney injury (AKI) prompting cystoscopy for clot evacuation that was complicated by bladder perforation. The next day, intra-peritoneal free air was discovered prompting exploratory laparotomy. Over the next 5 days, he required blood transfusions, had worsening AKI, hydronephrosis, and clot re-accumulation. He required percutaneous nephrostomy tube placement by interventional radiology (IR) despite multiple risk factors for cardiac compromise during general anesthesia, including right ventricular (RV) failure, moderate pulmonary hypertension (PHTN) and volume overload. General anesthesia was induced in the cardiac ICU prior to transport to IR. He was monitored with arterial and pulmonary artery (PA) catheters. General anesthesia was maintained with Propofol; dobutamine and epinephrine infusions were utilized for cardiovascular support. In IR, he was positioned prone with care to avoid manipulating the driveline. Pillows were placed under his right hip and shoulder to reduce abdominal compression. PA pressures began to rise and the pulsatility index decreased but returned to baseline with epinephrine boluses (10-20mcg), an increase in epinephrine infusion rate, and hyperventilation. He required norepinephrine support for part of the case. VAD parameters (flows and speeds) remained stable. At the conclusion of the case, he was positioned supine and transported back to the ICU. He was successfully extubated that night and AKI resolved over the next few days.

Conclusion: There were several challenging aspects to this case. First, the patient was not medically optimized for general anesthesia due to volume overload with RV failure and PHTN. Second, the physiology and hemodynamics of prone positioning in a morbidly obese patient with a VAD are unknown; there is one published case report of non-cardiac surgery in the prone position with a VAD.1 Third, due to non-pulsatile flow, pulse oximetry and non-invasive blood pressure monitors are often inaccurate requiring additional monitors such as arterial blood pressure and cerebral oximetry. In the prone position, IVC compression leads to decreased venous return and decreased stroke volume (SV), all exacerbated by obesity. Mean arterial pressure is maintained by increased SVR. Pulmonary vascular resistance (PVR) is also increased when prone. Thoratec's (VAD manufacturer) guidelines suggest 'temporary inflow obstruction can occur as a result of surgical positioning, patient position or during

straining' and cautions patients to never sleep on their stomach.2 In a patient with RV failure and PHTN, the RV may not generate enough SV to fill the LV leading to a 'suck-down' event and loss of CO. Prone positioning causing increased PVR and decreased venous return would exacerbate this physiologic derangement. Precautions include inhaled epoprostenol to decrease PVR, inotropic support for the RV, and maintenance of SVR with a pressor that does not increase PVR, such as vasopressin.

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MCC 29 (2001)

Medically Challenging Case: Radial Artery Cannulation in VAD patients and the Yoda Sign

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Introduction: The care of a rapidly deteriorating patient with a ventricular access device (VAD) is challenging and complex. An important measure of hemodynamic stability is the VAD patient's 'return to flow,' or the assessment of the patient's mean arterial pressure (MAP). Particularly for left ventricular assist devices, this value approximates the MAP generated by the pump. This vital sign can be assessed non-invasively by finding the brachial artery with a Doppler probe and observing the value at which the deflation of the upper arm blood pressure cuff allows return of blood flow. However, just like in any other patient, invasive arterial monitoring allows for the most accurate MAP readings. In particular, critically ill or perioperative VAD patients should have arterial lines placed for accuracy of return to flow measurements. This, of course, necessitates the placement of a radial arterial line, which is uniquely challenging in a patient without pulsatile flow.(1, 2) We describe a distinct anatomic appearance of the radial artery in relationship to its parallel veins that can aid practitioners when cannulating radial arteries in VAD patients.

Methods: In the non-LVAD patient, two ways of identifying the target artery are by palpation and by ultrasound. Palpation relies on pulsatile arterial rebound, usually absent in the LVAD patient. Ultrasound guidance identification is also aided by the pulsatile and non-compressible nature of the artery versus a vein. (3) However in patients with non-pulsatile flow, there are three specific ultrasound characteristics that can help providers identify the correct vessel: (1) The muscular wall of the artery appears thicker and more hyperechoic on ultrasound as compared to thin-walled vessels, and can be tracked up and down the arm reliably as opposed to tortuous veins. (2) Color Doppler flow, while continuous, will appear to flow in the opposite direction of vessels that are more likely to be veins. (3) Duplicated veins on either side of the radial artery form a reliable anatomic appearance we call the 'Yoda sign.'

Results: We encountered several cases in which lack of pulsatile flow was confusing and frustrating for practitioners who needed to thread the radial artery. Ultrasound guidance allowed successful placement of arterial lines in these cases.

Conclusion: In cases of difficult arterial lines and non-pulsatile vessels, these ultrasound identification criteria can aid in arterial cannulation. Specific to the radial artery, which is of most interest to practitioner caring for a VAD patient, is the Yoda sign. This anatomic ultrasound appearance of the radial artery flanked by its veins can greatly aid practitioners who are placing invasive blood pressure monitoring in non-pulsatile vessels.

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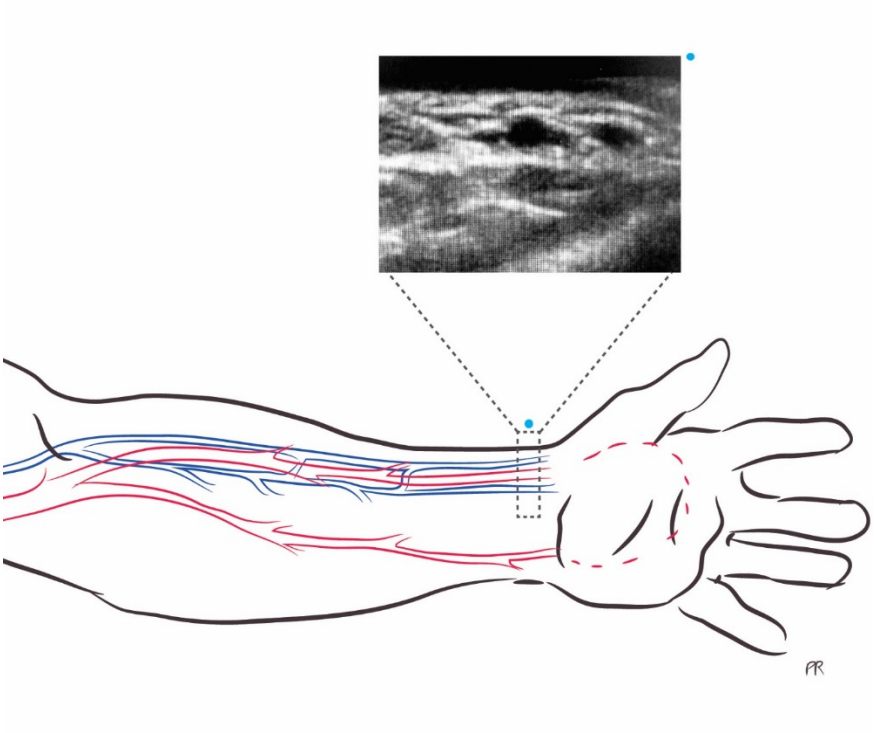

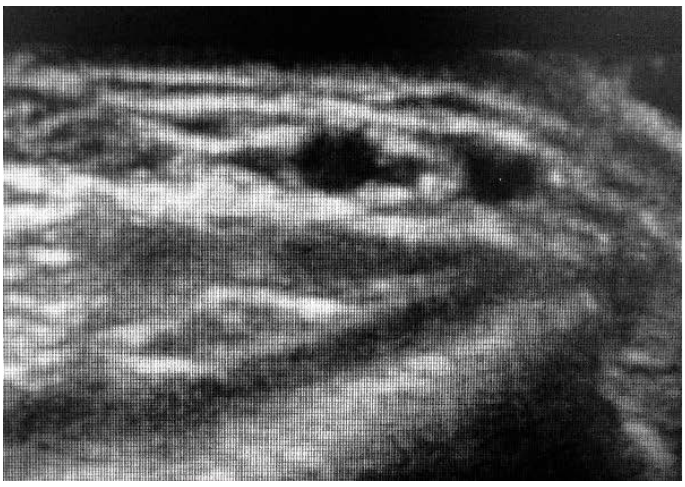

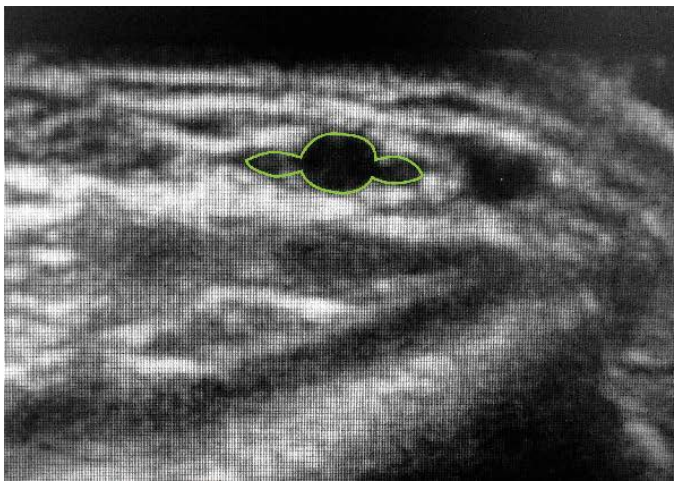

MEDICALLY CHALLENGING CASES 3

Posters: 30-35

Moderator: Will Mulvoy, MD, MBA, and Ronald Pauldine, MD

MCC 30 (2038)

Serotonin Syndrome Following Cardiac Surgery

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Introduction: Serotonin syndrome may present with a wide variety of neuromuscular abnormalities, mental status changes, and autonomic hyperactivity and is potentially fatal. Given the broad spectrum of presenting symptoms, the true incidence of serotonin syndrome is unknown.[1] Management generally includes ruling out more serious causes of neurologic decline, withdrawal of offending agents, and supportive therapy. Cyproheptadine, a serotonin receptor-blocking agent, may be used as well. We describe a case of serotonin syndrome following a redo-sternotomy and mitral valve replacement.

Case Description: A 57 year old male with a history of native mitral valve endocarditis and failed previous mitral repair, presented for redo-sternotomy and mitral valve replacement. Preoperative evaluation yielded a history of anxiety, for which he took escitalopram, which is a selective serotonin reuptake inhibitor (SSRI). Operative course was significant for a fentanyl dose of 250 micrograms, cardiopulmonary bypass time of 201 minutes, blood loss of 1.5 liters, and severe vasoplegia requiring vasopressor support including a methylene blue bolus and infusion. The patient was transferred to the surgical intensive care unit for recovery.

Results: After achieving hemodynamic stability, the patient received reversal of neuromuscular blockade and sedation was weaned on postoperative day one. Physical exam showed bilateral nonreactive and dilated pupils with subsequent development of ocular clonus, hyperreflexia of extremities, as well as rigidity and tremors of bilateral lower extremities. Computed tomography showed no acute process and electroencephalogram showed evidence of encephalopathy only. The clinical constellation of mydriasis, hyperreflexia, rigidity, ocular clonus and tremors, with negative diagnostic testing was most consistent with serotonin syndrome. Cyproheptadine was initiated, and slow but steady neurologic improvement was made. The patient was at neurologic baseline on the fifth postoperative day.

Conclusion: Serotonin syndrome following cardiac surgery is infrequently described in the literature and the variability in presentation precludes a good estimate of incidence. Vasoplegic syndrome occurs in 5% to 25% of patients requiring cardiopulmonary bypass[2] and methylene blue, a potent monoamine oxidase inhibitor, may be required to correct the vasoplegia. The combination of escitalopram, fentanyl, and methylene blue may lead to serotonin syndrome. Treatment includes withdrawal of offending agents, supportive therapy, and cyproheptadine. Recovery time to neurologic baseline is variable.

Reference(s):

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MCC 31 (1895)

Veno-Venous Extracorporeal Membrane Oxygenation After Left Ventricular Assist Device

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Introduction: Veno-venous extracorporeal membrane oxygenation (VV ECMO) facilitates gas exchange for patients with respiratory failure[1] and, in conjunction with additional hemodynamic support, VV ECMO aids recovery from acute cardiopulmonary distress.[2] We describe a case of VV ECMO for respiratory support during an episode of acute pulmonary edema following destination left ventricular device (LVAD) Heartmate II therapy. We additionally describe our management of perioperative anticoagulation and thrombocytopenia during LVAD therapy.

Case Description: A 66 year old male with a history of ischemic cardiomyopathy, NYHA class IV heart failure, atrial fibrillation with pacemaker dependence, bioprosthetic mitral valve replacement, left ventricle aneursym s/p repair, and CKD stage 3 was electively admitted for optimization prior to destination LVAD therapy. Initial optimization included PAC-directed inotropic support and aggressive diuresis. After 13 days, the patient underwent placement of Impella 5.0 for further optimization. Of note, due to worsening thrombocytopenia, the patient was transitioned off of heparin to bivalirudin for anticoagulation. After an additional 10 days of optimization, the patient underwent implantation of LVAD Heartmate II, removal of Impella, triscuspid valve repair, and redo mitral valve replacement. When separating from cardiopulmonary bypass there was evidence of flash pulmonary edema and secondary acute hypoxemic and hypercapnic respiratory failure. Nitric oxide was initiated and inotropic support included epinephrine, norepinephrine, vasopressin, milrinone, and methylene blue. Although hemodynamics improved, oxygen requirements remained high and VV ECMO was initiated along with lung protective mechanical ventilation.

Results: The patient was further stabilized in the surgical intensive care unit, weaned from VV ECMO over the next three days and then decannulated. He ultimately underwent tracheostomy to facilitate weaning from mechanical ventilation, as well as tunneled dialysis catheter placement for intermittent hemodialysis. Heparin induced thrombocytopenia assays were negative, however, due to continued multifactorial thrombocytopenia, we limited his immediate postoperative anticoagulation to subcutaneous heparin. He was weaned from mechanical ventilation and transferred to a skilled nursing facility on hospital day 82.

Conclusion: While the combination of LVAD therapy with venoarterial (VA) ECMO is often cited in addressing cardiorespiratory failure, our case illustrates the successful use of VV ECMO for respiratory failure following LVAD Heartmate II insertion.[3] VV ECMO along with LVAD therapy can work separately

yet simultaneously to address cardiovascular and respiratory compromise. This case also illustrates the preoperative optimization of Class IV heart failure with temporary mechanical support, as well as the management of perioperative thrombocytopenia and the successful use of a direct thrombin inhibitor for anticoagulation.

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MCC 32 (1878)

Unexpected Metabolic Acidosis During Low Dose Propofol Infusion in a Difficult to Ventilate Post-Operative Patient

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Introduction: Propofol infusion syndrome (PRIS) is an uncommon but life-threatening complication of sedation in the ICU. PRIS presents with a varied constellation of lactic metabolic acidosis, hypertriglyceridemia, liver injury, rhabdomyolysis, hyperkalemia, and refractory ventricular arrhythmias progressing to cardiovascular collapse[1,2]. Expert opinions recommend maintaining infusion rates below 4-5 mg/kg/hr for less than 48 hours for safety[3]. This is based on retrospective data showing significantly increased incidence of PRIS and associated mortality above 5 mg/kg/hr[1,2]. Here we present a case of unexpected metabolic acidosis attributed to low dose propofol infusion after tracheobronchoplasty.

Methods: A 53 year old 90 kg female with a history of severe tracheobronchomalacia, asthma, and COPD presented for tracheobronchoplasty after successful tracheal stent trial. Anesthesia was maintained with sevoflurane and a thoracic epidural catheter. Intraoperative course was uneventful and she was transferred to the ICU intubated. Sedation was maintained with propofol infusion at 2.5-3 mg/kg/hr. Nine hours after admission, she became tachycardic and had a sudden increase in peak airway pressures. Bronchoscopy confirmed patent upper airways. Arterial blood gas showed a mixed respiratory and metabolic acidosis with lactate of 6.6 mmol/L. In the absence of evidence of tissue ischemia, the lactate elevation was initially attributed to endogenous catecholamines in the setting of respiratory distress. She was treated for presumed bronchospasm with continuous albuterol, magnesium bolus, and epinephrine infusion at 0.01 mcg/kg/min without significant improvement in ventilation. Epinephrine infusion was stopped after 2 hours. Cisatracurium infusion was started for ventilator dysynchrony with improved dynamics, raising pH from 7.15 to 7.29. Lactic acidemia persisted, peaking at 8.7 mmol/L 4 hours after cessation of epinephrine infusion. MAP was maintained above 60 mmHg throughout, with increasing urine output during the period with highest lactate levels. Propofol infusion was subsequently stopped with rapid normalization of lactate. Creatine kinase levels peaked at 3200 IU/L and remained elevated for several days. Kidney and liver function remained normal. Triglyceride levels were not checked.

Conclusion: This is a case of significant metabolic acidosis attributed to infusion of propofol below 3 mg/kg/hr for less than 24 hours against a backdrop of challenging ventilation. Epinephrine and albuterol initially confounded the diagnosis, but acidosis persisted after their cessation. While the exact mechanism of PRIS is not fully elucidated, propofol induces mitochondrial dysfunction in skeletal and cardiac muscle via multiple mechanisms[4]. Patients with underlying sub-clinical mitochondrial disease

may be more susceptible to this effect at lower doses, especially in the setting of stress, fasting, and catecholamines[5]. Our patient did not undergo metabolic workup during admission. As a diagnosis of exclusion, PRIS could not be definitively confirmed. This case contributes to the case literature on PRIS in the setting of short duration low-dose propofol infusions, which may be an under-diagnosed or under-reported entity[2]. Further investigation is needed to identify specific patient subsets who may be at increased of harm from propofol doses widely used in intensive care units.

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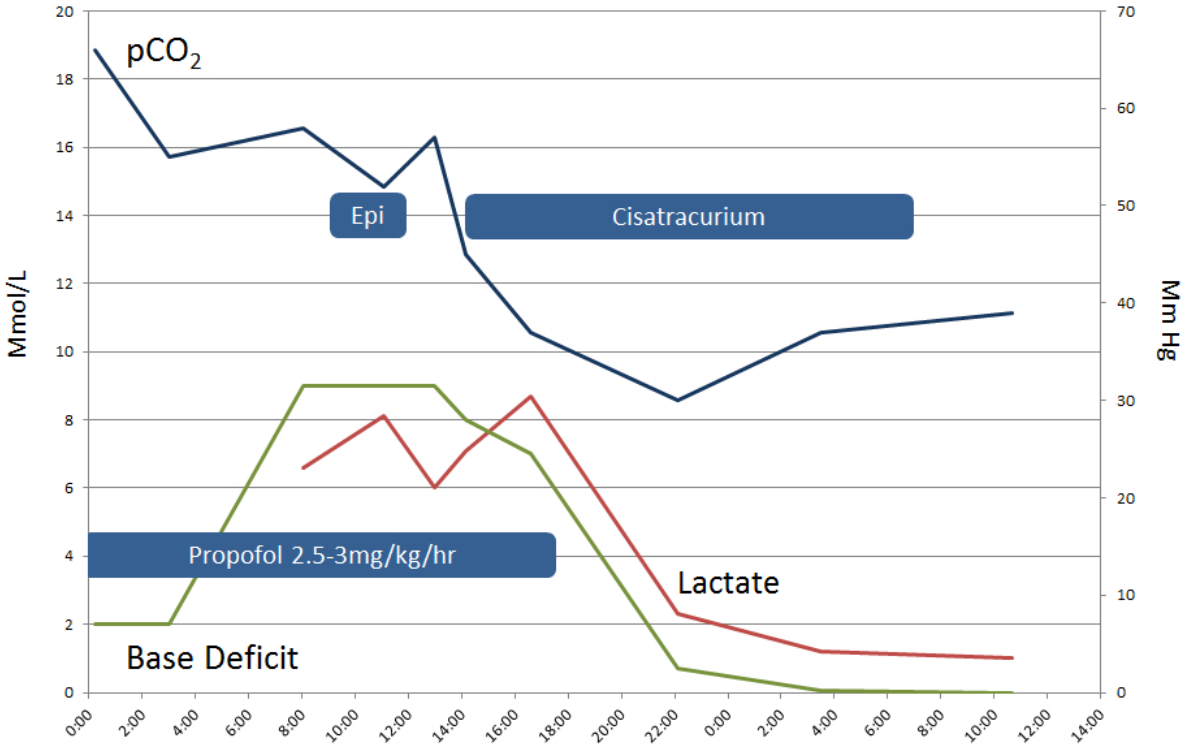

MCC 33 (1877)

Ruptured Sinus of Valsalva Aneurysm Into the Right Atrium - A Rare Cause of Subacute Heart Failure

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Introduction: Sinus of Valsalva aneurysm (SVA) is rare congenital entity. Sometimes, few acquired cases have been seen from infections e.g tuberculosis, syphilis, infective endocarditis. . Incidence of SVAs approximately 70% in the right coronary sinus, 29% in the non-coronary sinus, and only 1% in the left coronary sinus. It could be an incidental finding on imaging or patient may present with cardiac symptoms including frank heart failure to myocardial infarction. Prompt treatment is necessary in symptomatic cases in order to avoid life threatening fatal complication. Surgical repair is the only definitive treatment option. Anesthestic management and perioperative critical care could be challenging. We present a case of ruptured sinus of valsalva aneurysm into right atrium resulting in worsening heart failure.

Case Description: 55 year old man with past medical history of heart murmur since childhood, smoking presented to ICU with worsening heart failure over last 4 months. Patient started having shortness of breath and pedal edema which were progressively worsened. Initial echocardiogram failed to detect any significant valvulopathy or wall motion abnormality. Ejection fraction was determined to be 65%. He was admitted to our ICU with NYHA class III heart failure. On physical examination, a continuous grade IV murmur was auscultated over the precordium, radiating to bilateral carotids, along with pedal edema, rales in the chest. TEE was performed which showed continuous flow from aortic root to right atrium and patent foramen ovale. Further confirmation through a coronary angiogram was done which showed a fistulous connection between non-coronary sinus valsalva and right atrium with a significant left to right shunt. Cardiac surgery was consulted for further evaluation and consideration of surgical repair. Intra operative management required cardio pulmonary bypass and retrograde cardioplegia. Along with surgical repair of SVA and fistulous connection between aorta and right atrium, ASD was also closed. Patient was transferred to surgical ICU with minimal vasopressor support which was weaned off gradually over next few hours. Trachea was able to be extubated on fast track basis on the same day. Discussion - Defects above the non-coronary cusp of the aortic valve are uncommon. The most common form of defect is the sinus of Valsalva aneurysm (SVA), which was first described in by Hope in 1839, their first repair in 1950. We describe a ruptured sinus of Valsalva aneurysm from the non-coronary cusp of proximal aorta to the right atrium, which account for between 20 and 30% of SVA. Patients often present in third or fourth decade of life with acute or subacute heart failure and continuous cardiac murmur.

Results: Discussion continued - Echocardiography is the most common diagnostic modality. Surgical repair in timely fashion and perioperative critical care are utmost important for successful recovery.

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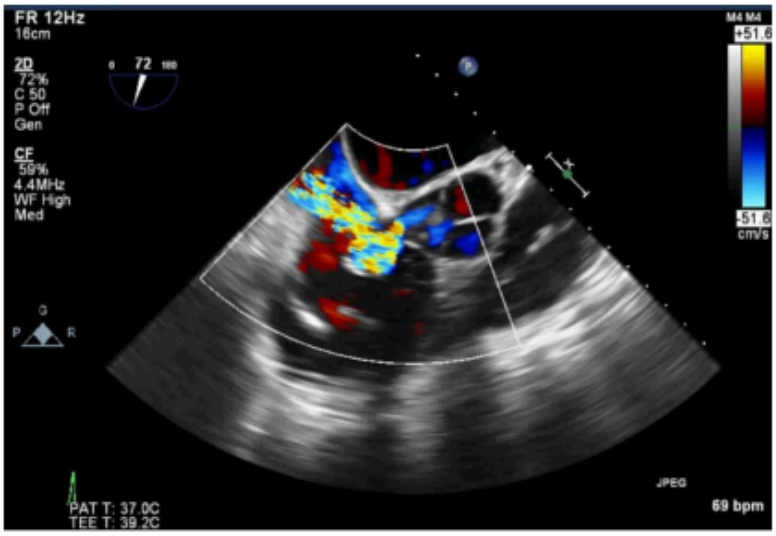

Figure 1. Intraoperative TEE showed continuous left to right shunt from proximal non-coronary cusp of the aortic valve into the right atrium with fistulous tract into the right atrium.

MCC 34 (1935)

Non-Surgical Management of a Patient with Prosthetic Aortic Valve Thrombosis Resulting From Hypercoagulability - A Case Report

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Introduction: Prosthetic valve thrombosis (PVT) is a well described and serious complication of cardiac valvular surgery. Left sided PVT has an incidence of 0.1% to 6% per patient-year, the risk depends on valve type, prothrombotic state and anticoagulation (1). Treatment options include surgery, thrombolytic and heparin therapy. The AHA/ACC and European guidelines recommend surgery for patients in NYHA classes III and IV unless surgery is high risk (2,3). For patients with left-sided PVT and large thrombus area, early surgery over fibrinolytic therapy is suggested, unless contraindications to surgery exist (4). In this report we present management of a patient with PVT and hypercoagulable state with relative contraindications to surgery.

Case Description: A patient with a mechanical aortic valve (AV) and a history of antiphospholipid syndrome, presented with PVT. She was treated with tissue-type plasminogen activator (t-PA). After the thrombolytic therapy she developed a large intraparenchymal hemorrhage, and was given prothrombin complex concentrate (PCC) and fibrinogen concentrate. The intracranial bleed stabilized, and after 72h heparin infusion was started and continued until surgery.

Results: A 59 years old female patient presented after mechanical AV, aortic root, and ascending aorta replacement for an acute type-A aortic dissection with a deep sternal wound infection (DSWI). Her medical history was significant for antiphospholipid syndrome, diagnosed after a workup prompted by the sudden cardiac death of her brother. On admission she complained of dizziness, lightheadedness, dyspnea, tachycardia and hypotension. Despite anticoagulation with warfarin her INR had been subtherapeutic. The EKG showed atrial flutter with rapid ventricular rate, for which she was cardioverted with resolution of symptoms. Transesophageal (TEE) and transthoracic (TTE) echocardiography performed prior and after cardioversion showed an ejection fraction of 35-45%, global hypokinesis and mean gradients (MG) of 45-50mmHg across the AV concerning for thrombosis. Figure 1 shows a TEE image of the stuck AV leaflets. Fluoroscopy confirmed severe reduction in leaflet mobility. As the patient had a DSWI and remained asymptomatic and hemodynamically stable after cardioversion, surgical treatment was postponed and thrombolytic therapy with tissue plasminogen activator (t-PA) started with the goal of decreasing the thrombus burden prior to surgery. t-PA was delivered in 25mg dose during 6h infusions for five days, and 50mg over 12h on the sixth day(5). Warfarin had been continued during hospitalization and was stopped on day five of thrombolytic therapy in anticipation of surgery, with an INR between 1.9 and 2.3. After the last t-PA dose she developed a left intraparenchymal hemorrhage with symptoms progressing to right hemiplegia and

severe dysarthria. She was treated with PCC, fibrinogen concentrate, antihypertensives and mannitol. Follow up imaging demonstrated stable hemorrhage and heparin infusion was started 72h after the event and continued until surgery.

Conclusion: Currently, in patients with mechanical AV and hypercoagulable state, therapy with warfarin and low dose aspirin is recommended (2,3). In patients with PVT, thrombolytic therapy with low dose (25 mg) and slow (6h) infusion of t-PA has been reported to be safe and effective, however a regimen for patients with antiphospholipid syndrome has not been established (5). Those patients might benefit most from early surgical intervention.

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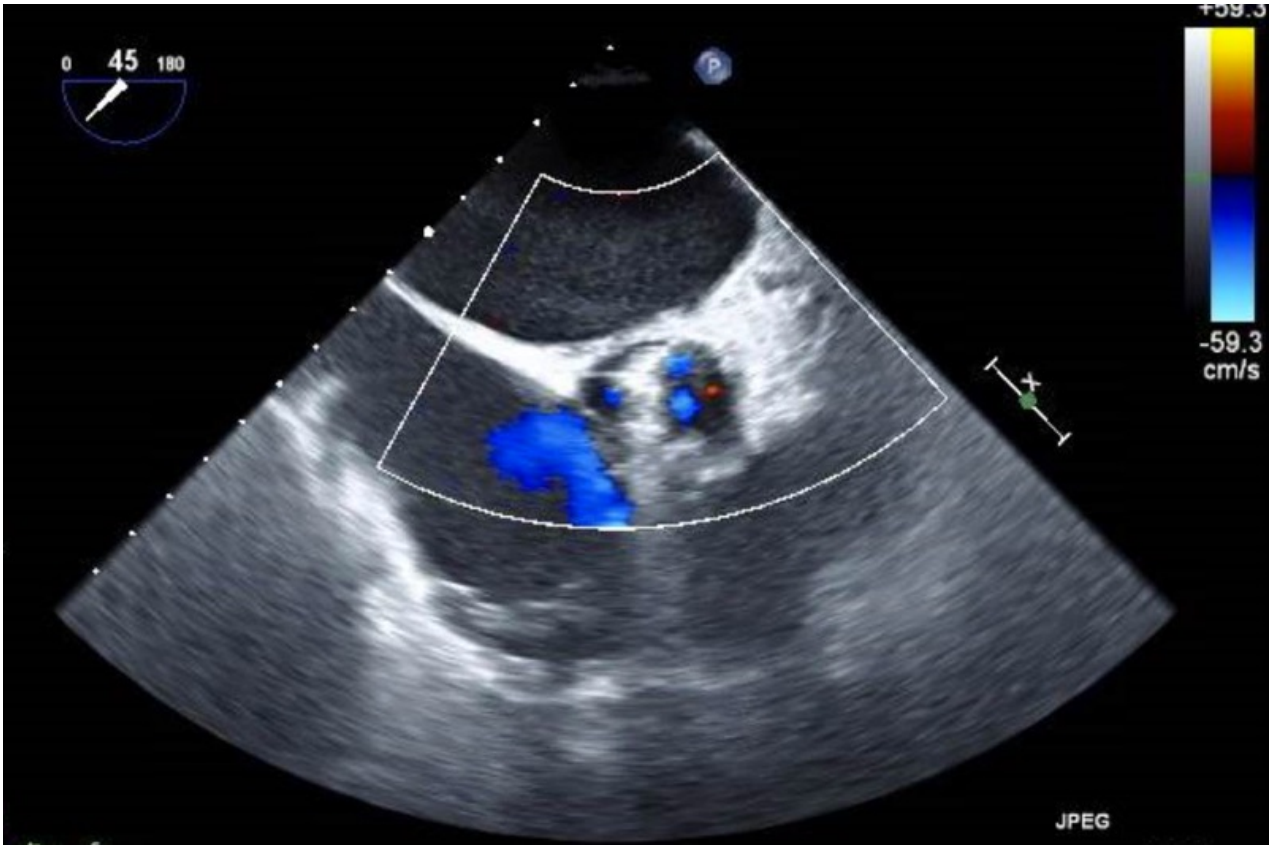

MCC 35 (1797)

A Case Report of Milrinone Infusion for the Treatment and Prevention of Refractory Cerebral Spasm in Subarachnoid Hemorrhage

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Introduction: Currently, the mainstay of medical management for delayed cerebral ischemia in aneurysmal subarachnoid hemorrhage (SAH) consists of the use of a calcium channel blocker and 'triple H therapy.' 'Triple H therapy' (hypervolemia, hypertension, and hemodilution) aims to increase cerebral blood flow in the setting of cerebral vasospasm with its efficacy and role remaining uncertain. Other medical therapies have been sought to avoid the adverse consequences of 'triple H therapy' such as pulmonary edema, myocardial infarction, hyponatremia, cerebral edema, or cerebral hemorrhage. Intra-arterial (IA) and intravenous (IV) milrinone, a phosphodiesterase III inhibitor, has shown promise through its vasodilatory and inotropic properties with angiographic improvement in arterial diameter size.[1] Although IA milrinone injection provides an immediate and possibly more effective outcome, there are case reports of high dose IV milrinone infusions leading to clinical improvement 1.5 hours after administration.[2] Furthermore, IV milrinone infusions have been shown to increase global cerebral oxygenation (measured by non-invasive transcranial cerebral oximetry) and decrease the incidence of cerebral vasospasm.[3] In this case report, a trial of continuous IV milrinone infusion was completed for refractory cerebral vasospasm in a patient with a large aneurysmal SAH with no improvement in clinical outcome.

Case Description: A 32 year old female with no past medical history presented to an outside hospital with a thunderclap headache and photophobia. She was found to have a Hunt Hess 2, modified Fisher 4 SAH. A posterior communicating artery aneurysm was coiled on post bleed day (PBD) 1. Her hospital course was complicated by severe cerebral vasospasm with infarctions in the left MCA and ACA territories with resultant right hemiplegia and global aphasia. She required intra-arterial verapamil and balloon angioplasty on PBD 4, 6 and 7. In addition, she required multiple vasopressors (norepinephrine, epinephrine, and phenylephrine) to maintain a mean arterial pressure of 120-150 mmHg. A trial of milrinone was administered from PBD 7-14 at a dose of 0.75 mcg/kg/min.

Results: She continued to deteriorate on neurological exam with a repeat CT angiogram on PBD 15 showing a new right sided MCA vasospasm, additional left MCA vasospasm with full left MCA territory infarction and malignant edema. She underwent a decompressive left hemicraniectomy on PBD 17. She developed bilateral full MCA infarction with flexor posturing and blown pupils on PBD 19. She expired on PBD 20.

Conclusion: Although continuous IV milrinone infusion for treatment and prevention of cerebral vasospasm in patients with SAH have shown benefit in smaller studies and case reports, there is currently only very low evidence to support implementation of milrinone therapy in our standard practice.4 We describe a case report where milrinone therapy did not improve the clinical outcome. The precise pathophysiology of delayed cerebral ischemia in the setting of SAH is not fully understood. It is unclear whether the timing of milrinone administration in the time course after the SAH event plays a role in the effectiveness of the therapy. Future prospective studies are required to further elucidate the role of milrinone therapy in the treatment and prevention of cerebral vasospasm in SAH.

Reference(s):

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3. Egyptian Journal of Anaesthesia. Volume 30: 73-82. 2014.
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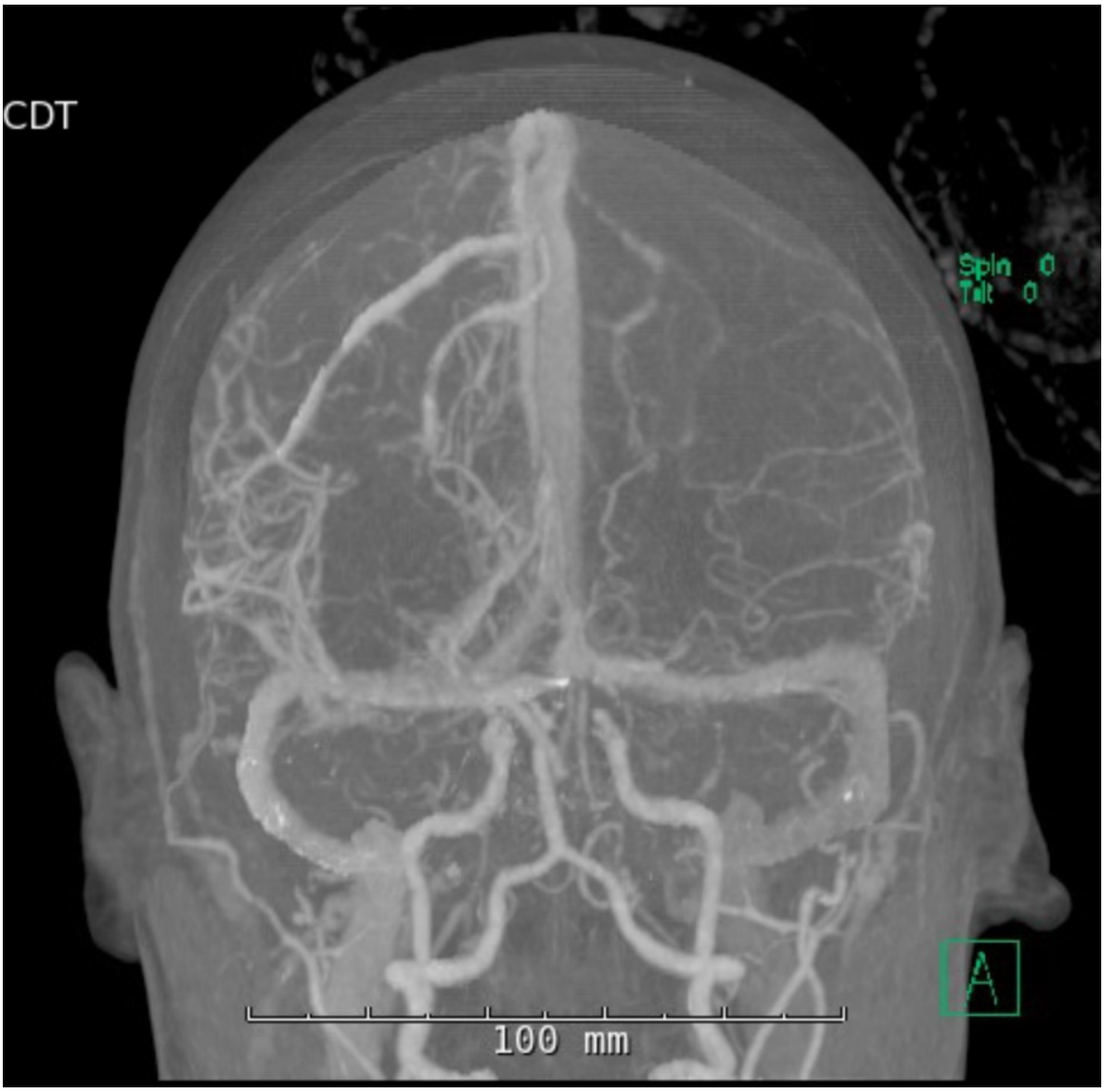
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MEDICALLY CHALLENGING CASES 4

Posters: 36-41

Moderator: George Frendl, MD, PhD, FCCM, and Julia Sobol, MD

MCC 36 (1123)

TIA Following TAVR Secondary to Dynamic LVOT Obstruction

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Introduction: A subset of patients with long-standing aortic stenosis (AS) have asymmetric septal hypertrophy (ASH) that may cause dynamic left ventricular outflow tract obstruction (LVOTO) following replacement of the aortic valve.[1] We present a patient who developed stroke-like symptoms due to dynamic LVOTO following a transcatheter aortic valve replacement (TAVR) for severe AS, and responded well to treatment once the diagnosis was recognized.

Methods: A 97 year old female with symptomatic AS was referred for AVR. TAVR was selected given her advanced age, medical comorbidities, and preference. CT angiogram demonstrated basal ASH measuring 15 mm and a septal-to-posterior wall thickness ratio (STP ratio) of 1.36. TTE demonstrated a pressure gradient across the LVOT of < 30 mm Hg at rest, which does not suggest LVOTO, although no provocative testing was performed. Left heart catheterization was done as well, but intraventricular pressures and pressure gradients were not recorded, and provocative testing was not performed. The decision was made to proceed with a TAVR because the ASH was mild based on the 15 mm wall thickness. Approximately 3 hours postoperatively she developed altered mental status, dysarthria, and left-sided weakness, concerning for a stroke. She was tachycardic and blood pressure was labile. A 'stroke code' was activated and the patient taken for emergent CT scan. A bedside TTE was performed subsequently. This revealed an underfilled and hypertrophied LV with a prominent septal bulge [Fig 1]. Color-flow Doppler revealed turbulent flow in the LVOT during systole [Fig 2] and continuous-wave (CW) Doppler demonstrated high velocity blood flow with late peaking, 'dagger shaped' waveforms [Fig 3] - a picture consistent with LVOTO. Crystalloid boluses and phenylephrine were administered and her symptoms resolved promptly. Subsequent TTEs with CW Doppler through the LVOT demonstrated reduced velocities and normalizing waveforms [Fig 4]. The entire episode lasted approximately 30-45 minutes. The CT scan and further neurologic workup were negative for an acute process and the remainder of the patient's postoperative course proceeded uneventfully.

Results: Strokes following a TAVR have been attributed to valvular calcium debris embolization during valve deployment.[4] However, the change in blood flow through the LVOT as seen on spectral Doppler, coincident with the resolution of the patient's symptoms and hemodynamic status, strongly suggests dynamic LVOTO to be the etiology of this TIA. As many as 10% of patients with AS present with ASH, which places these patients at risk for dynamic LVOTO.[2] AVR in this patient population is thought to 'unmask' dynamic LVOTO as a consequence of changes in LV loading conditions. Manufacturers of TAVs do not list ASH with an outflow gradient or HOCM as contraindications to TAVR, but, rather, as precautions.[5] Some authors advocate for an open surgical septal myectomy at the time of AVR if the

STP is > 1.3 [1,2,3], or alcohol septal ablation prior to TAVR if there's any demonstrable LVOTO following discovery of basal ASH > 15 mm or STP > 1.3.[6]

Conclusion: This case demonstrates that despite detailed preoperative evaluation for TAVRs, patients with severe AS scheduled for surgical correction, accompanied with severe concentric or ASH and diastolic dysfunction may be at risk for dynamic LVOTO in the perioperative period with hemodynamic instability and potentially serious consequences.

Reference(s):

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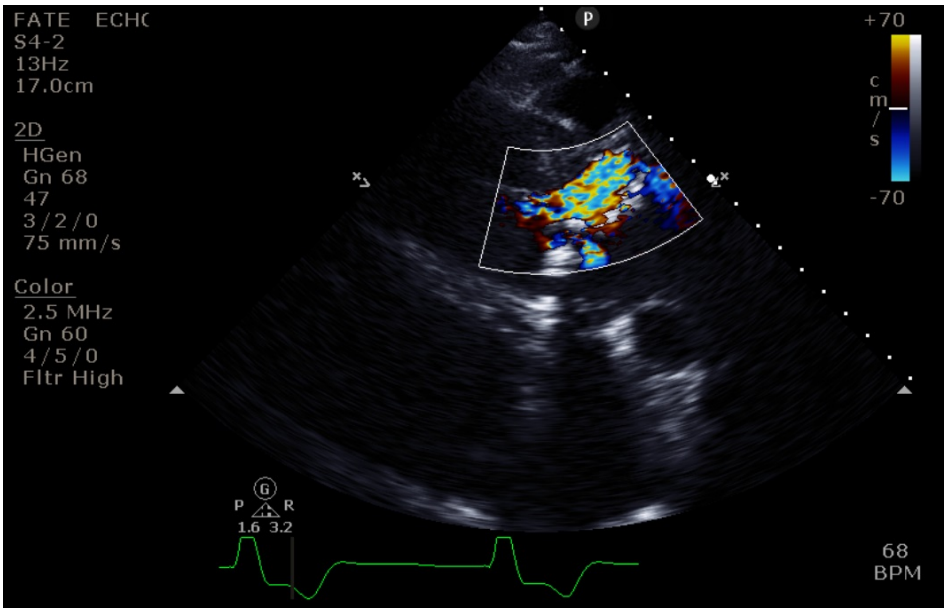
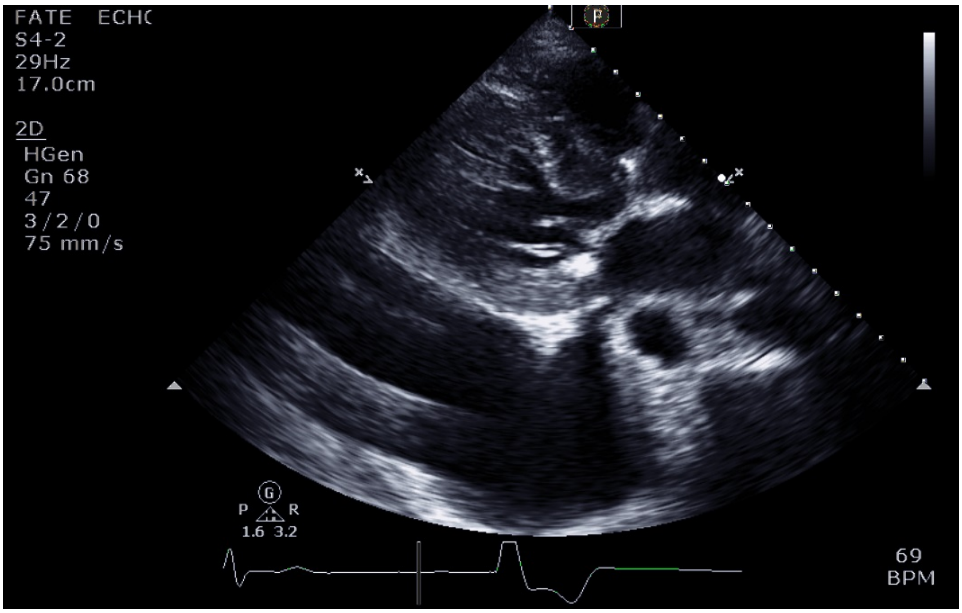
2. Ann Thorac Surg. 2010;89:459-64.
3. J Thorac Cardiovasc Surg. 2013;145:171-5.
4. JACC. 2012;59(13):1200-54.
5. CoreValve System [package insert]. Medtronic Inc., 2014.
6. Curr Treat Options Cardio Med. 2016;18:17.

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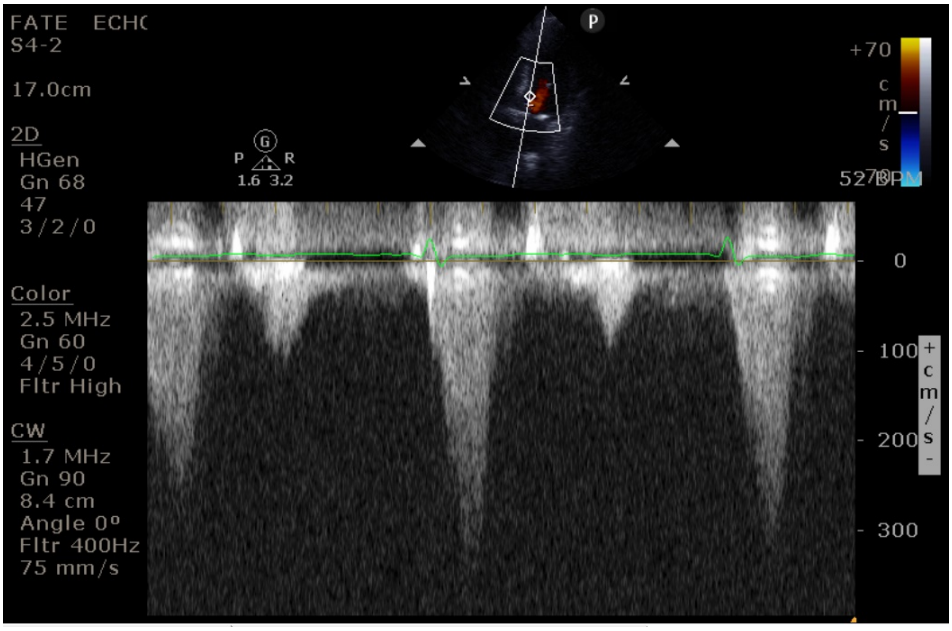
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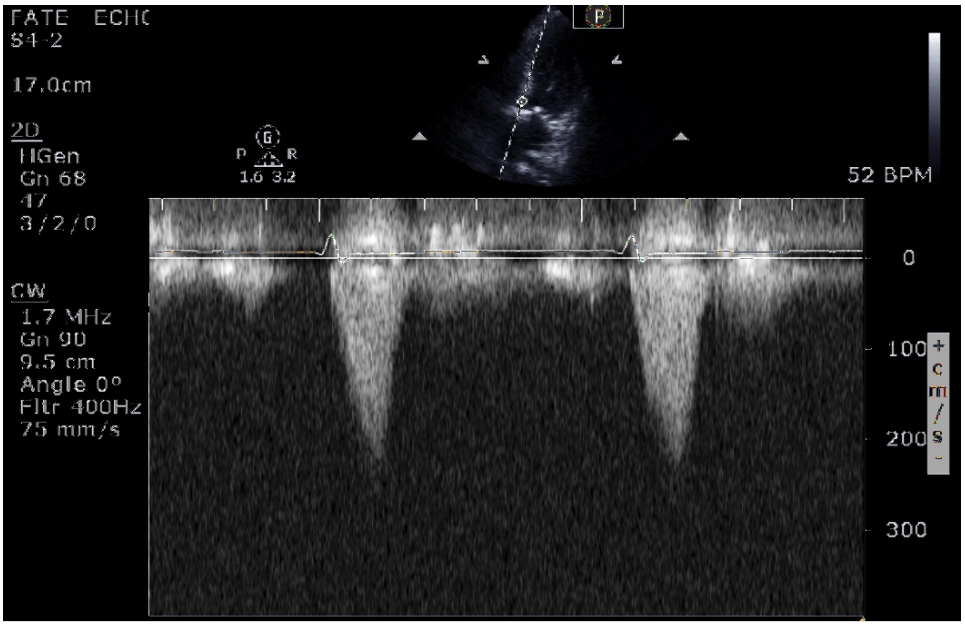
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MCC 37 (2099)

Airway Management in a Patient with Tracheal Disruption due to Penetrating Neck Trauma with Hollow Point Ammunition: A Case Report

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Introduction: Penetrating neck injuries represent 0.4-10% of penetrating trauma in the civilian population, and carry an up to 11% mortality rate1,2. Mortality can be greater than 50% for gunshot wounds to the neck.1 Seventy-four percent of penetrating trauma injuries occur in the cervical trachea.4 Numerous algorithms exist for the evaluation and management of patients with penetrating neck wounds; however, there is a paucity of data or algorithms for airway management in this patient population and tracheal disruption injury in particular.1, 2, 3, 5-9 Most available data consists of case reports, pediatric patients, and blunt mechanism.3 We present airway management in a patient with tracheal disruption due to penetrating neck trauma with 45 acp hollow point ammunition, with an intralumenal bullet.

Case Description: The patient is a 21 year old who presented to the trauma bay with a zone 2 gunshot wound to the left neck. Upon arrival, he was vocalizing and spitting up blood. His respiratory status worsened and rapid sequence intubation was undertaken. A grade 1 view of vocal cords was seen with a MAC 3 blade; a 7.5 endotracheal tube (ETT) was passed through the cords where resistance was noted. With bronchoscope unavailable, the ETT was withdrawn slightly and again advanced with a corkscrew maneuver without resistance. End tidal carbon dioxide was reported.

Results: Subcutaneous emphysema developed shortly after intubation. Tracheal obstruction and injury were entertained and the ETT was advanced into right mainstem with adequate and stable ventilation. CT illustrated diffuse subcutaneous emphysema with possible tracheoesophageal injury. The patient was taken emergently to the operating room with ENT for neck exploration and sustained a right lateral wall tracheal defect just inferior to the seventh tracheal ring (Figure 1). An intralumenal bullet was encountered at the site and removed (Figure 2). The posterior tracheal wall was intact. A tracheostomy was placed at tracheal ring 5 and secured with an inferiorly based Bjork flap and the defect was repaired.

Conclusion: Airway management remains the first priority in all trauma resuscitation. Airway injury should always be suspected in those with penetrating trauma to the neck. Those with gunshot wounds

from hollow-point bullets in particular, are especially susceptible. The ability to expand, high-energy transfer, and large cavity creation make them capable of causing a great deal of damage, especially when applied to important airway and vascular structures in the neck.9 Challenges specific to penetrating neck injury include direct airway penetration, airway obstruction, distorted tissue planes or anatomy, hematoma formation, cervical and spinal cord injury, gastric contents, or excessive blood.6 Multiple retrospective study at trauma centers endorse rapid sequence induction and intubation (RSI) as first choice for airway control in penetrating trauma to the neck.1,2, 4-9 No airway management has been found to be superior to another in penetrating neck trauma. Additionally, management will be impacted by patient cooperation, injury, and visualization. Blood, gastric contents, and mucous may interfere with bronchoscopic visualization and can impede the ability to apply topical anesthetic in the oropharynx and larynx.5 The intubating provider should utilize the method of airway management they are most comfortable and facile with in each scenario for the best chance at securing an airway.

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5. Anesth Analg 1993:77:1135-8.
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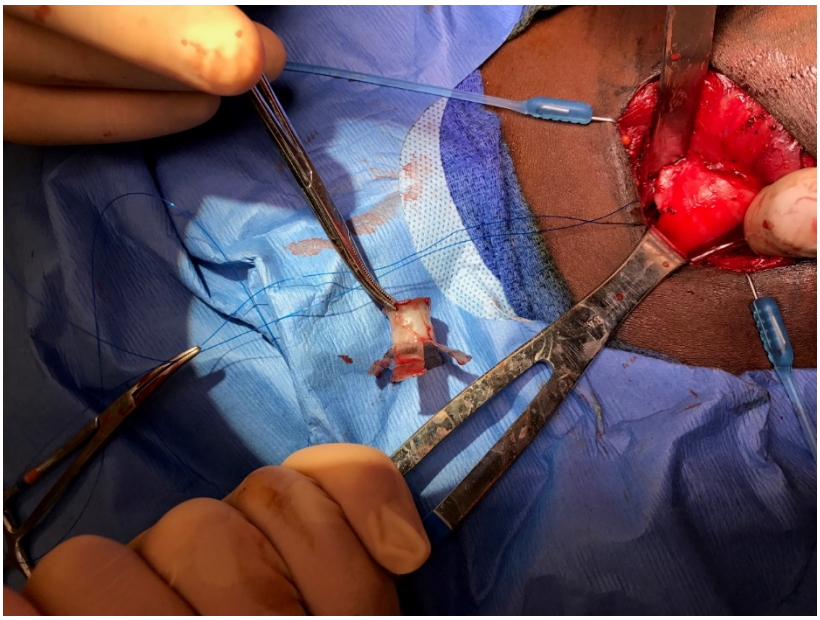

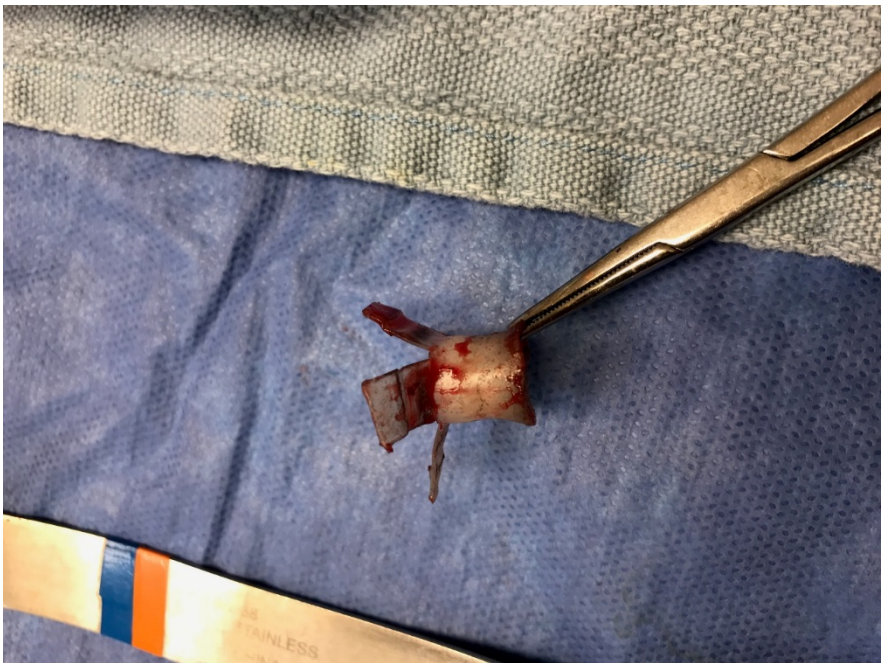

MCC 38 (1409)

Case Report: ARDS Secondary to Severe Varicella Pneumonia in Immunocompetent Patient

Sajjad Ibrar, MD, John Denny, MD

Rutgers, Robert Wood Johnson Medical School, New Brunswick, NJ

Introduction: A previously healthy 34 year old female developed a vesicular rash and fever about 4 days prior to admission. Patient was transferred to the ICU after becoming increasingly dyspneic as an outpatient. She had been exposed via her two children with chickenpox.

Case Description: Original outpatient chest x-ray is shown in Figure one. Past medical history includes depression treated with Buspirone and Clomipramine hydrochloride. She was a smoker and smoked cigarettes up until admission to the hospital. Physical exam showed a temperature of 103.2, blood pressure of 130/60, pulse of 120, and respiratory rate of 30. Skin examination revealed numerous vesicles containing straw colored fluid over an erythematous base in a distribution from face to legs. Some vesicles were crusted over. Chest exam showed bilateral rhonchi with basilar crackles bilaterally. Patient had normal heart tones with a sinus tachycardia. As seen in Figure two, portable chest x-ray revealed nodular interstitial infiltrates which had become more pronounced since initial CXR. Arterial blood gas analysis on 5 liters of nasal cannula oxygen showed pH 7.48, pCO2 30, pO2 88, HCO3 22, saturation of 96%. Patient was started on Acyclovir antiviral therapy as well as empiric erythromycin for possible atypical organisms. Patient's respiratory status deteriorated with increasing tachypnea and worse oxygenation despite an FIO2 of 100%. Her CXR worsened and became consistent with Adult Respiratory Distress Syndrome as shown in Figure three.

Conclusion: This case illustrates an example of severe Varicella pneumonia in a young, healthyimmunocompetent adult, without any risk factors except smoking. As mentioned above, between 5 and 15% of cases of adult chickenpox will have some form of pulmonary involvement. Identified risk factors for progression of varicella to pneumonia include age, pregnancy, smoking, chronic obstructive pulmonary disease and immune suppression. None of these risk factors except smoking were present in this patient. Typically, as in this case, pulmonary symptoms occur 1 to 6 days after the onset of varicella zoster infection. They often include cough, dyspnea and fever. Hemoptysis, pleuritic chest pain, or cyanosis sometimes occur, although fortunately, not in this patient. This patient responded to conventional treatment with a 10-day course of intravenous acyclovir. We were able to utilize CPAP therapy to avoid intubation and mechanical ventilation. Some evidence suggests that early intervention may modify the natural course of this complication. Finally, this case illustrates the radiographic disease progression through the series of chest x-rays in the evolution of Varicella Pneumonia into ARDS.

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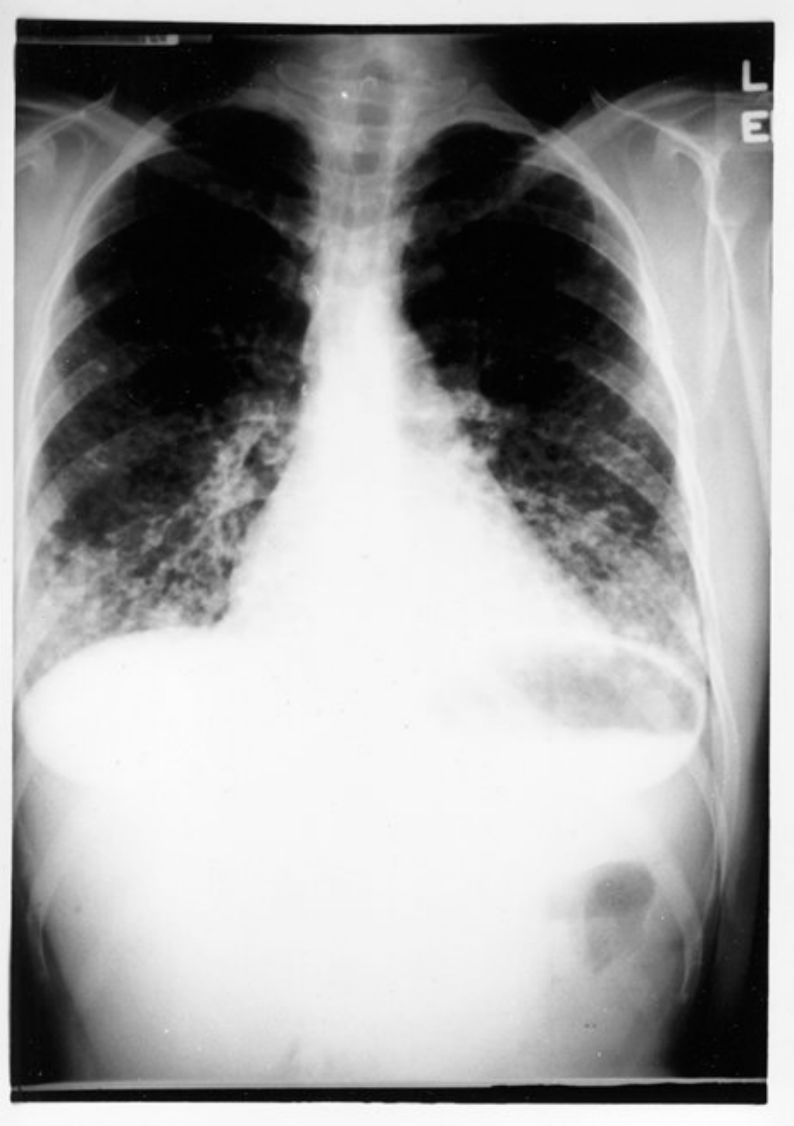

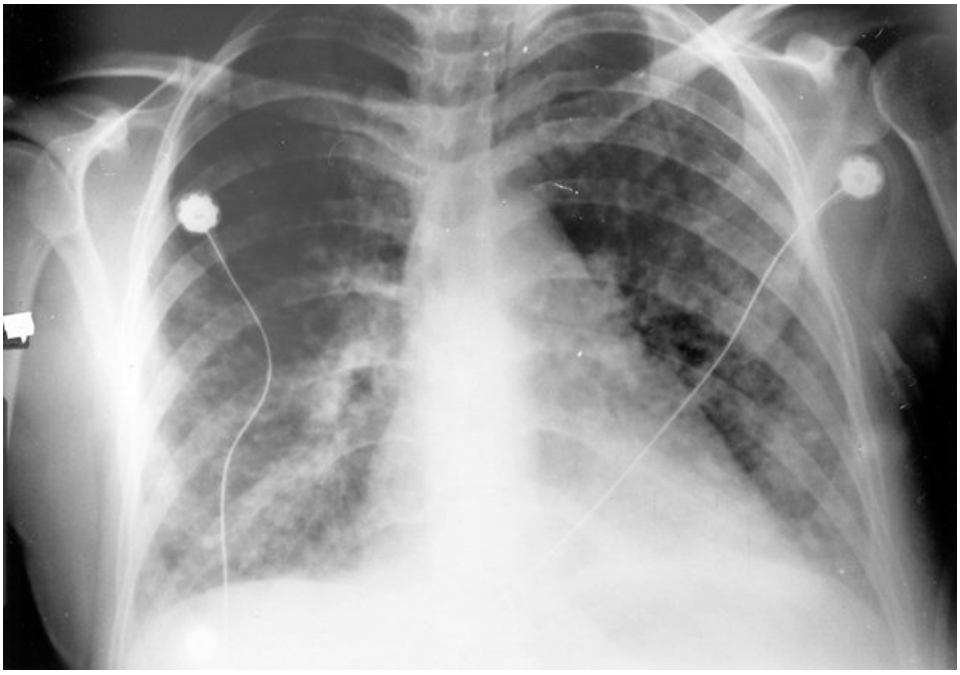

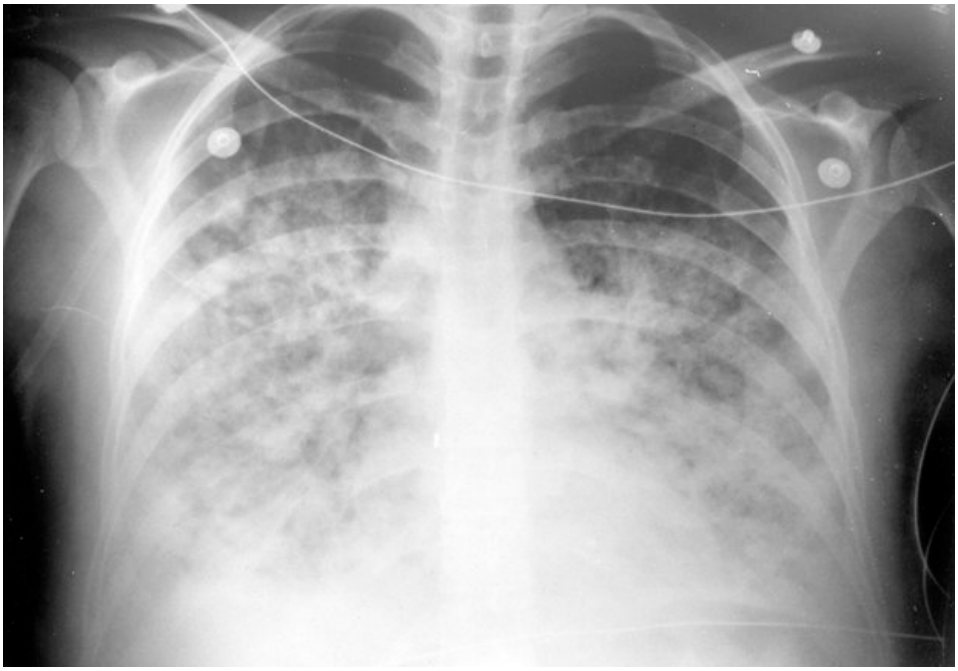

MCC 39 (2220)

Post-infectious Vasculitis Complicating Sepsis: A Rare Clinical Presentation

Chantel Gray, MD, Anoop Chhina, MD, Madiha Syed, MD, Roshni Sreedharan, MD, Avneep Aggarwal, MD, Ashish Khanna, MD, FCCP

Cleveland Clinic, Cleveland, OH

Introduction: Historically, vasculitides have been classified as primary or secondary based on the etiology of the inciting agent. Refinement in diagnostic tools has led to the classification of vasculitides previously thought idiopathic to being infection related[1]. Many infectious agents, both bacterial and viral, have been implicated in the development of classified vasculitides; however, the clinical presentation is usually consistent with overt signs or symptoms of vasculitis, such as glomerulonephritis or purpura[2]. Our case illustrates a presentation of a secondary vasculitis, caused by a fusobacterium infection, mainly characterized by severe encephalopathy and motor deficits.

Results: A 33-year-old, otherwise healthy female, presented to an outside hospital with complaint of fever, nausea, and abdominal pain. The patient underwent exploratory laparotomy, during which purulent drainage was found from an ovarian abscess, with intra-operative cultures identifying growth of fusobacterium. On post-operative day one, she developed septic shock and altered mental status requiring emergent intubation and vasopressor support. She was subsequently transferred to our institution for further management. Upon admission, routine EKG showed inferior ST segment depressions, and follow-up cardiac enzyme measurements demonstrated an elevated troponin T , as well as elevated MB, and CK-MB fraction. Transthoracic echocardiogram demonstrated a mildly reduced LVEF to 47%, but no regional wall motion abnormalities. By the next morning, the patient's shock resolved, and attempts were made for liberation from sedation and mechanical ventilation. It was noted, however, that the patient had altered neurological status, including agitation, inability to follow simple commands, withdrawal only to painful stimuli, and minimal purposeful movement. Bedside EEG monitoring revealed severe diffuse encephalopathy, while a MRI brain demonstrated innumerable punctate microhemorrhages with differential considerations including angiopathy, vasculopathy, or vasculitis. A CT chest, abdomen and pelvis also obtained that day showed an area of necrosis or infarct in the right lower lung lobe, as well as a long segment of wall thickening involving ileus, cecum and ascending colon, with the differential including infection, vasculitis or ischemia. Given concern for vasculitis, steroid treatment was initiated. Initial labs, including ESR and CRP were elevated, yet non-specific. ANA, p- and c-ANCA were negative, as was trans-esophageal echocardiogram obtained for the elimination of the possibility of septic emboli. Over the course of the next two days, the patient's mental status markedly improved, and she was extubated without incident.

Conclusion: Bacterial infections can directly cause a vasculitis, or mimic a primary vasculitic syndrome[2]. This case illustrates a likely post-infectious vasculitis, caused by fusobacterium infection. Invasive fusobacterium disease is characterized by fever, tachycardia and leukocytosis, but usually not by neurologic manifestations. The fact that this case does not conform clinically to either a primary central nervous system or primary systemic vasculitis, highlights the importance of consideration of a secondary vasculopathy, particularly in the setting of infection and encephalopathy. The cryptogenic nature of secondary vasculitis requires prompt recognition and treatment, not only of the infection, but also of the inflammatory state.

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MCC 40 (1893)

Early Postoperative Tracheo-esophageal Fistula: A Masquerader in the ICU

Chantel Gray, MD, Roshni Sreedharan, MD, Sandeep Khanna, MD

Cleveland Clinic, Cleveland, OH

Introduction: Tracheoesophageal fistula (TEF) in adults is a rare but serious complication of endotracheal intubation or tracheostomy placement during the perioperative period. Known causes include prolonged intubation, use of high cuff pressures (>30 cm H20), and rigid bronchoscopy[1]. Our case describes TEF secondary to tracheostomy.

Results: A 52 year old female with history of diabetes, hypertension, and severe COPD requiring steroid treatment, was hospitalized with diverticular bleed. Following abdominal exploration, she was tracheostomized on post-operative day (POD) 10. Six days after tracheostomy placement, a right IJ dialysis catheter was inserted under ultrasound guidance. Shortly thereafter, she developed extensive subcutaneous emphysema of the chest wall and face. Increased peak airway pressures and progressive difficulty in ventilation raised concerns for pneumothorax. CT chest demonstrated a large pneumomediastinum suggesting a possible tracheal or esophageal injury. ENT was consulted and the tracheostomy was removed under fiberoptic guidance, revealing a 6 cm tracheo-esophageal fistula (TEF) extending from rings 7 to10. A cuffed Shiley XLT tracheostomy tube was inserted through the stoma to bypass the fistula, with dramatic improvement in ventilation. As she was not a candidate for surgical closure, a tracheal stent was placed bronchoscopically and an endotracheal tube was then inserted via the larynx under fiberoptic guidance and positioned beyond the stent to provide an adequate seal for ventilation.

Conclusion: There are few reports of TEF secondary to tracheostomy, mostly several days after the procedure. To our knowledge this is the first case report of a TEF secondary to a tracheostomy occurring within a week. Manifestations include mediastinal and/or subcutaneous emphysema, hemoptysis, pneumothorax, and pneumoperitoneum. ICU patients are particularly susceptible to TEF development, as risk factors include prolonged mechanical ventilation, history of poor nutrition, airway infection, hypotension, hypoxemia, anemia, diabetes, and steroid therapy[2]. Intensivists should have a high index of suspicion for TEF in these patients as early diagnosis and treatment can lead to favorable outcomes.

Reference(s):

1. Annals of Thoracic Medicine, 2008, 3:23-25.
2. Respiratory Medicine Case Reports, 2016, 17:86-89.

MCC 41 (1130)

Intraoperative Vascular Access for Liver Transplantation in a Patient with SVC Thrombosis

Peter Downey, MD[1], Ryan Chadha, MD[2], Julia Sobol, MD[1]

[1]Columbia University/New York-Presbyterian Hospital, New York, NY, [2]Mayo Clinic, Jacksonville, FL

Introduction: Superior vena cava (SVC) thrombosis is a well-described complication of long-term central venous catheterization.(1) Over time, collateral circulation develops to allow proximal venous drainage.(2) Central venous access is a critical component of orthotopic liver transplantation for the purposes of hemodynamic monitoring, volume resuscitation and vasoactive medication administration.(3) Standard practice also includes selective placement of a pulmonary artery catheter.(3, 4) SVC thrombosis limits traditional internal jugular (IJ) or subclavian (SC) vein approaches, and the scenario is further complicated in that inferior vena cava access is interrupted during conventional liver transplant technique.(5) These patients require unique planning for safe monitoring and resuscitation.

Methods: A 25-year-old woman was selected for liver transplantation due to progression of primary biliary cirrhosis. Her medical history was significant for cystic fibrosis. She had previously undergone double lung transplantation, during which time she had developed total SVC occlusion. Preoperative neck ultrasound was performed which demonstrated additional RIJ and LSC occlusive thrombi. Following review of her imaging, a plan was made to ensure adequate access proximal and distal to the intrahepatic IVC. The patient was brought to the operating room with a right basilic vein peripherally inserted central venous catheter (PICC) in situ. She underwent uncomplicated induction. A left femoral vein 8 French introducer catheter was placed for intraoperative volume and vasopressor infusion. A standard pulmonary artery catheter (PAC) was then advanced into the PA. Cranial to the IVC, the PICC remained in place for vasopressor administration, and a 16-guage peripheral intravenous (IV) catheter was placed in the right external jugular (EJ) vein for volume infusion. Following dissection, prior to IVC clamping, the PAC was withdrawn to 40 cm. The EJ IV and PICC became the primary access for volume infusion and vasopressor administration, respectively. The surgical team proceeded with IVC clamping, liver explantation, and donor liver implantation under stable hemodynamics. The patient tolerated reperfusion of the donor liver using her combined lower and upper extremity venous access. She experienced a complete recovery without further vascular complications.

Conclusion: Vascular access poses a unique challenge in patients who will require central venous reconstruction in the setting of thrombosis. Important considerations include location of planned catheter tips in relation to surgical procedures and the need for volume or vasopressor administration. In a similar setting, we recommend preoperative formal vascular ultrasound evaluation of the vessels to be accessed in order to reduce anesthetic time and prevent unnecessary access attempts. This case also

highlights the importance of anesthetic-surgical team communication and emphasizes the overall benefit of a unified operative care plan.

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MEDICALLY CHALLENGING CASES 5

Posters: 42-47

Moderator: Adam Evans, MD, MBA, and Shaezad Shaefi, MD

MCC 42 (2287)

Tacrolimus-Induced Coronary Vasospasm in a Lung Transplant Recipient

Todd A Dodick, MD, MPH, Bahaa Daoud, MD, Oliver Panzer, MD

Columbia New York Presbyterian, New York, NY

Introduction: While calcineurin inhibitors have enabled continued advances in organ transplantation, the administration of these agents is often accompanied by a wide variety of side effects. Here we present a case of tacrolimus-induced coronary vasospasm.

Case Presentation: A 62 yo M with a history of sarcoidosis on home O2 received a sequential double lung transplant and was admitted to the CTICU postoperatively on VA ECMO. Following a complicated post-operative course he was eventually weaned from ECMO and decannulated, shock resolved and he was stable undergoing a prolonged ventilator wean in the ICU. On post-operative day 14 he acutely became hypotensive and bradycardic with profound ST elevation in the anterior, inferior, and lateral distributions (Fig 1: ECG with diffuse tombstoning). He was taken to cath lab and found to have severe, diffuse vasospasm that responded well to intraarterial nitroprusside injection (Fig 2: pre- and post nitroprusside cath images). However, he remained hypotensive and had an Impella placed due to poor left ventricular contractility on transthoracic echocardiogram with marginal right ventricular function. He returned to the ICU and required increasing inotropic and vasopressor support overnight despite a max troponin of 1.78 and a normal EKG. He was placed on femoral VA ECMO the following morning. After he failed to stabilize hemodynamically, with no response to external stimulus, his family opted to withdraw care the following day.

Conclusion: Vasospasm due to endothelial dysfunction is a severe, and largely unknown, side effect of tacrolimus therapy. Here we present a case of coronary vasospasm in a patient two weeks following double lung transplantation leading to cardiogenic shock requiring mechanical support. Only one case report of calcineurin inhibitor-induced coronary vasospasm exists in the literature1, while other cardiac ischemic events have been associated with supratherapeutic levels of tacrolimus2. The morning of his vasospasm his tacrolimus level was 14.8 ng/ml on a dose of 0.5 mg sublingual q12 hours, which falls in the high end of the therapeutic range.

Reference(s):

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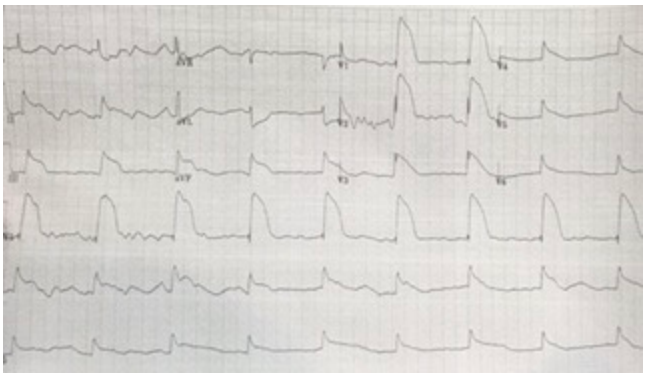
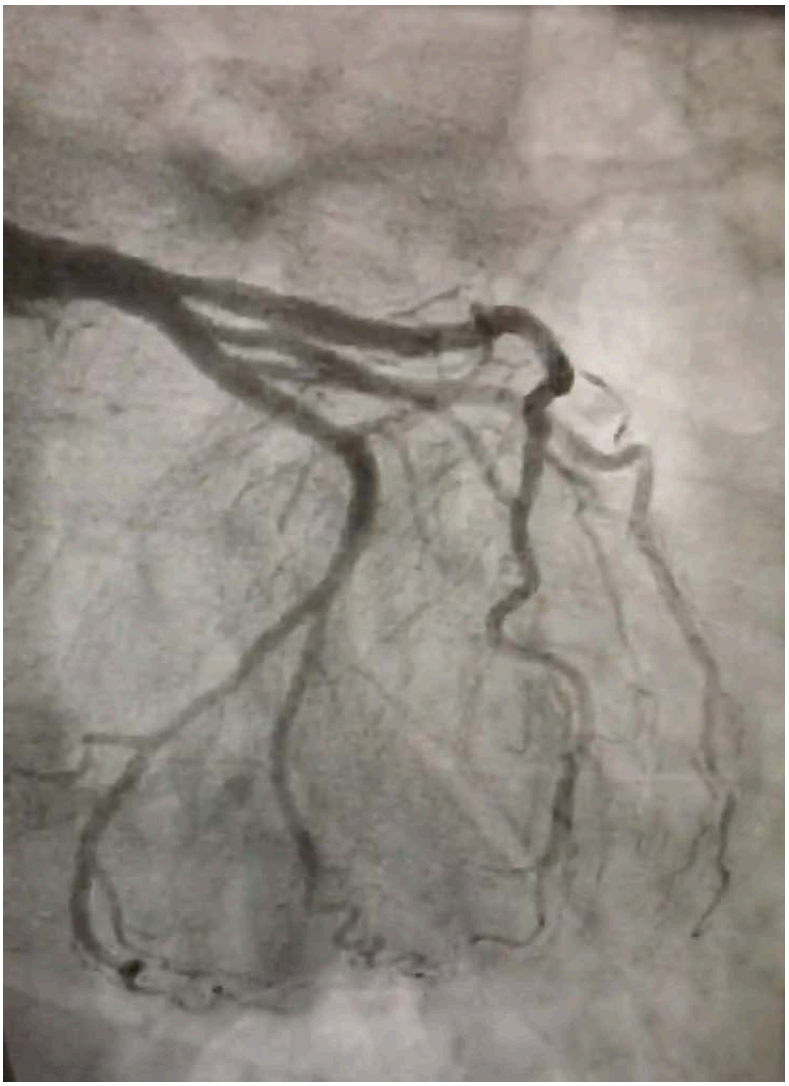
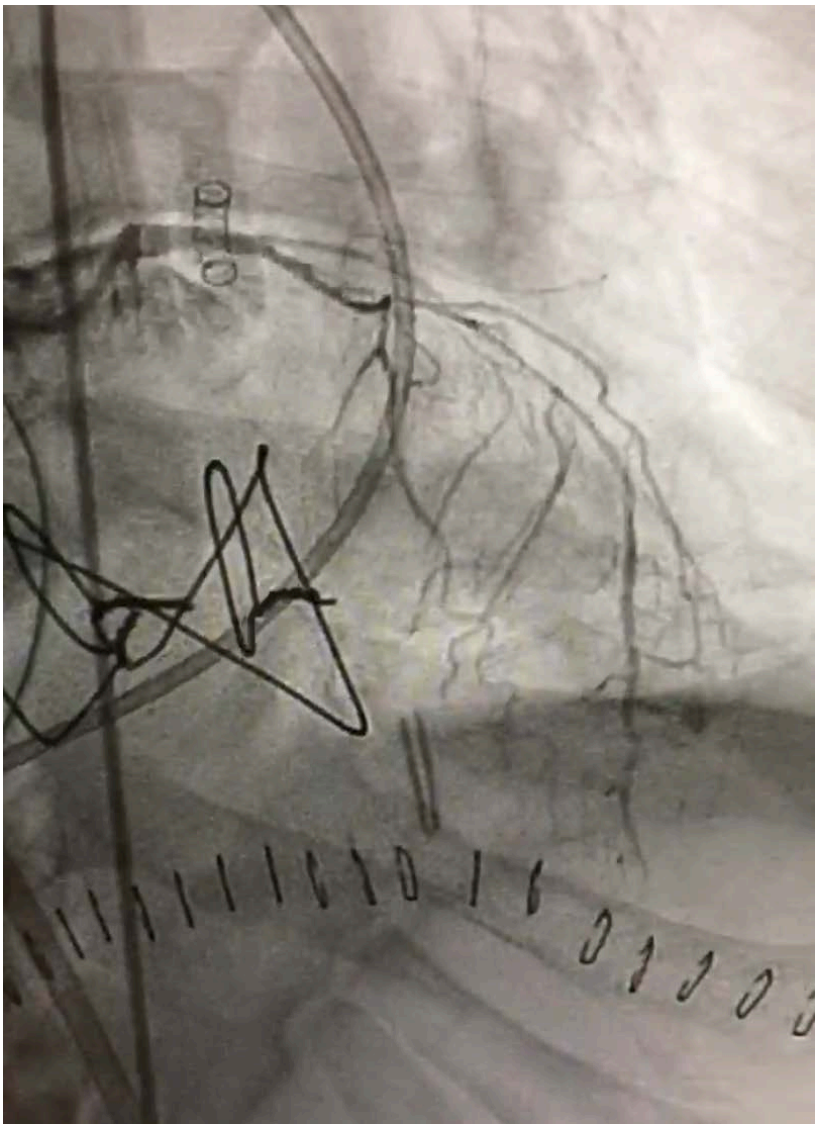
2. Cardiovasc Drugs Ther 2003; 17:141-9.







MCC 43 (2033)

Near-Fatal Kinking of Mammary Graft Due to Severe Emphysema

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Introduction: We report a case of a 75 yo male who had a near-fatal kinking of his mammary artery graft upon sternal closure due to distended, emphysematous lungs impinging on the mammary graft. Patient arrived for elective CABG, but TEE also revealed the unanticipated finding of severe mitral regurgitation. During the surgical exposure of the mammary artery, the surgeon noted that the emphysematous lung bullae were interfering with surgical exposure. The lungs were each crossing the midline. Thus, surgeon requested that the tidal volume be decreased to facilitate his surgical exposure. This was done in a step-wise fashion down to a 300 ml TV, with a compensatory increase in ventilator rate up to 22. The patient underwent an elective CABG times 3 and a mitral ring placement. Free LIMA to LAD, a Y graft vein to OM, and reversed SVG to RPDA. PMH: The patient had a PMH of severe COPD with bullous emphysema. He was dependent on home nasal cannula oxygen. Pre-operative Pulmonary Function Tests revealed an FEV1/FVC of 50%. Pt had a 60 pack-year history of smoking and had quit smoking 3 months previously.

Methods: After the sternum was wired closed, pt suffered a severe hemodynamic deterioration with new septal WMA requiring emergent re-opening of the chest. No surgical bleeding was found in chest, nor was pericardial fluid observed. Careful surgical examination revealed kinking of his mammary artery graft upon sternal closure due to distended, emphysematous lungs impinging on the mammary graft. The patient was re-heparinized, and using an off-bypass technique, the mammary was transected near its origin off the subclavian, and the mammary was instead grafted onto the hood of the vein graft for the OM. In this position, the graft no longer was impinged upon by the distended emphysematous lungs. Doppler flow was excellent throughout the course of the mammary. Subsequently, the patient's sternum was able to be closed without hemodynamic impingement.

Results: It is routine technique in cardiac surgery to carefully size the graft length so that it is neither too short to comfortably reach the target anastomosis, nor excessively long so that it may fold over or kink, thus leading to a potentially catastrophic mechanical blockage of blood flow. Problems with internal mammary grafts have been described previously. Brenot described two cases in 1988 diagnosed post-operatively and in which re-operation was needed. Sachdeva reported a case where the mammary graft only kinked during expiration The use of stents to correct kinking post-operatively has been reported. However, Cetindag et al describe a thoracotomy was necessary to correct a kink in a right IMA graft. Delayed kinking was managed in one report also with stenting.

Conclusion: This report describes mammary artery conduit kinking due to impingement by an emphysematous lung during chest closure. Although COPD is well described to increase complications in CABG surgery , it has not been previously associated with the kinking of a left internal mammary artery graft. Even though the PFT's in our patient suggested severe lung disease (an FEV1/FVC of 50%), this has not been reported to be associated with LIMA kinkage. This report highlights another contribution that COPD can make to increased morbidity following CABG surgery, and alerts readers to watch for this complication in susceptible patients.

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MCC 44 (2265)

Anticoagulation with Bivalirudin in a Complicated Patient with SMA Thrombosis Who Developed Heparin-Induced Thrombocytopenia and Thrombosis (HITT) and Failed Argatroban Therapy

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Introduction: Heparin-induced thrombocytopenia and Thrombosis (HITT) is a drug reaction characterized by platelet activation, thrombocytopenia, hypercoagulable state, and a resulting increased risk for thrombosis. The clinical diagnosis is supported if platelet-activating antibodies are detectable. Treatment includes cessation of heparin and use of an alternative non-heparin anticoagulant.(1) Here it is described the case of an obese patient who underwent gastric sleeve surgery, developed SMA thrombosis and was started on heparin for anticoagulation, who later developed HITT. Patient failed argatroban therapy, and it was decided to start anticoagulation with bivalirudin.

Methods: 36 year-old male patient with BMI of 55.5, underwent gastric sleeve surgery. His postoperative course was complicated by SMA thrombosis, necrotic bowel, required emergent exploratory laparotomy, bowel resection and was admitted to the Intensive Care Unit post - op. He was started on anticoagulation with heparin infusion. His ICU course was significant for prolonged respiratory failure, pneumonia, bacteremia, sepsis, renal failure and anemia. He was found to have thrombocytopenia with positive PF4 and SRA; thus a diagnosis of HITT was made, heparin was discontinued and he was started on argatroban infusion. PTTs were followed and dose titrated accordingly to hospital protocol and platelet count normalized; a few days later in spite of achieving therapeutic PTTs, patient presented with Deep Venous Thrombosis of lower and upper extremities including Right Subclavian and Internal Jugular veins. Central venous access was required for TPN and renal replacement therapy. Hematology was consulted and patient was started on bivalirudin infusion. At this point patient developed upper GI bleeding, with a negative upper GI endoscopy, except for mild esophagitis. He received transfusion of Packed Red blood Cells. The cause of GI bleeding was deemed most likely secondary to anticoagulation and a lower therapeutic range of PTT was accepted.

Results: Patients who develop HITT will have an ongoing need for anticoagulation due to the risk of thrombosis associated with this entity, and possibly also for the condition for which heparin was administered initially; such is the case of this patient who was started on anticoagulation secondary to history of SMA thrombosis. Literature recommends alternative non-heparin anticoagulants to treat it, including fondaparinux, bivalirudin, argatroban(1). Direct thrombin inhibitors are effective as anticoagulants for patients with HIT or presumed HIT(2). Bivalirudin and argatroban were similar in achieving and maintaining therapeutic anticoagulation goals, clinical outcomes, and safety(3). Based on

average use and average wholesale price, bivalirudin cost less per day(2). For patients with normal renal and hepatic functions, the choice between agents may depend on clinician or institutional preferences. In patients with renal failure or dysfunction, argatroban is the drug of choice, secondary to its hepatic metabolism. For refractory HITT, it has been described the use of therapeutic plasma exchange and rituximab immunosuppression. (4) It has not been studied the use of a direct thrombin inhibitor after another one has failed.

Conclusion: Direct thrombin inhibitors are effective to treat HITT. Renal and hepatic function tests are necessary when choosing the right anticoagulant. It has not been studied the use of a direct thrombin inhibitor after another one has failed.

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MCC 45 (1822)

Pneumonectomy After Trauma and Complex Airway Management in the Critical Care Setting

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Introduction: Pneumonectomy immediately after trauma is an enormously risky procedure associated with extremely high mortality. We present a case of successful post-traumatic pneumonectomy. Key points of single lung ventilation, the use of extra-corporeal membrane oxygenation (ECMO) in ARDS and right heart failure, and management of a complex airway after the development of bronchial stump leak are discussed.

Methods: 21 year old male with no past medical history presented with a gunshot wound to the right pulmonary hilum which resulted in a bilateral thoracotomy with a right sided total pneumonectomy. In addition, the massive resuscitation led to an abdominal compartment syndrome requiring an exploratory laparotomy and decompression. In the immediate postoperative period, due to refractory hypoxia and right sided heart failure, the patient was placed on VA-ECMO. The patient was eventually weaned off VA-ECMO, but continued to require high ventilator support. Subsequently, the patient developed a bronchopleural fistula at the pneumonectomy stump site. This challenging airway situation was managed with a left sided double lumen tube to isolate the left lung and allow the right bronchial stump to heal. Due to pneumonias and difficulty keeping the double lumen tube patent, the patient had to be initiated on VV-ECMO to safely perform a tracheostomy with modified inner cannula inserted into the left mainstem bronchus (Figure 1 and 2). As a result of the prolonged intubation of the left mainstem bronchus an uncommon complication of bronchomalacia. He continues ventilator wean and rehabilitation.

Conclusion: Critical care management of the trauma patient with a penetrating injury of the chest is challenging. The nature of the injury and required surgical treatment can predispose the patient to a high morbidity and mortality if total pneumonectomy is required. Retrospective studies have shown mortality rates of 50% in patients requiring a pneumonectomy. Specifically, right sided pneumonectomy has been shown to have a greater incidence of bronchopleural fistula. Our case demonstrated the early use of VA-ECMO in the acute trauma setting of pneumonectomy, severe post-traumatic ARDS, and right ventricular failure. A review of the literature suggests that double lumen tubes are the preferred method for prolonged periods of lung separation in the intensive care unit. A novel method of safely performing a tracheostomy in a patient with bronchial leak was employed using VV-ECMO to ensure adequate oxygenation of the patient. No long term studies exist to expose complication rates such as the bronchomalaica subsequently developed by this patient. Additionally, the need for laparotomy,

likely due to the massive volume resuscitation at initial presentation, has been linked to the development of ARDS. The use of ECMO allowed this patient to remain neurologically intact.

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Figure 1: Chest Xray showing reinforced endotracial tube through a tracheostomy

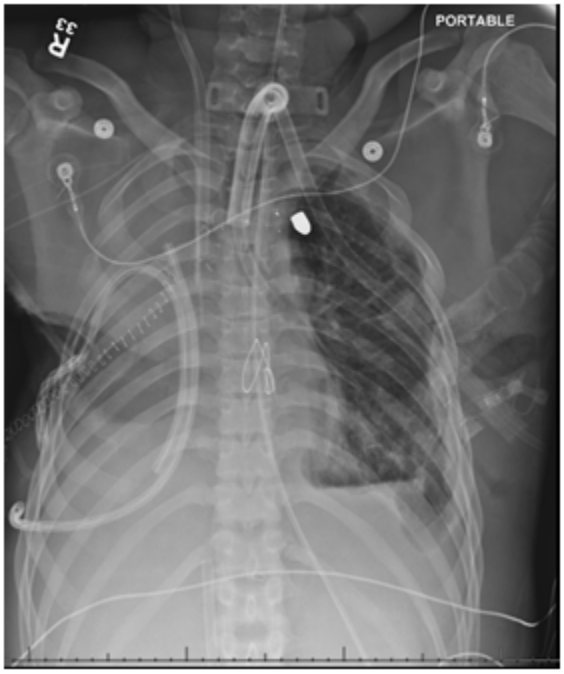
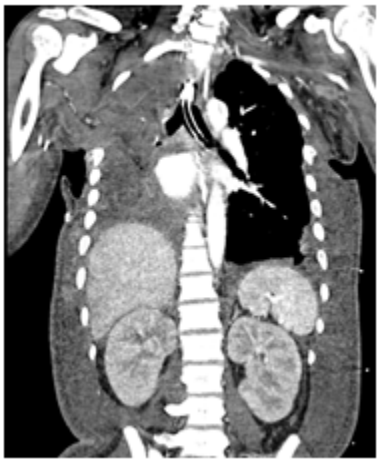


Figure 2: CT Scan showing reifornced endotrachail tube through a tracheostomy



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MCC 46 (1192)

Case Report: Metastatic Papillary Thyroid Carcinoma with Refractory Thyroid Storm

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Introduction: 71 yo male with leg weakness secondary to pelvic mass. Biopsy was performed and showed metastatic papillary thyroid carcinoma. Two days post-op patient progressed to thyroid storm. Patient was medically managed with numerous med and eventually plasmapheresis. He achieved a euthyroid state and was taken to the OR for a thyroidectomy.

Methods: 71 yo hx of CKD, HTN, dyslipidemia, obesity, OA, A-fib on anticoagulation and diastolic heart failure. Pt had a vague hx of abnormal TFTS 2014. He had worsening back pain for 2 months leading to leg weakness. Transferred from outside hospital for large pelvic mass. Admitted by ortho for 2 day hx of right foot weakness and increased rt leg pain walks with a cane at baseline now not able to ambulate. CT showed pulmonary mets and recent echo and stress test negative. Echo on admission showed hyerdynamic heart EF > 70% no all motion abnormalities. Pt was admitted, anticoagulation reversed with Vit K and FFP and scheduled for tumor biopsy Procedure performed without incident. Eventually biopsy results returned and was a papillary(follicular) thyroid carcinoma metastasized to multiple locations. POD 2 pt had progressive confusion leading to agitation, AMS and non-responsiveness on POD 3 received zyprexa and haldol and transferred to ICU intubated empirically started on broad spec abx and put on esmolol drip. HR remained120-140. Free T4 >8.0 T3 > 460 and TSH <0.01 overt thyrotoxicosis. ICU course complicated by multiple infections,thrombocytopenia, AKI and CRRT. Endocrinology team consulted and started Endo consulted and started cholestyramine, methimazole, SSKI, propranolol, and dexamethasone however patient was refractory to medical management. Plasmapheresis eventually needed to achieve a euthyroid state. Patient was then taken for thyroidectomy and trach. Pt brought in to OR for IV induction ETT exchanged for NIM tube with C-MAC A-line and PIV placed Procedure was uneventful NIM ETT exchanged for tracheostomy and pt brought back up to ICU in stable condition.

Conclusion: In patients with thyrotoxicosis prompt management is key. It is a life threatening disease and is diagnosed clinically. Initial supportive management for hemodynamic stability, maintenance for intravascular fluid, avoidance of arrhythmias and fevers are then followed by management of thyroid hormone. PTU and methimazole can be used to inhibit synthesis. Steroids can help inhibit peripheral conversion of T4 to T3. Iodide therapy aids in blocking release of thyroid hormone. Cholestyramine aids in removing thyroid hormone from circulation. However in patients who do not respond to medical management, plasmapheresis is a viable option.

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MCC 47 (1846)

Profound Hyponatremia Secondary to Severe Volume Depletion Following Diverting Loop Ileostomy

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Introduction: Hyponatremia is the most common electrolyte abnormality identified in clinical practice, however, profound hyponatremia, defined as a serum sodium < 125 mmol/L, is only identified in 2-3% of patients (1). Additionally, a profound derangement can be quickly fatal (2). Treatment of severe disorders must be carried out promptly, but this must be done carefully and with adequate monitoring, in order to prevent debilitating neurologic disease (2).

Methods: A 66-year-old female presented to the emergency room on postoperative day number 32 status post colo-vesical fistula take-down, sigmoidectomy, and diverting loop ileostomy with high ostomy output, inability to tolerate PO intake and hypotension. On examination, the patient was noted to be alert and oriented to person, place, time and situation. Laboratory studies in the ED revealed profound hyponatremia with serum sodium of 107 mmol/L, as well as hyperkalemia with potassium of 7.0 mmol/L and acute-on-chronic kidney disease. She was admitted to the surgical intensive care unit for management of severe electrolyte derangement and her hypovolemic hypernatremia was carefully corrected with normal saline and D5 water rehydration to prevent rapid correction. Twenty-four hours after admission, the patient's mental status did deteriorate requiring 48 hours of intubation and mechanical ventilation. When her sodium recovered to a level greater than 110 mmol/L, low flow continuous hemodialysis was utilized with a low-sodium bath to cautiously treat the hyponatremia. Five days following admission, the patient's sodium was corrected within the normal range and she was transitioned to intermittent hemodialysis. Her kidney injury ultimately resolved and she was discharged to home without need for renal replacement and neurologically intact.

Conclusion: Severe volume depletion is a known cause of profound hyponatremia. Simple fluid resuscitation is not an appropriate management strategy in this situation, as the correction of serum sodium may be too rapid and result in osmotic demyelination syndrome. Recommendations for treatment of severe disorders include a maximum correction of 8-10 mEq/L/24 hours (2). This process can be carried out safely and effectively in an intensive care unit with low flow continuous hemodialysis.

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MEDICALLY CHALLENGING CASES 6

Posters: 48-53

Moderator: Taylor Johnston, MD, and Sylvia Wilson, MD

MCC 48 (1195)

Management of Multiple Rib Fractures/Flail Chest with Continuous Serratus Plane Block

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Introduction: After the successful establishment of pectoralis muscles block in the form of Pecs I and Pecs II, Blanco et al. and colleagues have introduced serratus plane block as a safe and easy to perform novel technique with few side effects compared to paravertebral or epidural blocks. A local anesthetic is injected either superficial or deep underneath serratus anterior muscle providing regional anesthesia for chest wall surgeries and perioperative analgesia [1].

Case Report: A 28 -year old male sustained bilateral 1-5 ribs fractures along with bilateral pulmonary contusions and displaced fracture of the manubrium after motor vehicle collision. Besides, the patient suffered subarachnoid hemorrhage and multiple skull fractures. At the emergency department, the patient was intubated with Glasgow coma scale of 6. On the 7th day of admission, for pain control and to facilitate extubation, our team decided to perform left side single shot Pecs I, II as well as right side single shot Pecs II, which did not provide the desirable analgesia and bilateral serratus plane block was done afterward. The followed day, the patient had much improved but still in pain. Left side single shot Pecs I,II and right side single shot Pecs II were provided as well as bilateral serratus plane block and catheter placement for continues serratus block. The catheter was removed three days later. Procedure: • The patient was on fentanyl drip at 1 mcg/kg/hr. He received extra doses of fentanyl/ midazolam for the procedure then weaned after the block was done. • The patient was in supine position and an ultrasound (10-12 MHz) used in the entire nerve blockade procedures. • For the single shot Pecs blocks, we used 21-G, 9 cm StimuQuik needle, the main dose is 20 mL 0.25% Ropivacaine per each single shot block. • For the serratus plane block and catheter placement, we used 18-G, Tuohy needle, the main dose is 20 mL 0.25% Ropivacaine at serratus plane. The epidural catheter was connected to 8mL/hr continuous infusion of 0.2% Ropivacaine. • For pain break: Hydromorphone IV PRN was administrated and Lidocaine Patch Q24hr. • The pain was well controlled (rated 2/10 on a pain scale).

Results: Discussion Pectoralis muscle block (Pecs I) is achieved by injecting the local anesthetic between pectoralis major and pectoralis minor muscle, blocking both medical and lateral pectoral nerves. Pecs II block is done by injecting the local anesthetic between pectoralis minor and serratus anterior muscles, blocking intercostobrachial, third to sixth intercostals, and the long thoracic nerves [2]. Serratus anterior Serratus anterior muscle (SAM) block is done by injecting the local anesthetic in the fascia deep or superficial to SAM, blocking thoracic intercostal nerves and providing complete hemithoracic analgesia [1]. Such approach has provided a new era for the ultrasound-guided regional block. Successful use of serratus plane block has been reported in breast surgery [3], shoulder surgery [4], placement of

subcutaneous implantable cardioverter defibrillator [5], and pain control in case of multiple ribs fracture [6].

Conclusion: 1. Pecs I, Pecs II, and serratus plane block have shown to be an effective regional nerve block in cases of thoracic cage injury. 2. Decrease the risks with paravertebral and thoracic epidural analgesia i.e. pneumothorax and the need to add extra analgesia. 3. In our patient, continuous serratus plane block using catheter has provided analgesia for 3 days.

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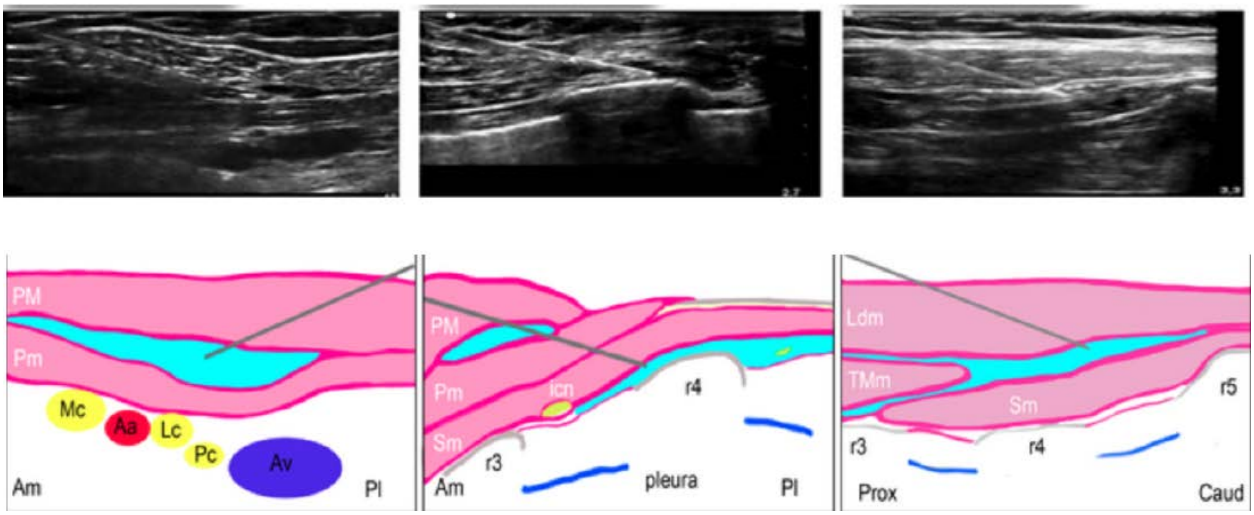

MCC 49 (1449)

Oxygen Consumption and Carbon Dioxide Production Monitoring to Facilitate Weaning From Veno-Arterial and Veno-Veno Extracorporeal Membrane Oxygenation: A Case Report

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Introduction: Extracorporeal membrane oxygenation (ECMO), both veno-veno (VV) and veno-arterial (VA), is increasingly used to salvage patients from life-threatening acute yet reversible cardiopulmonary failure. Standard methods to wean VV and VA ECMO do not have defined standards for physiologic monitoring (1.). Often weaning off VV and VA ECMO is based on parameters such as arterial blood gases and transesophageal echocardiography. Pulmonary artery catheters are often unable to determine cardiac output with VA and VV ECMO. Gas exchange monitoring is indicated in critically ill patients for indirect calorimetric determination of caloric needs (2.). We report a novel, physiologically accurate method to wean from VA and VV ECMO by measuring lung oxygen uptake (VO2) and carbon dioxide production (VCO2) and the respiratory quotient (RQ) using volumetric gas exchange monitors.

Methods: A 31 year old patient, with past medical history of post-traumatic stress disorder and chronic insomnia, presented to an outside hospital with acute hypoxemic respiratory failure requiring intubation; on attempted intubation the patient aspirated and had a cardiac arrest secondary to hypoxemia. After transfer to our hospital the patient had continued refractory hypoxemia that did not respond to optimization of mechanical ventilation, inhaled nitric oxide therapy, or neuromuscular blockade. We elected to initiate ECMO to treat refractory hypoxemia. Full VA ECMO (2 lumen jugular venous and femoral arterial) support was therefore initiated and hypothermia to 33 degrees for 24 hours was pursued. After two days of VA ECMO support the patient was then converted to VV ECMO. After an additional two days of VV ECMO support the patient was decanulated from ECMO successfully. The patient had brain stem deficits on clinical exam. At seven days, the patient opened eyes to voice; and at twelve days the patient was extubated. The patient was transferred for neurologic rehabilitation and identified to have Lance-Adams syndrome. During ECMO period, we standardly institute gas exchange monitoring with CAiOVX monitor (Carescape B650/B850, GE Healthcare) to determine volumetric gas exchange. During weaning periods we anticipate that stability of gas exchange and a normal and stable respiratory quotient less than 1.0 are consistent with cardiopulmonary reserve necessary to tolerated cessation of ECMO (3.).

Results: Our patient was tested daily per our standard practice for readiness for weaning from ECMO. The patient was weaned from VA ECMO by reducing circuit flow rate. Gas exchange from day 1 to day 2 improved and arterial pressure was maintained; although gas exchange and oxygenation was somewhat

impaired, arterial blood pressure was maintained. After arterial decannulation, two lumen right jugular cannula was utilized for VV ECMO and again, on a daily basis, gas exchange was tested and confirmed. On day 4 of ECMO with pressure control ventilation and FiO2 of 65 percent, gas exchanged through ECMO was stopped with ECMO weaning. VO2, VCO2, and RQ were in stable and normal ranges during this weaning.

Conclusion: A few authors have considered using gas exchange monitoring to measure physiologic stability during ECMO (4.)(5.). In this case, gas exchange monitoring proved physiologic stability prior to conversion of VA to VV ECMO and prior to decannulation of VV ECMO. Further investigation into the method and benefit of volumetric gas exchange monitoring during ECMO is warranted.

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MCC 50 (1327)

A Novel Approach to Hemostasis During Hemorrhagic Shock

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Introduction: Massive transfusion, defined as the replacement by transfusion of 10 units of red cells in 24 hours, is practice used to treat massive and uncontrolled bleeding in a patient with hemorrhagic shock. Physiologically, hemodynamic compensatory mechanisms maintain vital organ perfusion until approximately 30% total body volume loss. Massive transfusion protocols (MTPs) utilize a pre-defined ratio of RBCs, FFP/cryoprecipitate and platelets units (random donor platelets)-such as 1:1:1. This ratio is designed to disrupt the 'lethal triad' of acidosis, hypothermia, and coagulopathy that can result in a patient in hemorrhagic shock. However, despite the use of MTP, bleeding can continue. Physicians can utilize off-label prohemostatic drugs-such as antifibrinolytic agents, fibrinogen, and PCC-in efforts to decrease bleeding and subsequent blood loss.

Methods: A 45 year old female (51kg) was brought to University Hospital's trauma department after sustaining open abdominal injuries from a bus collision. Upon arrival, patient was immediately taken up to the OR due to her extensive abdominal trauma. The patient sustained lacerations to both her liver and spleen that persisted despite multiple operative interventions to control the bleeding. Massive Transfusion Protocol was in effect, which the patient had received 3 liters of crystalloids, 33 units of pRBC, 31 units FFP, 2 packs of platelets, and 2 units of cryoprecipitate though the patient continued to bleed through the abdominal packing. At this point, it was decided to administer 540 units of aPCC (Feiba), which immediately decreased the bleeding. The patient was observed in the OR and then taken to the SICU for observation.

Results: Prothrombin complex concentrate (PCC) is an inactivated concentrate of factors II, IX, and X, with variable amounts of factor VII. Currently the primary indication for use of PCCs is urgent reversal of Vitamin K antagonists. In the trauma patient, levels of fibrinogen tend to decrease while the levels of thrombin tend to increase. Off-label use of PCCs may subsequently be considered for patients with ongoing bleeding despite restoration of fibrinogen levels. FEIBA is the only activated PCC product available-containing activated Factor VII and inactivated forms of Factors II, IX and X. In addition to supplying factors to maintain coagulation, FEIBA's mechanism of action also entails action by prothrombin enzymes to enhance thrombin generation on the platelet surface. FEIBA is currently indicated to for treatment of Hemophilia A and Hemophilia B, as well as bleeding in non-hemophiliacs with acquired inhibitors to Factors VIII, IX, and XI. Studies comparing effectiveness of PCC to FFP indicate that PCC products provide a more rapid decrease in INR values as compared to FFP. Finally, unlike FFP,

PCC's are free of leukocytes and are less likely to cause transfusion related acute lung injury (TRALI) or infusion reactions. Potential complications that arise from use of PCCs are thromboembolic in nature.

Conclusion: Massive transfusion protocol has been a valuable and vital component in treating the hemorrhagic patient. The ASA recommends that when traditional methods fail, recombinant factors may be used as a second line treatment. While, FEIBA is approved for anticoagulation reversal in hemophiliac patients, its use in hemorrhagic shock has not been sufficiently studied. In this particular case, FIEBA was utilized as a last resort effort to stop bleeding.

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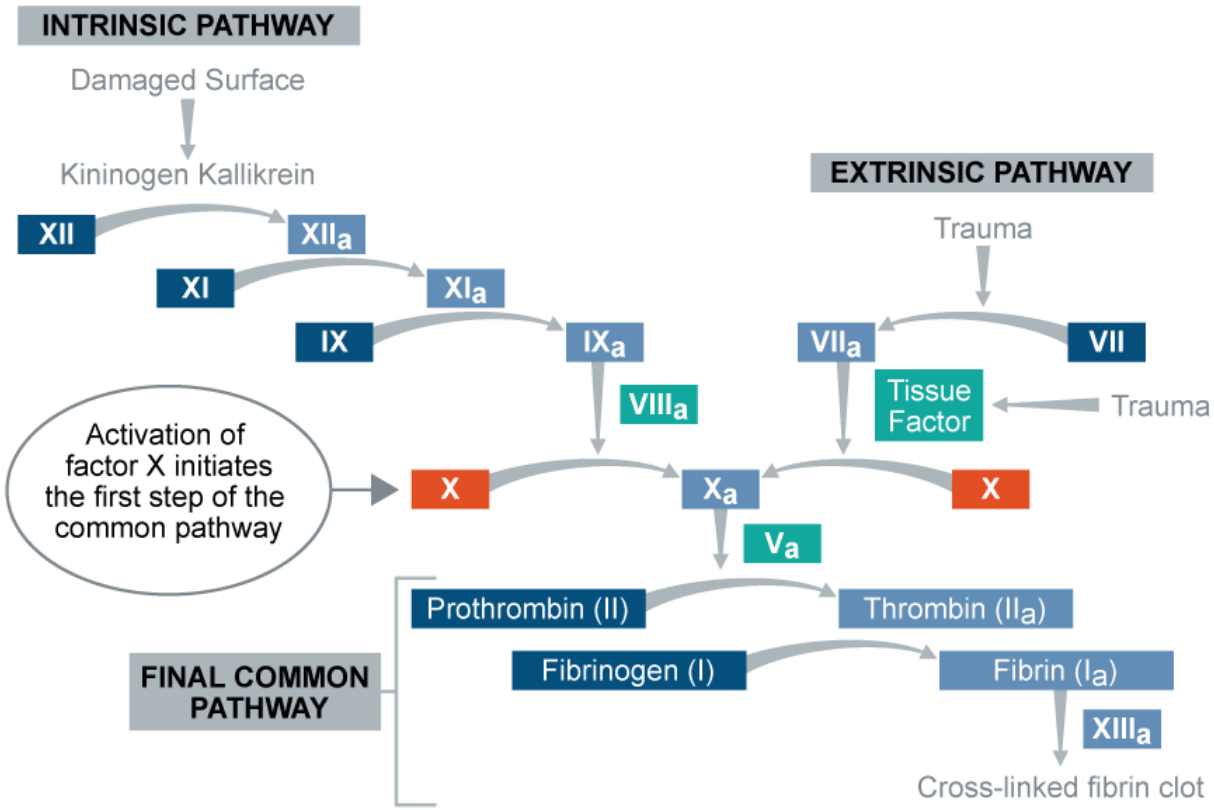

MCC 51 (1821)

Progressive Pulmonary Hypertension Status Post Trans-Septal Approach Mitral Valve Repair

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Introduction: We present a case of a hemodynamic monitoring in the ICU with pulmonary artery catheter (PAC) and enlarging atrial septal defect (ASD) status post mitral valve replacement. Progressively worsening symptoms and rising PA pressures prompted further investigation with TEE, which identified a new ASD. Key points of PAC use and monitoring in the critical care setting are discussed.

Case Description: The case is a 66 year old male with a past medical history significant for diabetes, hypertension, COPD, and previous aortic valve replacement (AVR) presented with severe symptomatic mitral stenosis. Preoperative TEE demonstrated a preserved ejection fraction with severe mitral stenosis (area by plannimetry 0.8cm2, area by PISA 0.7cm2, area by PHT 1.6cm2, peak gradient 9, mean gradient 5.6mmHg). He underwent trans-septal approach MVR with a 25mm bioprosthetic valve. Post-operative course was complicated by development of complete AV block requiring pacemaker placement. In addition, it was noted that his systolic PA pressures (PAP) which were preoperatively 20-30mmHG, rose progressively over the first post-operative week as high as 80 mmHg. This was associated with dyspnea at rest as well as coughing spells with evidence of cyanosis. Follow up TEE on POD 16 discovered a large ASD near the anterior leaflet of the mitral valve measuring 1cm in diameter. The ASD demonstrated bidirectional flow with a predominant left to right shunt with a QP: QS of 2:1. Right heart fluid overload, moderate tricuspid regurgitation, and decreased right ventricular systolic function were noted at that time. Follow up TEE on POD 22 showed the ASD had further increased in size to 1.4cm in diameter. At this point, the patient required continued inotropic support for RV failure. The patient subsequently underwent an open ASD repair which revealed the ASD had developed at a different site from the trans-septal puncture site.

Conclusion: Causes of elevated PA pressures in the immediate post-operative period are numerous and both invasive and non-invasive hemodynamic monitoring are critical to diagnosis and management. Iatrogenic ASD status post MVR remains a rare cause of postoperative ASD. Use of invasive monitoring with PACs has decreased in favor of non-invasive imaging even though studies are inconclusive regarding overall outcomes. Echocardiography can reliably estimate PAPs by Doppler assessment of

peak tricuspid regurgitant jet velocity and application of Bernoulli's principle. However, continuous TEE monitoring in the ICU setting remains impractical and costly, while PAC availability is widespread. While PAPs rise with ASDs, they must be at least 10mm in diameter to cause a hemodynamically significant shunt. Immediate postoperative monitoring with PAC in this case triggered further workup, discovery, and eventually treatment of a rare complication following MVR.

Reference(s):

1. Cardiol Clin (2013) 31(4): 545-65.
2. Anaesthesia (2015) 70: 264-71.
3. Critical Care (2006) 10(suppl 3): 1-2.
4. Circulation (2006) 114: 1645-53.

MCC 52 (1955)

Safely Extending Indications for Bedside Percutaneous Tracheostomy with Innovative Hybrid Surgical Technique

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Introduction: In this report we advance further modifications with a simple, safe hybrid tracheostomy (HT) procedure that combines the safety and exposure elements of an open ST with the benefit of bedside dilatational PT. We have been able to safely carry out this bedside HT in patients who otherwise meet all criteria for unacceptably high risk for PT and would otherwise have needed transport to the operating room for surgical tracheostomy.

Methods: Current indications for this procedure include traumatic injuries, tracheobronchial hygiene, low Glasgow Coma Score, upper airway obstruction, prolonged oral intubation due to failure to wean from mechanical ventilation, reduced sedation requirements, patient comfort, and pulmonary infection. Dilatational PT technique has been performed safely on a large number of patients since the original description and is considered by some as the gold standard for critical ill patients. A recent meta-analysis comparing PT to standard open ST did not demonstrate significant differences in complications. Long-term outcomes are similar regardless of surgical approach and have been confirmed in a multicenter retrospective clinical trial.

Results: Patients were positioned flat but without neck extension and given adequate sedation followed by paralytic agents.The posterior portion of the cervical neck brace was left in place on patients with cervical injuries. Continuous oxygen saturation, blood pressure and ECG were monitored. The anterior cervical area was prepped and draped for sterile surgical procedure in the usual fashion. After identification and assessment of the anatomical landmarks, 2.5 longitudinal incision centered on the trachea was made 1-2cm above the notch of the manubrium. The incision was made just large enough to accommodate two Weitlaner retractors placed at a perpendicular angle to facilitate exposure and correct entry site into the trachea. Subcutaneous tissues were divided with blunt dissection until it was possible to palpate any portion of the trachea below the cricothyroid membrane and below the first tracheal ring with the operator's index finger. When the first and second tracheal ring could be palpated through the incision, the two Weitlaner retractors were placed perpendicular to each other exposing soft tissue over the trachea. A bronchoscope was then introduced by a third operator through the endotracheal (ETT) tube and the ETT and bronchoscope were slowly withdrawn to expose the first and second tracheal ring from inside the trachea. We were able to minimize the amount of time that the airway was partially occluded by the bronchoscope by doing all the surgical dissection prior to placing the bronchoscope. Using standard PT technique under direct continuous visualization from within the trachea a needle was place through the incision into the trachea in the midline between the 1st and 2nd

rings. Using Seldinger wire technique, progressive dilation was carried out and finally the tracheostomy tube was introduced with endotracheal position confirmed by direct bronchoscopic visualization. Tracheostomy tube balloon was inflated, retractors were removed, and the flanges of the tracheostomy tube were secured to the skin with four interrupted sutures.

Conclusion: There were no complications in any patient; no instances of oxygen desaturation, arrhythmia, or required transfer to the operating room. The time to carry out the HT procedure was equivalent to PT.

Reference(s):

1. J Am Coll Surg. 212,163-70, 2011
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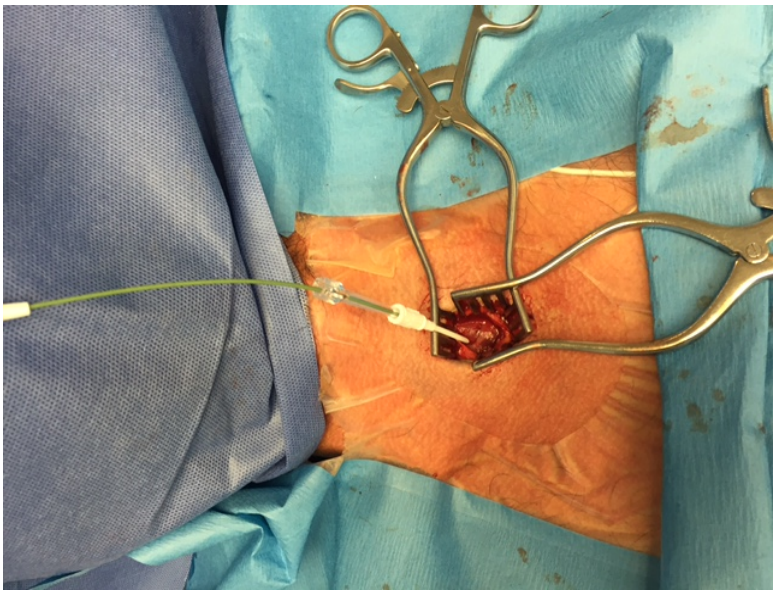

MCC 53 (1688)

Biventricular Assist Device and Extracorporeal Membrane Oxygenation for Giant Cell Myocarditis

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Introduction: We present a case of giant cell myocarditis (GCM) where extracorporeal membrane oxygenation (ECMO) and biventricular ventricular assist device (VAD) were used as a bridge for heart transplantation.

Methods: GCM is a rare idiopathic disease with a high mortality rate. Patients are often young (age 16-69) and present with mild subacute symptoms (dyspnea, decreased exercise tolerance, orthopnea, peripheral edema) followed by fulminant heart failure. Diagnosis is made histologically by diffuse fibrous tissue with cell necrosis and multinucleated giant cells inflammation. Unfortunately, the treatment options are limited to aggressive immunosuppression and/or transplant either with or without mechanical cardiac support bridge. Multiple publications support the use of ECMO or VAD. The most common cause of death is congestive heart failure while awaiting transplant. Recurrent GCM years after initial resolution supports the belief that patients require long term immunosuppression.

Results: A 44-year-old male with a negative past medical history was found to have sinus tachycardia and ST depressions on routine physical. Outpatient workup included a nuclear stress test that revealed a fixed defect of the inferior-septal wall with EF 23%. MRI was significant for myocardial infiltration. He was started on a heart failure regimen and fitted for a LifeVest. Shortly thereafter, he presented to an outside institution with dyspnea. Cardiac catheterization did not reveal significant obstructive coronary disease but the procedure was complicated by acute cardiogenic shock. After discharge home, he presented again to an outside facility with dyspnea. Upon arrival, he was diagnosed with cardiogenic shock and admitted to the CCU with refractory hypotension, severe acidosis, and complete heart block. The decision was made to insert an intra-aortic balloon pump and a transvenous pacemaker. Cardiac catheterization with biopsy was significant for giant cell myocarditis and fulminant heart failure. Concurrently, he began to have worsening hepatic and renal function requiring continual renal replacement therapy. The team inserted a left ventricular Impella and consulted our institution for possible emergent mechanical support with ECMO. After assessment of his acute illness, we felt ECMO was indicated for salvage therapy. We utilized peripheral ECMO and removed the Impella device as he had developed a large left ventricular thrombus. After days of immunosuppression and vasopressor support he failed to show signs of improved cardiac function requiring implantation of long-term cardiac support. We implanted a Thoratec paracorporeal left VAD and reconfigured the ECMO with central cannulation of the pulmonary artery. One week later, we implanted Thoratec paracorporeal right VAD cannulas connected to ECMO for continuing ARDS treatment. Despite all our efforts over the course of 6

weeks, our patient's cardiac function did not improve resulting in refectory multisystem failure. He unfortunately passed after withdrawal of care as per family request.

Conclusion: GCM is a rare and severe disease requiring high degree of suspicion for diagnosis in the context of unexplained acute heart failure in an otherwise healthy patient. One must attain am immediate biopsy to confirm diagnosis and consult for mechanical cardiac support and heart transplant as soon as possible for best outcome. Once treated, surveillance biopsies are required to promptly identify and treat recurrence.

Reference(s):

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2. International Society for Heart and Lung Transplantion, 21, 674-79, 2002.
3. Archives of Pathology and Laboratory Medcine, 140, 1429-34, 2016.

MEDICALLY CHALLENGING CASES & CRITICAL CARE 1

Posters: 54-60

Moderator: Jean-Francois Pittet, MD, and Madiha Syed, MD

MCC 54 (1046)

Impella 2.5 for LV Support after STEMI: New FDA Approval for Cardiogenic Shock

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Introduction: We describe the use of an Impella 2.5 as bridge to recovery after a myocardial infarction (MI).

Results: A 53-year-old male presented in cardiogenic shock after an ST elevation MI. He was intubated for altered mental status, supported with an intra-aortic balloon pump (IABP) and transferred to our institution. Admission echocardiography revealed an ejection fraction (EF) of 10% with severe anterior wall dyskinesia. The patient arrested in the ICU, requiring CPR. An emergent cardiac catheterization was performed and demonstrated 95% occlusion of the left main coronary artery which was stented. The IABP was removed and an Abiomed Impella 2.5 was inserted. The Impella was left in place as a temporary left ventricular (LV) assist device and he returned to the ICU on high doses of ionotropic and vasopressor support. His lactate peaked at 5.8mg/dL and troponin at 440ng/mL. He moved all extremities but was not following commands. Within 24 hours of Impella support he cleared his lactate, creatinine normalized, had decreased vasopressor and inotrope requirements and increased his urine output. Three days after stent placement, his EF improved to 25%. On postoperative day (POD) 6 the Impella was removed and an IABP was placed. He was extubated on POD9. His course was complicated by bouts of hyperactive delirium. By POD15, the patient was weaned from IABP and TTE showed an EF of 35%. He went home on POD23.

Conclusion: Cardiogenic shock following acute MI and coronary revascularization is a common indication for percutaneous mechanical ventricular support. Impella or VenoArterial ECMO are suitable options as temporary percutaneous LV assist devices. In this acutely ill population, Impella provides rapid hemodynamic improvement and effectively functions as a bridge to bridge or bridge to recovery. Recently, the FDA has approved the Impella 2.5 as a temporary percutaneous assist device to be used following acute MI with LV failure not responsive to medical management. The initial absence of a clear mental status and rapid organ recovery with Impella support convinced us not to advance to VenoArterial ECMO or LVAD and instead use it as a bridge to recovery. We report the safe and effective use of the Impella 2.5 alone for 6 days as temporary assist device.

CC 55 (2080)

A Comparison of Basic vs In-Depth Education for Families of ECMO Patients

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Introduction: Patients considered for Extracorporeal Membrane Oxygenation (ECMO) evaluation are always critically ill. Their families face a significant burden of stress during their loved one's hospitalization. Our institution is unique in that we not only accept internal transfers to our ECMO center, but also transfers from outside hospitals already on ECMO or we will remotely cannulate patients, if necessary. Given the extreme circumstances surrounding either internal or external transfers to our ECMO center, the burden on families can be overwhelming. Currently, we have no formal standardization of education materials for ECMO patient family members regarding the unique care and support their loved ones will be receiving. Our objective is to compare two depth levels of educational resources for family members, both intended to educate regarding ECMO.

Methods: The study population consists of the families of ECMO patients and not the patients themselves because the overwhelming majority of ECMO patients or consults are critically ill and lack appropriate level of consciousness. We will sequentially assign the families of new inpatients being evaluated for or recently placed on VV/VA ECMO to one of 2 groups: 'basic education group' or 'in-depth education group'. All education materials will be delivered either by the critical care attending physician of the patient, the critical care fellow caring for that patient, or the RN ECMO coordinator. The provider delivering the printed education materials will describe the information contained therein. They will then give copies to family members to keep. All family questions will be answered as usual. Within 24-48 hours later, the provider will follow-up with family members in person or via phone to address the education materials provided initially, to answer a short survey, and to assess their satisfaction with what was provided.

Results: We plan to assign 10 patients to the basic education group and 10 to the in-depth education group. It is expected for patient family members assigned to the in-depth education group to show higher levels of satisfaction with the resources made available to them. Currently, we have enrolled and interviewed 5 individuals (2 basic, 3 in-depth) with individuals in both groups displaying similar degrees of satisfaction from their respective educational resources. Most notably, all 5 'strongly agreed' with all questions pertaining to the provider's explanation and answering questions satisfactorily.

Conclusion: Given the challenges and stresses that families face when their loved ones are critically ill, it is rare that they receive satisfactory education or time to digest information about care for their loved one. Standardizing the basic information that we provide to patient families' ensures that they have

both. In our comparison of education materials, we predict that families will express more satisfaction with the in-depth educational materials, will have fewer questions with the in-depth educational materials, or both. Thus far it seems that patients from both groups show the highest levels of satisfaction regarding their provider's explanation of ECMO and having their questions answered. It may be that educational resources can only supplement the patient-provider interaction. This information will guide the formation of educational materials for our ECMO unit and the approach our providers take presenting complex patient care to family members.

CC 56 (1344)

Venoarterial ECMO for Recovery From Right Ventricular Failure After Pericardiectomy

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Introduction: Surgical pericardiectomy provides a potentially curative intervention for constrictive pericarditis. However, it is associated with significant post-procedure mortality. In these patients, low cardiac output from right ventricular (RV) failure is one of the most common causes of morbidity and mortality.[1] In the event of severe RV failure refractory to medical management, venoarterial extracorporeal membrane oxygenation (VA-ECMO) may offer a therapeutic alternative providing RV decompression and facilitating myocardial recovery.[2] There is a paucity of reports demonstrating the benefit of VA-ECMO in this setting, herein we report a case to support its utilization for this indication.

Methods: A 50-year-old male with a five-year history of refractory ascites, shortness of breath, and lower extremity edema was admitted to our intensive care unit for surgical treatment of chronic constrictive pericarditis. Immediate post-pericardiectomy transesophageal echocardiography (TEE) demonstrated increased size of the right atrium (RA) and mild RV dysfunction. Within 72 hours, this progressed to severe RA dilation with moderate RV systolic dysfunction and hemodynamic deterioration refractory to optimal medical management and intra-aortic balloon pump (IABP) placement. After developing cardiogenic shock, VA-ECMO therapy was emergently implemented. Determination of cardiac functional recovery was performed by evaluating maintained arterial pressure, adequate organ perfusion, and visualization of ventricular function by echocardiography in the context of ECMO flow and vasoactive infusion rates.

Results: After cannulation, hemodynamic status stabilized with continued vasopressor and inotropic support. During this time, continuous veno-venous hemofiltration was initiated while vasoactive infusions were slowly weaned. On day four of ECMO, RV size and systolic function normalized on TEE. Less than 24 hours later, all vasoactive infusions were successfully withdrawn and the patient was decannulated after a total of 109 hours on ECMO support. The patient was weaned off the ventilator and extubated after two more days followed by IABP removal an additional day later. Apparent sepsis later resulted in significant hypotension and, ultimately, multi-system organ failure. He acutely decompensated twenty-one days after decannulation and care was withdrawn one day later after which the patient expired, a total of thirty days after pericardiectomy.

Conclusion: Prolonged pericardial constriction may alter cardiac architecture and precipitate the state of low cardiac output commonly encountered after pericardiectomy.[1,3] In cases similar to our patient, severe RV dysfunction does not improve and progression to cardiogenic shock refractory to medical

management necessitates intervention with mechanical circulatory support. VA-ECMO is ideal in this setting because of its capacity to provide gas exchange, oxygenation, and circulatory support while decompressing the RV and facilitating myocardial recovery. Although the patient eventually passed away because of sepsis and resultant organ failure, his course on VA-ECMO did result in recovery of cardiac performance. Therefore, it should be considered in the future when similar morbidity is encountered after surgically treated constrictive pericarditis.

Reference(s):

1. Am J Cardiol 2015;116(3):469-473.
2. Med J Malaysia 2015;70(6):369-370.
3. Tex Heart Inst J. 2012;39(2):199-205.

CC 57 (2066)

Percutaneous Cannulation for Venovenous ECMO Without Fluroscopy

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Introduction: Venovenous extracorporeal membrane oxygenation (VV ECMO) provides pulmonary support to critically ill patients via cannulation of the central veins. Recently developed techniques such as percutaneous cannulation have improved ECMO outcomes (1,2) and allow ECMO to be initiated by non-surgeon intensivists. There is limited research into the adverse events associated with this technique and the studies conducted have limited generalizability to bedside VV initiation as they include data from arterial cannulations and often use real-time fluroscopy, something not routinely available in the emergent ICU setting (3,4). Percutaneous cannulation at our program is done without routine fluroscopy and often with assistance of fellow physicians, something not yet reported in the literature. Our study seeks to examine adverse events associated with pecutaneous cannulation under these conditions.

Methods: This preliminary report was designed as a retrospective chart review and included all 30 adult VV ECMO patients cared for from 9/1/2014 to 3/15/2016. Data on adverse events was gathered from the electronic medical record. These were defined as any intra-procedure event requiring intervention, bacteremia, recannulation, limb ischemia, or death within 24 hours. Patients were excluded if cannulation data could not be obtained or if fluroscopy was used. Data was abstracted by study authors and recorded on a standardized form. Baseline characteristics of the participants along with incidence and kind of adverse events were detailed by descriptive statistics and a chi-squared test was used to detect a difference in incidence of adverse events during cannulations with and without presence of a fellow.

Results: Of the 30 patients included 2 were excluded for use of fluroscopy and 14 for lack of operative report. 14 patients underwent abstraction, 5 were female and the average age was 47 with range of 23-69. 5/14 suffered adverse events attributed to cannulation with 3 having intra-procedure events (1 pneumothorax, 2 cardiac arrest), 1 developing bacteremia, 1 requiring recannulation for VV ECMO, 1 suffering from limb ischemia, and 2 dying within 24 hours. Overall in-hospital mortality for this cohort of VV ECMO patients was 8/14. Non-surgeon intensivists performed the cannulation 4/14 times and fellows were present for 3 of the cannulations with no difference found in the rate of adverse events when trainees were present (66% vs 25%, p=.23).

Conclusion: As ECMO continues to expand and expertise grows with percutaneous VV ECMO cannulation, best practices are still being established. Our preliminary data must be interpreted with caution due to it's retrospective nature and is hampered by incomplete reporting and small sample size

but certainly suggests that routine use of fluroscopy during cannulation may reduce incidence of adverse events. No signal of harm was seen when these procedures involved fellows which suggests hands on training may benefit physician education without hampering patient care. Further research is needed to elucidate ideal VV ECMO cannulation techniques and particularly the role of fluroscopy as well as to identify and minimize adverse events associated with this procedure.

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2. Moreno-Cabral RJ, et al: Percutaneous extracorporeal membrane oxygenation. Adv Card Surg 1994; 5:163-179.
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CC 58 (2088)

Practical Management of Displaced Central Venous Catheters

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Introduction: Central venous lines (CVL) are placed for short and long-term vascular access. CVL displacements can occur despite usage of ultrasound guidance. Normal, congenital, and acquired abnormalities of the central veins can predispose to displacements. Knowledge of the anatomy is a prerequisite for safe placement. CVL displacement can occur during insertion or present later secondary to migration. Vascular stenosis, prior procedural manipulation (i.e. tunneled IV catheter placement), and migration of CVLs into smaller vessels (internal thoracic vein) still occur. CVL complications are a reportable National Quality Measures Patient Safety Indicator. Quality performance measures associated with CVL complications will adversely affect reimbursement under the Affordable Care Act (ACA). We describe two case reports of displaced CVLs and a systematic stepwise approach to the management of displaced CVLs.

Case 1: A 26 y/o female presented with a severe headache. Imaging revealed a SAH, and a 3mm aneurysm at the Left MCA. A Left Internal jugular (LIJ) CVL was placed in prep for surgery. The CVL was placed using ultrasound. The CVP measured 8 cm without pulsatile flow. Post insertion Chest x-ray revealed a displaced CVL in the left internal thoracic vein (Figure 1). The CVL was removed and pressure applied for 30 minutes. The patient later developed pleuritic pain and an expanding neck hematoma. Resuscitation was initiated and the airway secured. Chest x-ray revealed a hemothorax (Figure 2). The surgical team was consulted, a chest tube inserted, and the patient was stabilized. Imaging revealed a soft tissue hematoma without arterial injury and a radiopaque density in the left brachiocephalic vein representing a retained catheter fragment from prior tunneled line placement. This density was the site of brachiocephalic vein injury during CVL removal. The aneurysm repair and postop course was uneventful and the patient was discharged.

Case 2: A 52 y/o male was admitted for an orthotopic liver transplant. A left IJ CVL was placed intraoperatively. Postop hemorrhaging required a return to the OR. The patient received large amounts of blood products using the CVL. A postop chest x-ray revealed a left CVL projecting left of the mid-line (Figure 3). The CVL was left in place per algorithm, and vascular surgery consulted. Imaging revealed the CVL in the left internal thoracic vein, no hematoma identified, and a left pleural effusion (Figure 4). A catheter was inserted draining 1700mls of serosanguinous fluid. The CVL was removed without complications. The CVL maintained functional use during massive transfusion and migrated to the internal thoracic vein from the brachiocephalic vein sometime after intraoperative insertion.

Conclusion: The two cases demonstrate the displacement and migration of Central venous catheters. There are two approaches to the management of displaced central venous catheters. The (1) removal technique is associated with a higher morbidity than the (2) surgical or endovascular management. Complications include stroke, hematoma, false aneurysm, or death. The cases were discussed in our Dept CQI meeting. An algorithm was developed and reviewed by the Patient Safety Committee for implementation at UAB. Following an algorithm for management along with early surgical consultation can prevent major morbidity and mortality.

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4. N Engl J Med. 2003; 348(12):1123-1133.
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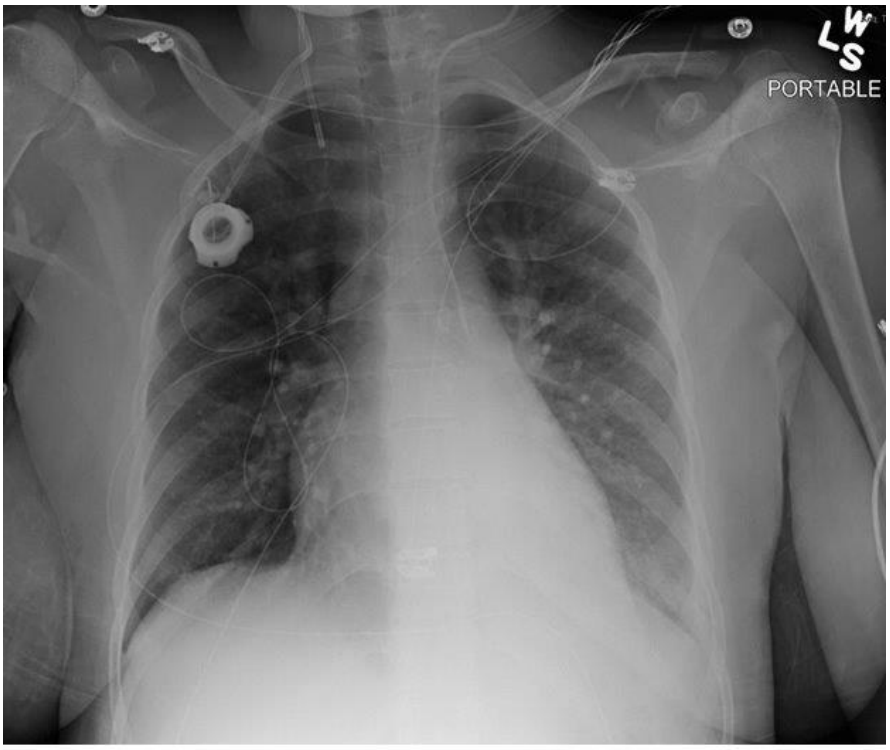

Figure 1: Post CVL insertion chest X-ray

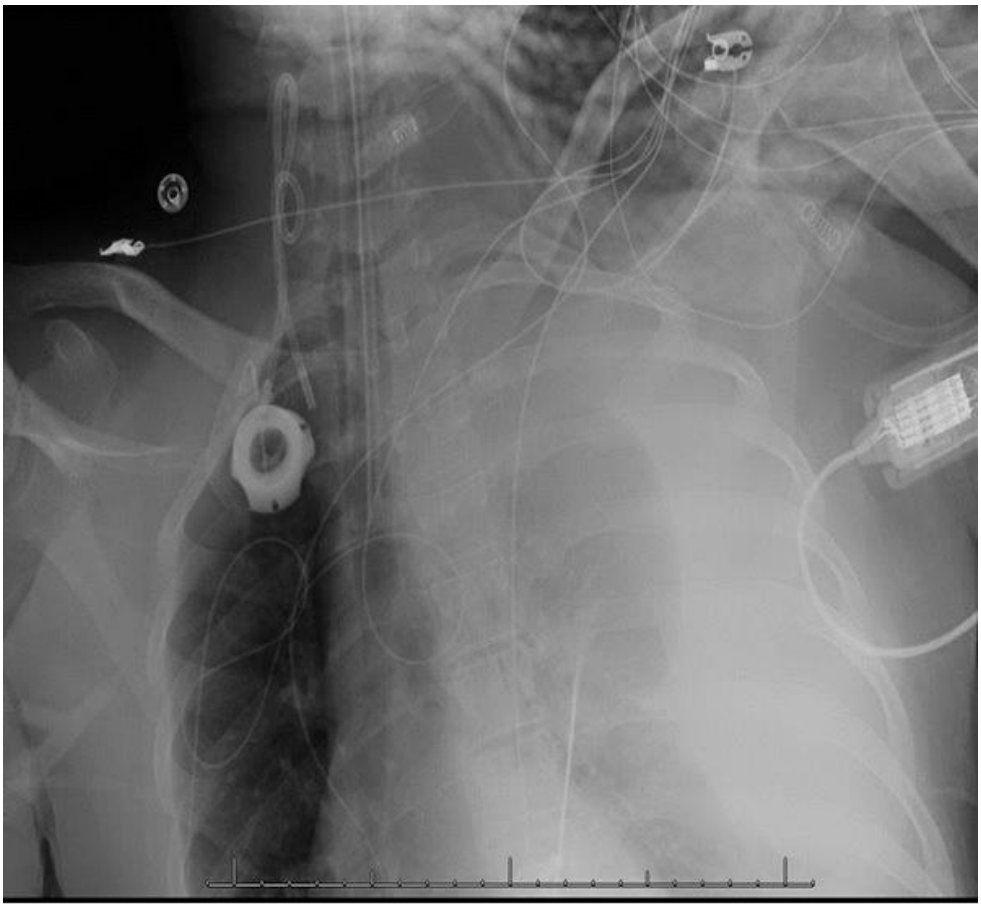

Figure 2: Chest X-ray after removal of CVL

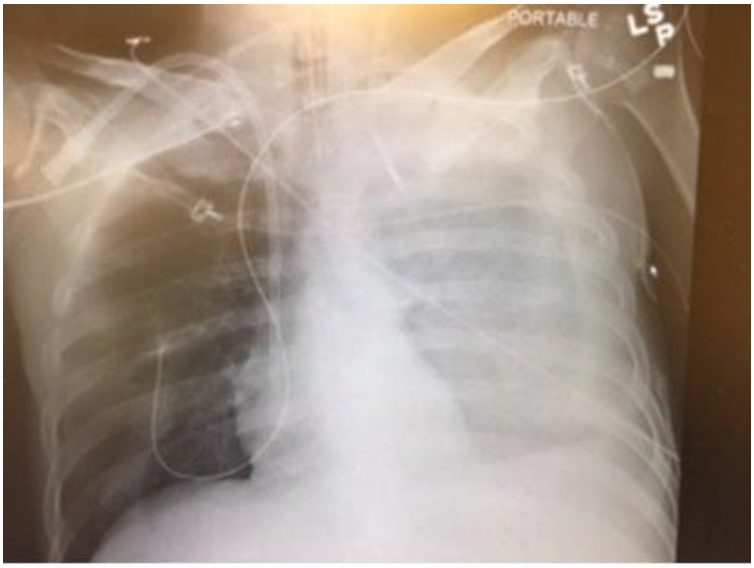

Figure 3: Chest X-ray of displaced CVL

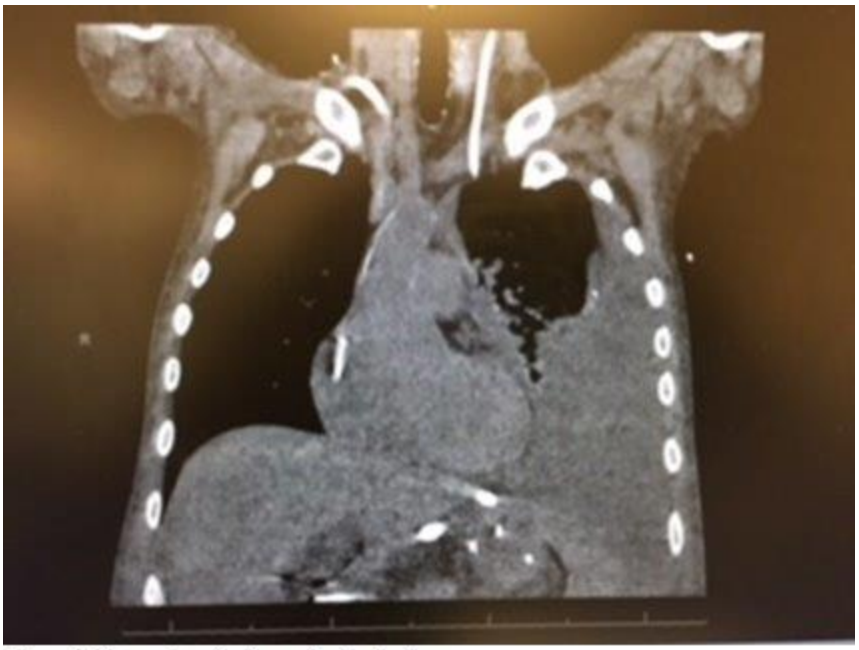

Figure 4: CT scan showing large pleural effusion

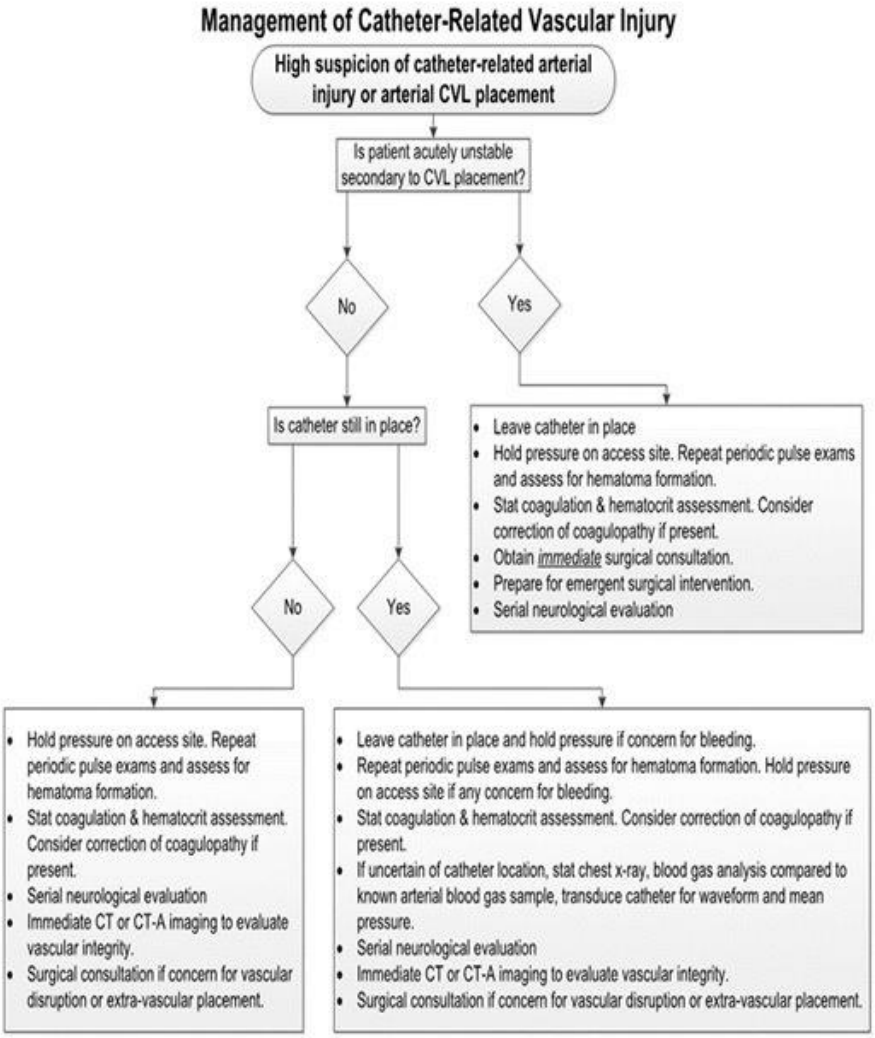

Figure 5: Algorithm for the Management of a suspected Vascular Injury during CVL Insertion

CC 59 (1533)

Pathway for Surgical Intensive Care Unit Discharge—A Quality Improvement Initiative

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Introduction: Early surgical ICU readmissions negatively impact patient mortality rates, and increase ICU and hospital length of stay (1). Practices addressing early readmission have included implementation of novel ICU discharge process components such as a discharge summary and a verbal communication with the team receiving the patient and have been found to reduce readmissions (2). In a pilot study, we aimed to implement such a new discharge pathway, to examine compliance with completion of the pathway, and to study our early readmission rate with this pathway in place. The project was carried out through the Cleveland Clinic Solutions for Value Enhancement course (SolVE), a unique continuous improvement training program available to the Cleveland Clinic critical care fellows in which the participants are educated in the appropriate structure for a quality improvement project.

Methods: A 1-month pilot study was completed in a quaternary surgical ICU in which a discharge pathway was instituted for patients from one surgical service. The pathway's construction incorporated a literature review, a process map for ICU discharge, discussions with caregivers, and lessons learned during the 12 week SolVE quality improvement training course. The pathway was demonstrated to the ICU staff. In the pathway, readiness for discharge was determined by the intensivist and the surgeon. The most active medical problems were identified on rounds and outlined in an ICU discharge note in the electronic medical record. A phone call outlining the care plan then occurred between the discharging and the receiving service members and was documented in the record. Compliance with the pathway was measured by review of the records and required that both the discharge note and the documentation of the phone call were present. The ICU census record was analyzed to identify readmissions occurring within 24 hours of ICU discharge.

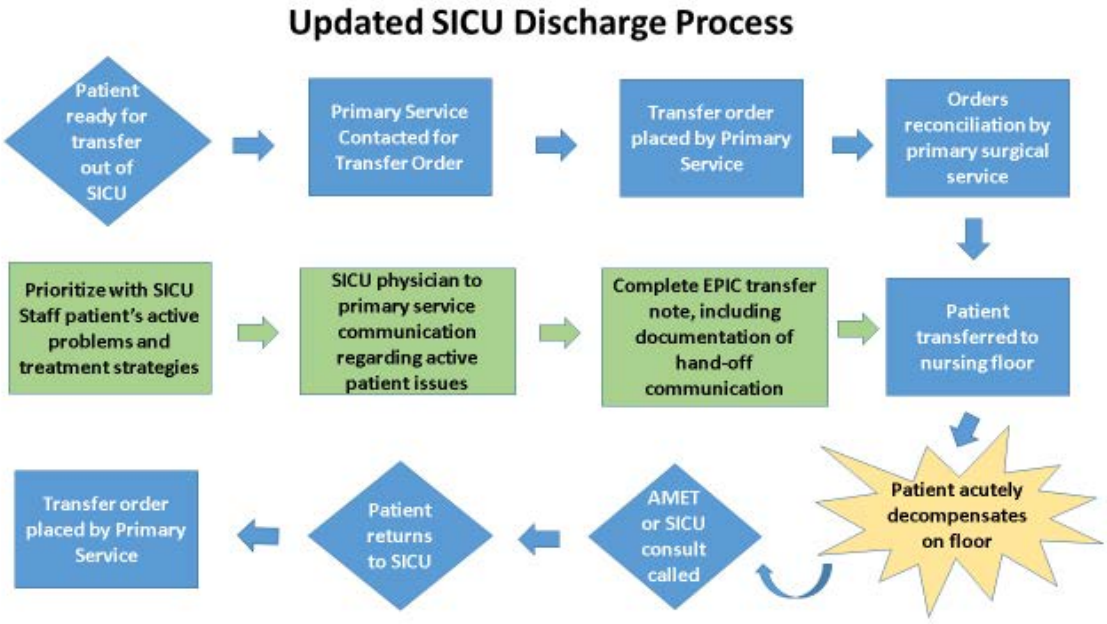
Results: The pathway was completed in 5 of 17 patients, giving an overall 29% compliance rate. Compliance after the first week was 40%. At this point, interventions included sending personal e-mail reminders, posting a reminder in the daily work room, and making available personal assistance with the pathway. Compliance was 33% for weeks 2 and 3; however, it decreased to 17% during the final week once reminders and help were absent. Only 1 of the 17 discharged patients was readmitted within 24 hours, and this patient had not had the pathway completed.

Conclusion: A continuous improvement course outlining how to perform a quality improvement project is available to the Cleveland Clinic critical care fellows. This unique opportunity was utilized to perform a

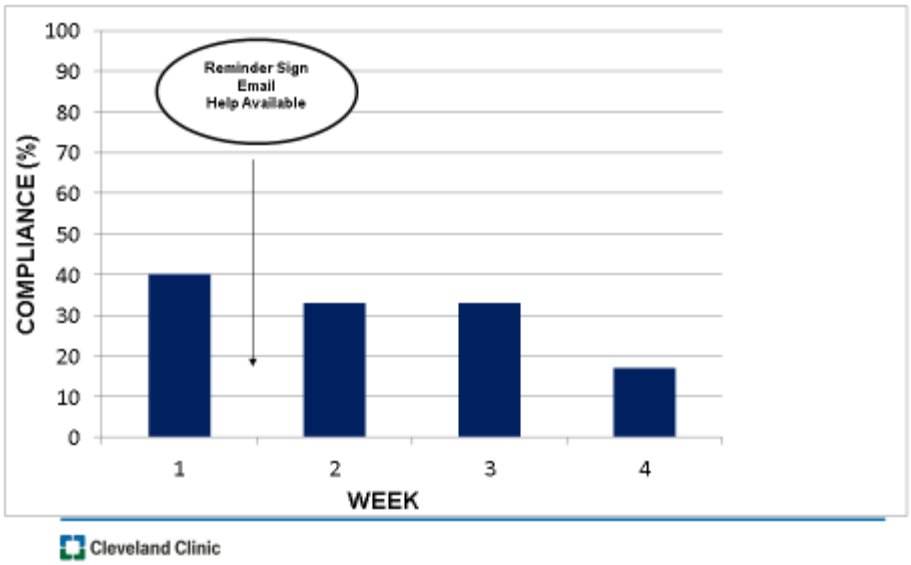
pilot study addressing the problem of early ICU readmission. Our compliance results demonstrate the difficulty associated with implementation of a new work flow pathway in a busy quaternary level hospital surgical ICU. Pathway compliance would likely require using it for all patient discharges, streamlining the pathway phone call, and an electronic discharge order hard stop mandating completion of the pathway. Our examination of the incidence of early readmission was supportive of our pathway's value. None of the patients for whom the pathway was completed were readmitted early. This study has formed the basis for a continuation project that is part of an ACGME quality improvement grant, and future goals include results sustainability and spread to other intensive care units.

Reference(s):

1. Crit Care Med 2013; 42: 24-33
2. J Trauma 2006; 61: 116-121



Compliance with Pathway by Week



Cleveland Clinic

CC 60 (1541)

Use of Dexmedetomidine in the Trauma Intensive Care Unit: Incidence of Failure and Associated Factors

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Introduction: Intensive care unit (ICU) patients receiving mechanical ventilation (MV) require adequate analgesia and sedation; but deep sedation within the first 48 hours of MV is associated with higher mortality.1 Titrated, light sedation with non-benzodiazepine therapy is recommended if possible.1 Dexmedetomidine, a pure alpha-2 agonist, produces sedation, analgesia, and anxiolytic effects without respiratory depression. It is often used to wean patients with agitation and ICU delirium from MV.2 Efficacy of dexmedetomidine has been investigated in the surgical (SICU) and medical ICU (MICU), but not the trauma ICU (TICU). Trauma patients may have a higher incidence of substance abuse and delirium, which may impede achieving adequate sedation and prolong liberation from mechanical ventilation. The goal of this exploratory study is to examine the incidence and associated factors of dexmedetomidine failure in mechanically ventilated patients in the TICU.

Methods: Medical records were reviewed of patients admitted to TICU January 1, 2015 - December 31, 2015 who received dexmedetomidine during MV. Inclusion criteria were: 18 years or older, 24 hours of MV or more, and at least 6 hours of dexmedetomidine infusion during this time. Patients were excluded if they received neuromuscular blockade, had known severe hepatic disease, or required a benzodiazepine for an alternative diagnosis. Baseline characteristics of the groups were collected (Table 1). Dexmedetomidine failure was defined as switching to or addition of another continuous infusion sedative. Secondary outcomes were length of ICU stay and length of MV (T-test), and bradycardia (≤50 bpm), hypotension (≤65 mmHg), and mortality (Chi^2). A subanalysis was performed to evaluate predictors of dexmedetomidine failure based on between-group differences using T-tests for continuous variables and Chi^2 for categorical variables.

Results: Of the 52 subjects included, 29 failed dexmedetomidine (56%), usually resuming a propofol infusion (Table 1). Seventy percent of subjects received sedation (usually propofol) within 24 hours prior to dexmedetomidine infusion (Table 2). Of those who failed, 69% were receiving the maximum infusion rate (≥0.7mcg/kg/hr), 21% were receiving 0.6 mcg/kg/hr, and 10% were receiving ≤0.5 mcg/kg/hr. The only significant difference between the failure and non-failure group was use of midazolam infusion

prior to initiation of dexmedetomidine (P = 0.03; Table 3). Failure was not associated with a significant increase in ICU length of stay, duration of MV, or mortality (Table 4).

Conclusion: Dexmedetomidine failure rate in the TICU was similar to that of other ICU populations (50-53.3%).3 Contrary to some studies, failure was not associated with prolonged ICU stay or increased duration of MV.4 Previous studies have reported higher rates of dexmedetomidine success for sedation of MICU patients on home antidepressants, or with lower APACHE-II scores.3 We found that administration of high cumulative doses of midazolam prior to initiation of dexmedetomidine infusion was associated with failure. These patients may have required higher doses of sedation overall, or may have had higher rates of delirium. This study is limited given small sample size, retrospective nature, and lack of adequate nursing documentation of delirium. Prospective studies are needed to establish validity of our findings, and to establish additional predictors of dexmedetomidine failure.

Reference(s):

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4. JAMA. 2012;307(11):1151-1160.

Figure 1. Sedative Use Upon Dexmedetomidine Discontinuation (n=52)

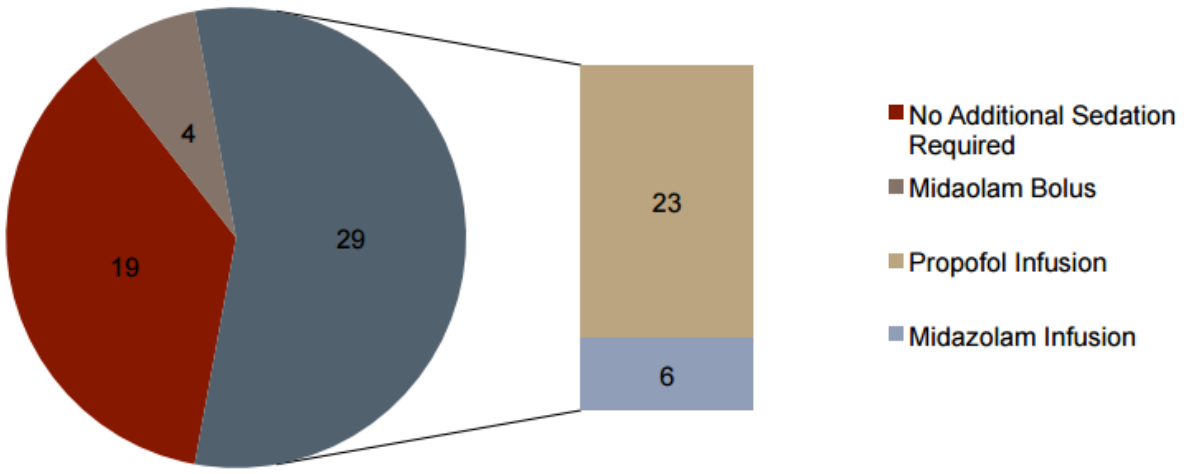

Table 1. Patient Characteristics

Characteristic	Patients (n=52)
Demographics	
Male, n(%)	33 (63.5)
Black/African American, n(%)	18 (34.6)
Mean Age	50 years
Mean Weight	88.4 kg
Burn Admission, n(%)	8 (15.4)
Medication Use Prior to Admission	
Narcotic/Benzodiazepine, n(%)	0 (0)
Psychiatric, n(%)	2 (3.9)
Clonidine, n(%)	1 (1.9)
Alcohol, n(%)	9 (17.3)
Illicit Drugs, n(%)	3 (5.8)
Past Medication History	
COPD, n(%)	2 (3.9)
Psychiatric, n(%)	5 (9.6)
Hypertension, n(%)	14 (26.9)
Dexmedetomidine Infusion	
Mean duration	51 hours
Mean maximum infusion rate	0.73 mcg/kg/min
Mean discontinuation rate	0.56 mcg/kg/min
Mean maximum RASS	-1.9
Mean minimum RASS	+0.8
Mean maximum respiratory rate	34

Table 2. Concomitant Analgesia and Sedation During Dexmedetomidine Infusion

Sedative	Patients, n(%)	Mean Dose	Mean Duration
Sedation 24 Hours Prior to Dexmedetomidine			
Sedative within 24 hours	36 (69.2)		
Midazolam	9 (17)	132 mg	
Propofol	27 (51.9)	2877 mcg	
Concomitant Medications			
Midazolam infusion	1 (1.9)	9 mg	0.4 days
Propofol infusion	5 (9.6)	878 mcg	0.31 days
Fentanyl infusion	41 (78.9)	5285 mcg	1.7 days
Midazolam bolus	21 (40)	9.8 mg	
Haloperidol	14 (26.9)	23.5 mg	
Olanzapine	16 (30.8)	434.4 mg	
Quetiapine	5 (9.6)	60.8 mg	

Table 3. Group Comparison by Dexmedetomidine Failure

Characteristic	Failure (*n*=29)	No Failure (*n*=23)	*p*-Value
Male, n(%)	18 (62.1)	15 (65.2)	0.82
Female, n(%)	11 (37.9)	8 (34.8)	
Black/African American, n(%)	10 (34.5)	8 (34.8)	0.98
Mean Age (years ± SD)	49.6 ± 19.3	50.4 ± 18.2	0.68
Mean Weight (kg ± SD)	86.2 ± 24.5	91.1 ± 19.6	0.58
Burn Admission, n(%)	5 (17.2)	4 (17.4)	0.99
Narcotic/Benzodiazepine, n(%)	0 (0)	0 (0)	-
Psychiatric medications, n(%)	0 (0)	2 (8.7)	0.11
Clonidine, n(%)	0 (0)	1 (4.3)	0.26
Alcohol, n(%)	4 (13.8)	5 (21.7)	0.45
Illicit Drugs, n(%)	1 (3.4)	2 (8.7)	0.42
COPD, n(%)	2 (6.9)	0 (0)	0.20
Psychiatric history, n(%)	1 (3.4)	4 (17.4)	0.09
Hypertension, n(%)	8 (7.6)	6 (26.1)	0.90
Propofol Prior, n(%)	15 (51.7)	12 (52.2)	0.97
24-Hour prior cumulative (hours ± SD)	2568 ± 2036	2522 ± 1686	0.95
Midazolam Prior, n(%)	8 (27.6)	1 (4.3)	0.03
24-Hour prior cumulative (hours ± SD)	143 ± 65	48	0.21
Mean prior sedation duration (hours ± SD)	154 ± 269	74 ± 90	0.13

Table 4. Secondary Outcomes

Characteristic	Failure (*n*=29)	No Failure (*n*=23)	*p*-value
Mean length of ICU stay	49 hours	37 hours	0.272
Mean duration mechanical ventilation	40 hours	21 hours	0.081
Hypotension (MAP ≤ 60 mmHg), n (%)	8 (27.6%)	4 (17.4%)	0.386
Hypotension (MAP ≤ 65 mmHg), n (%)	18 (62.1%)	13 (56.5%)	0.686
Mean low MAP	67 mmHg	66 mmHg	0.732
Bradycardia (HR ≤ 50 bpm), n (%)	2 (6.9%)	5 (21.7%)	0.119
Mean low heart rate	73 bpm	66 bpm	0.121

CRITICAL CARE 2

Posters: 61-65

Moderator: Michael Russell, MD, and Gebhard Wagner, MD

CC 61 (1677)

A Case of Fatal Calciphylaxis

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Introduction: Calciphylaxis is a potentially life-threatening syndrome involving vascular calcification, thrombosis, and skin necrosis. While calciphylaxis is typically associated with ESRD, its etiology is multifactorial and conditions such as obesity, diabetes mellitus, hypercalcemia, coagulopathy, and chronic inflammation have also been implicated in its pathogenesis [1]. We present a case of fatal calciphylaxis refractory to conventional therapy in a patient whose risk factors included female sex, sarcoidosis and morbid obesity.

Case Description: A 48 year old female presented to an outside hospital with a small lower extremity ulcer draining malodorous fluid. She was initially diagnosed with cellulitis and discharged with a short course of oral antibiotics. She continued to have progressive wound non-healing and malaise, and was subsequently admitted for septic shock requiring intubation and CRRT. She recovered from this incident and was discharged to a rehab facility. Her ulceration, however, continued to progress along with the development of large bullae. Prednisone, pentoxifylline, and ASA were started and further diagnostic workup at this time included two tissue biopsies of the ulcers: the first revealing small vessel thrombi and non-specific vasculitis; the second establishing a diagnosis of calciphylaxis. The ulcerations continued to enlarge and a green exudate developed. Blood and tissue cultures were performed revealing MDR Pseudomonas aeruginosa. Broad-spectrum abx were started and wound care continued. The patient continued to deteriorate and was transferred to our burn ICU approximately four months after her initial presentation. Upon transfer the patient was noted to have >20% body surface area ulceration. Prednisone, pentoxifylline, and ASA were discontinued and a heparin infusion was initiated. A repeat biopsy confirmed the diagnosis of calciphylaxis. The patient was started on a course of intravenous sodium thiosulfate, pamidronate, and phytonadione. Standard wound care along with dilute hypochlorite irrigation was utilized. The patient developed sepsis with respiratory failure and was intubated. Tissue culture and BAL revealed persistent MDR Pseudomonas and IV ceftolozane and inhaled tobramycin were started. The decision was made to perform surgical debridement of the affected lower extremity areas. Debridement was successful, but follow-up biopsy revealed ongoing calciphylaxis in the new surgical margins. The patient remained in guarded condition for approximately two weeks, but subsequently developed worsening lactic acidosis, hypoxemia, and hypotension refractory to multiple pressors. It was deemed that the risk of further debridement outweighed benefit given the ongoing progression. The patient eventually died from cardiac arrest refractory to standard ACLS measures.

Results: Discussion: The clinical course of calciphylaxis can be unremitting and has a poor prognosis with mortality levels as high as 60-80% once ulceration is present [2]. Current medical treatments are limited and those that are available suffer from a lack of prospective, randomized trials demonstrating their efficacy [3]. Super-infection of ulcerations with progression to sepsis is a serious problem and contributes significantly to the condition's high mortality.

Conclusion: Calciphylaxis is a serious disorder which carries high morbidity and mortality. In patients with severe progression, expert consultation with dermatology, surgery, and wound care should be considered.

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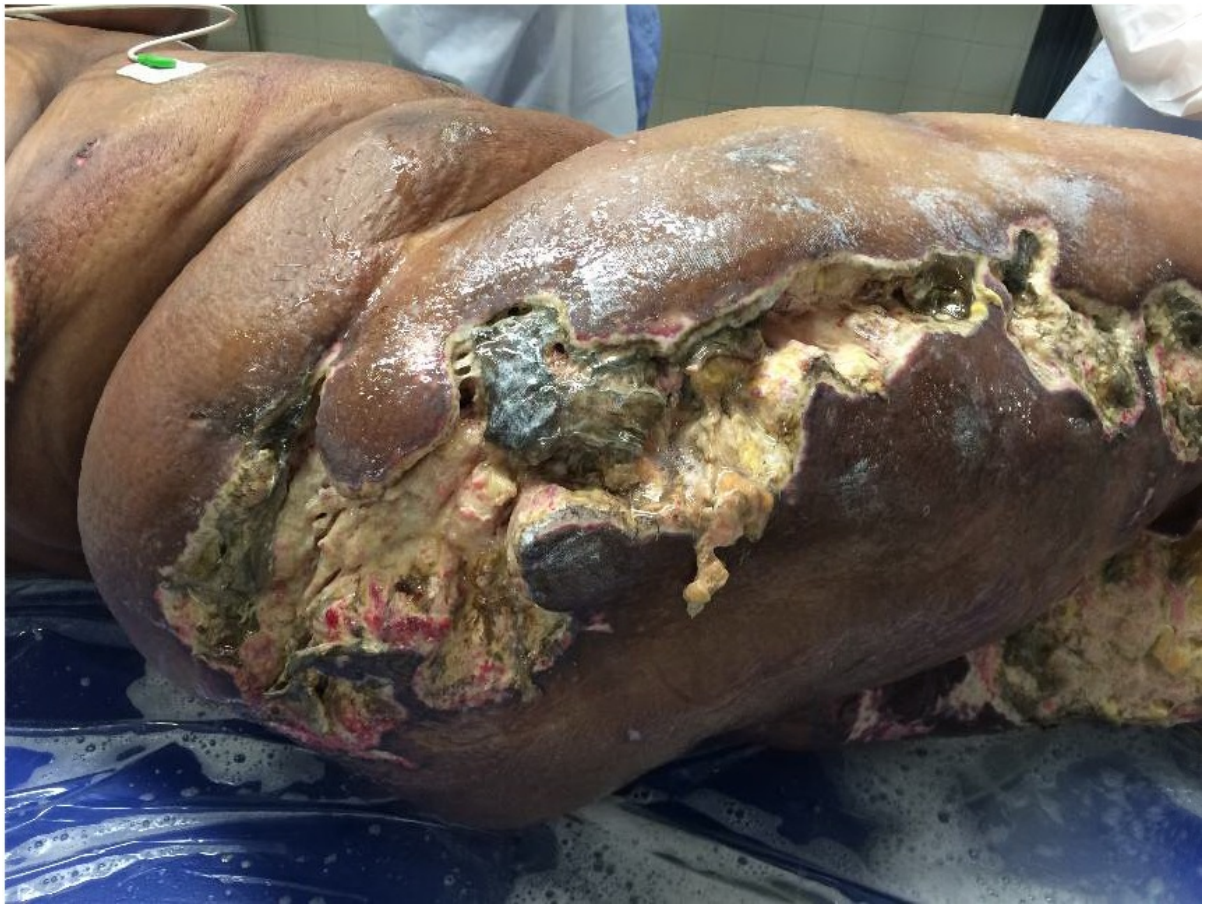
1. Calciphylaxis from nonuremic causes: a systematic review. Clin J Am Soc Nephrol 2008; 3:1139.
2. Calciphylaxis is usually non-ulcerating: risk factors, outcome and therapy. Kidney Int 2002; 61:2210.
3. Multidisciplinary approach to calcific uremic arteriolopathy. Curr Opin Nephrol Hypertens 2015; 24:531.



CC 62 (1589)

Incidence of Clostridium Difficile Infection in Patients with Severe Leukocytosis in the Adult Intensive Care Unit

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Introduction: In critically ill patients, severe leukocytosis (white blood cell (WBC) count ≥ 40,000) often signals the presence of a significant infectious process, with Clostridium difficile (C. diff), other gram positive sepsis and pulmonary infection being among the processes classically associated with this finding.[1] While leukocytosis has been demonstrated in hospitalized patients to be a sensitive marker of C. diff infection, it has not been shown to be reliably specific.[2-5] Patients who are critically ill may suffer from additional conditions increasing susceptibility to develop C. diff. To our knowledge, the incidence of C. diff infection in the critically ill with WBC count ≥ 40,000 has yet to be evaluated.

Methods: We performed a retrospective cohort study using the Medical Information Mart for Intensive Care III (MIMIC-III) database, comprising data from over 40,000 ICU admissions at Beth Israel Deaconess Medical Center between 2001 and 2012.[6] Patients with peak WBC count ≥ 40,000 were included, with infants and patients with ICD-9 codes related to lymphoproliferative disorders excluded from the cohort. We obtained the age, peak WBC count, ICD-9 diagnoses, and results of C. diff testing for each patient. Multivariate logistic regression was used to determine if there is an association between these covariates among this subgroup of patients with severe leukocytosis. Additionally, patients were categorized by quintile based on peak WBC count, and logistic regression was used to assess for a non-linear relationship between peak WBC count quintile and C. diff incidence. Finally, the overall incidence of C. diff was estimated using data from 46,635 adult ICU admissions.

Results: Of the 709 patients in the database with peak WBC count ≥ 40,000, 177 were excluded based on ICD-9 diagnoses of lymphoproliferative disorders. The mean peak WBC count of the remaining 532 patients was 54,700 (+/- 41.7). The mean age was 64. 360 of the 532 patients (68%) underwent stool testing during their ICU stay. 64 of 360 (17.8%) of those who underwent stool testing tested positive for C. diff; 95% CI [14.0%, 22.1%]. Peak WBC count ≥ 40,000 was not independently associated with increased likelihood of C. diff infection (p=0.35). Peak WBC count quintile also did not have significant predictive value. Overall, 1,037 of 46,635 adult ICU patients tested positive for C. diff, indicating an overall incidence of 2.2%. Thus, the combination of severe leukocytosis and suspicion for C. diff warranting stool testing had a specificity of 99.4%, sensitivity of 6.2%, and a positive predictive value of

17.8%. Diagnoses in patients with severe leukocytosis but with negative C. diff testing included sepsis and pneumonia.

Conclusion: Our results reveal that the positive predictive value of peak WBC count ≥ 40,000 and suspicion for C. diff in patients without lymphoproliferative disorder in the ICU is approximately 18%. Our overall incidence of C. diff of 2.2% was slightly lower than the 4% incidence cited in another study of ICU patients.[7] Although the combination of severe leukocytosis and suspicion for C. diff has high specificity, the low incidence of C. diff makes the positive predictive value relatively low. This may have useful implications in determining which patients should receive empiric treatment for C. diff while awaiting stool testing results.

Reference(s):

1. Clin Infect Dis 2002, 34(12):1585-1592.
2. Infect Control Hosp Epidemiol 2007, 28(4):377-381.
3. Am J Gastroenterol 2000, 95(11):3137-3141.
4. Clin Infect Dis 2002, 34(12):1585-1592.
5. Am J Med 2003, 115(7):543-546.
6. Scientific Data 2016, 3:160035.
7. Infect Control Hosp Epidemiol 2007, 28(2):123-130.

CC 64 (1122)

The Impact of Fluid Management on Sepsis in the Intensive Care Unit

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Introduction: Fluid management in septic shock patients remains challenging. The Surviving Sepsis Guideline[1] recommends early and aggressive fluid resuscitation, yet available evidence suggest that a conservative strategy is associated with reduced mechanical ventilation days and ICU length of stay[2]. We evaluated the impact of daily fluid balance on the outcomes of critically ill patients after adjustment for severity of illness and co-morbidities.

Methods: Following IRB approval, we identified patients who met the criteria for severe sepsis/septic shock and were admitted to the Intensive Care Unit from January 1, 2007, through December 31, 2009. We collected demographic, clinical, and outcome variables. 'De-escalation day' was defined as the first day a negative fluid balance was achieved. Data was retrieved by an electronic search engine, and manual verification performed for accuracy. The analysis was done with JMP Pro 10.0 software, SAS Instiitute.

Results: 633 patients who met criteria were enrolled in the analysis. The mean age was 68 (±16) years and 348 (55.0%) were male. The median (Inter Quartile Range) ICU length of stay was 2.4 (1.3-5.5) days. Median (IQR) daily fluid balance in ICU was 2352 (990-4323) ml. During the ICU admission, a day of de-escalation was achieved in 443 (70.0%) patients and the median day this was achieved was Day 2 (1-3). Among those who started de-escalation phase in ICU, the average cumulative fluid balance was -1.4 (±5.7) L [daily: -0.3 (±0.8) liters]. Following adjustments for the age, Charlson Comorbidity Index, SOFA and APACHE III scores, the amount of daily fluid balance among all patients was not associated with higher ICU or hospital mortality ($p>0.05$). Among those who started the de-escalation phase in ICU, the cumulative fluid balance was significantly associated with a lower ICU and hospital mortality after adjustments for age, gender, comorbidities and severity of illness scores. The odds ratio (OR) of death for the impact of each liter of cumulative negative fluid balance starting from de-escalation day at ICU discharge was 0.82, (95% CI 0.77-0.87) for ICU mortality and 0.9, (95% CI 0.86-0.94) for hospital mortality. The OR of mortality for the daily average negative fluid balance starting from de-escalation day at ICU discharge was 0.26, (95% CI 0.15-0.41) for ICU mortality and 0.47, (95% CI 0.33-0.65) for hospital mortality.

Conclusion: In our cohort of patients with severe sepsis and septic shock, daily fluid balance did not impact overall outcomes, but if the de-escalation phase was achieved in ICU prior to discharge, mortality appears to improve significantly.

Reference(s):

1. Dellinger, R., Levy, M. & Rhodes, A. Surviving Sepsis Campaign: international guidelines for management of severe sepsis and septic shock, 2012. Intensive care 41, 580-637 (2013).
2. National, H. et al. Comparison of two fluid-management strategies in acute lung injury. N Engl J Med 354, 2564-2575 (2006).

CC 65 (2035)

Hypocalcemia, Calcium Supplementation, and Mortality in Sepsis

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Introduction: Hypocalcemia occurs in up to 70% of patients in the intensive care unit (ICU) and in up to 50% of patients with bacterial sepsis (1, 2), in whom it has been associated with increased mortality (1). Calcium supplementation in sepsis, however, is associated with increased mortality in animal models; furthermore it is associated with prolonged ICU length of stay (LOS) and increased mortality in retrospective human studies (3, 4). Additional studies demonstrate that the mortality associated with hypocalcemia is not affected by supplementation (4). Thus there currently is equipoise as to whether to treat hypocalcemia associated with sepsis. We hypothesized that worse hypocalcemia and increased calcium supplementation would be associated with increased mortality in patients with sepsis.

Methods: In a prospective cohort study of patients with respiratory failure and/or shock, we extracted a subset of patients meeting criteria for severe sepsis (5). We reviewed the electronic medical record for daily ionized calcium levels and calcium supplementation. We assessed the associations of daily lowest ionized calcium plasma concentration, daily total calcium supplementation dose, and their interaction on the time-to-death from study enrollment until 28 days and on hospital LOS using Cox proportional hazards regression. We adjusted for the time-invariant effects of age, Charlson comorbidity index, and APACHE II score at enrollment, and the time-varying effects of daily CV and renal SOFA scores.

Results: We included 176 patients with severe sepsis and at least one documented ionized calcium level for analysis. Of these patients, 57% received calcium supplementation. The interaction between daily lowest calcium level and calcium supplementation was predictive of increased risk of in hospital mortality ($p = 0.01$) but not for increased hospital LOS ($p = 0.11$). In patients who were hypocalcemic, supplementation with greater than 3 grams of calcium chloride equivalents was associated with lower hazard of death (HR <0.001, $p = 0.002$) as compared to those who did not receive supplementation or those that received less than 3 grams.

Conclusion: Hypocalcemia and inadequate supplementation may be associated with an increased risk of death in septic ICU patients. Aggressive calcium supplementation may be protective against death when hypocalcemia develops. Further prospective studies on this topic are warranted to identify if routine calcium supplementation in sepsis may be beneficial.

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1. American Journal of Medicine, 84:208-14, 1988
2. Annals of Internal Medicine, 107:36-41,1987
3. Critical Care Medicine,41(11):e352-60, 2013
4. Critical Care, 17:R106, 2013
5. New England Journal of Medicine, 369:1306-16, 2013

CRITICAL CARE 3

Posters: 66-71

Moderator: Gozde Demiralp, MD, and Nicholas Sadovnikoff, MD

CC 66 (1405)

Comprehension of Critical Care Issues by Proxies of Patients Undergoing Major Surgery

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Introduction: Previous studies suggested that patient representatives in medical ICUs have very poor comprehension of the diagnoses, treatment, or prognosis of the patient they represent (1). Information needs of proxies for patients in medical ICUs are consistently not being met especially with regard to treatments and complications (2). There is however little information about the level of understanding healthcare proxies have when potentially representing patients undergoing major surgery where ICU treatment is common. The aim of this study is to determine the understanding of medical interventions by these potential patient surrogates and identify areas of concern and lack of knowledge.

Methods: This is a prospective, observation, single center questionnaire study. After IRB approval and informed consent were obtained, 20 healthcare proxies of patients undergoing major surgery were given a questionnaire prior to surgery and then again 2 and 5 days post-op if they remained in the ICU for that time. The questionnaire contained visual analogue scales, Likert-scales, objective knowledge assessments, and several open-ended questions to assess knowledge of the patient's diagnosis, illness duration, surgery, and afflicted organs. We additionally asked for an estimation of the length of stay, expected discharge location, and type of ICU interventions to be expected (sedation, mechanical ventilation, blood pressure medication, etc). Estimated and true length-of-stay were compared using paired t-test.

Results: All of the 20 patients whose proxies were enrolled were transferred to a surgical ICU post-op. 16/20 procedures were open cardiac. Most proxies understood the patient's surgery and diagnosis (19/20 and 18/20 respectively), and all could identify the primary organ involved in the patient's pathology. However, they underestimated the hospital length of stay (Figure: 10.7 +/- 8.6 versus 12.3 +/- 7.5 days, $p< 0.05$) and were frequently unable to identify necessary ICU interventions (Table). It was additionally found that 16 of 20 patients used the Internet to obtain information and all of these proxies found the information from the Internet helpful to very helpful (6-10 on a scale of 1-10, mean 8.1).

Conclusion: Our data suggests that healthcare proxies of patients undergoing major surgery with expected post-op ICU admission were well informed about the patient's surgery and diagnosis. This may not be surprising considering the many discussions that occur during preparation for surgery. Many of these proxies additionally turned to the internet to satisfy their information needs, and they generally found this helpful. However, it remains unclear whether this is transferred into objective knowledge. We found that proxies tended to underestimate hospital length of stay, though this gap was not significant.

It was however notable that many proxies were unable to predict routine treatment modalities the patients in our cohort were anticipated to undergo. All patients could be expected to remain on sedative medications, mechanical ventilation and pressors at some point during their ICU stay. Though not all received these interventions (eg. extubated in the OR), fewer numbers of proxies identified these as possibilities than the numbers of patients that actually experienced the intervention. It remains unknown whether this gap correlate to degrees of stress of dissatisfaction on the part of the proxy.

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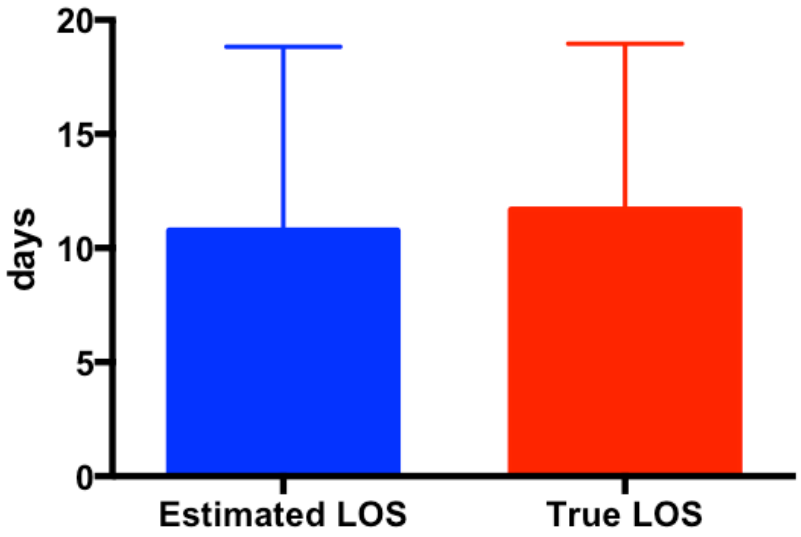

	"Sedation Medications"	"Intubation / Mechanical Ventilation"	"Intravenous Blood Pressure Meds (Vasopressors)"
Expected	10	7	5
Received	16	16	16
% correct	62.5 %	43.8 %	33.3 %

CC 67 (1798)

Severe Traumatic Brain Injury in the Over 75s - Should We Admit To Critical Care?

Charlotte S Cattlin, MBBS, Vanesa Garnelo Rey, MD, BSc

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Introduction: Traumatic brain injury (TBI) termed the 'silent epidemic' by the Center of Disease Control,(1) was previously a disease of the young, in recent years the number of elderly patients presenting with TBI is increasing.(2) This is due to an ageing population, often with extensive co-morbidities and varying degree of functional status prior to hospital admission.(3) The elderly presenting with TBI have often only experienced a seemly minor injury, such as a fall from standing.(4) In keeping with their age and comorbid state, they often are prescribed multiple medications particularly anti-platelets and anticoagulants, increasing their risk of devastating brain injury from a seemingly innocuous accident.(2,5) Those over the age of 75 presenting with TBI have the highest rates of admission to hospital and subsequent death from their injuries, old age being a predictor of worse outcome in TBI. Mortality ranging from 30-80% in those over the age of 55 and increased morbidity and post injury dependence.(5) We aimed to examine the outcomes of those presenting over the age of 75 with an isolated TBI, to elicit whether or not it is appropriate to admit them critical care.

Methods: The data was gathered in a Major Trauma Centre in London, our critical care unit admitting only level 3 (intubated and ventilated) patients. Examining the Trauma Audit and Research Network data we admit between 120-150 severe head injury patients per annum. Severe head injury being defined as those with a Glasgow Coma Score (GCS) of <9 with an Abbreviated Injury Scale of 2 in the head, or intubation and/or ventilation.(6) We became a Major Trauma Centre in December 2010, over the 6 year 2 month period until January 2017, we have admitted 14 patients over the age of 75 with isolated head injuries. Patients with other associated traumatic injuries were discounted.

Results: 60% (9/14) were admitted after a fall from standing. The rest being falls from steps, ladders and one pedestrian hit by a vehicle. Despite their advancing years 71.4% (10/14) of these patients were fully independent prior to their hospital admission. Admissions of those over 75 are increasing in number with over half of our sample presenting in the last 2 years. 57.1% (8/14) died during this hospital admission as a result of their brain injury. 14.2% (2/14) were discharged from hospital with significant morbidity and died within 9 months of discharge. 14.2% (2/14) survived with significant morbidity (tracheostomy and neurological impairment). 14.2% (2/14) were discharged well with a GCS of 15/15 (they also had the highest GCS after the initial injury prior to intubation (14/15)). Overall mortality at 1 year post injury 71.4% (10/14).

Conclusion: With overall mortality of 71.4% at 1 year and initial hospital mortality of 57.1%, outcomes in those over 75 with isolated TBI based on our sample, is poor. Those surviving more likely to be discharged to care facilities. Low presenting GCS in the elderly with TBI is associated with higher overall mortality, and in survivors, morbidity. Functional status at presentation had no effect on outcome. Our cohort is small, it would be difficult to suggest similar patients should not be admitted to critical care based on such a small number. However with the number of patients presenting in such a way increasing, we should have a larger cohort of patients on which to base our decisions in the future.

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5. Journal of American Geriatric Society 2006;54(10):1590-1595.
6. Trauma Audit and Research Network, UK. 2016.

CC 68 (1751)

Motoric Subtype of Delirium and Global Cognition after Critical Illness

Christina J Hayhurst, MD[1], Mayur B Patel, MD, MPH, FACS[1], Jim Jackson, PsyD[2], Annachiara Marra, MD[1], Jennifer L Thompson, MPH[2], Rameela Chandrasekhar, PhD[2], Christopher G Hughes, MD[1]

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Introduction: Delirium is associated with worse long-term global cognition after critical illness.(1) Hypoactive delirium has been associated with worse outcomes in ICU patients compared to hyperactive delirium (2), but the association of delirium motoric subtype with global cognition is unknown. We hypothesized that hypoactive compared to hyperactive delirium would be associated with worse global cognition.

Methods: In a multicenter prospective cohort of adult ICU patients, we assessed level of consciousness and delirium twice daily with the RASS (3) and CAM-ICU.(4) We considered a day to have hypoactive delirium if one or more CAM-ICU assessments were positive with corresponding RASS ≤ 0 and to have hyperactive delirium if one or more CAM-ICU assessments were positive with corresponding RASS > 0. We assessed global cognition with Repeatable Battery for the Assessment of Neurological Status (RBANS)(5) 3 and 12 months after discharge. We used multivariable linear regression to examine the independent association of days with hypoactive delirium and days with hyperactive delirium with global cognition. We allowed for interaction between hypoactive and hyperactive delirium and adjusted for baseline and ICU course covariates.

Results: We included 465 patients with a median age of 59 years, APACHE II score of 24, and ICU length of stay of 4.9 days, 91% of whom required mechanical ventilation. 74% of patients experienced hypoactive delirium (median 3 days), and 16% experienced hyperactive delirium (median 1 day). Increased number of days with hypoactive delirium was significantly associated with worse global cognition at 3 months (p=0.03) and 12 months (p=0.03) and was not modified by hyperactive delirium. There was no significant association between number of days with hyperactive delirium and global cognition at 3 months (p=0.09) and 12 months (p=0.16).

Conclusion: Hypoactive delirium but not hyperactive delirium is an independent risk factor for worse global cognition up to 12 months after hospital discharge.

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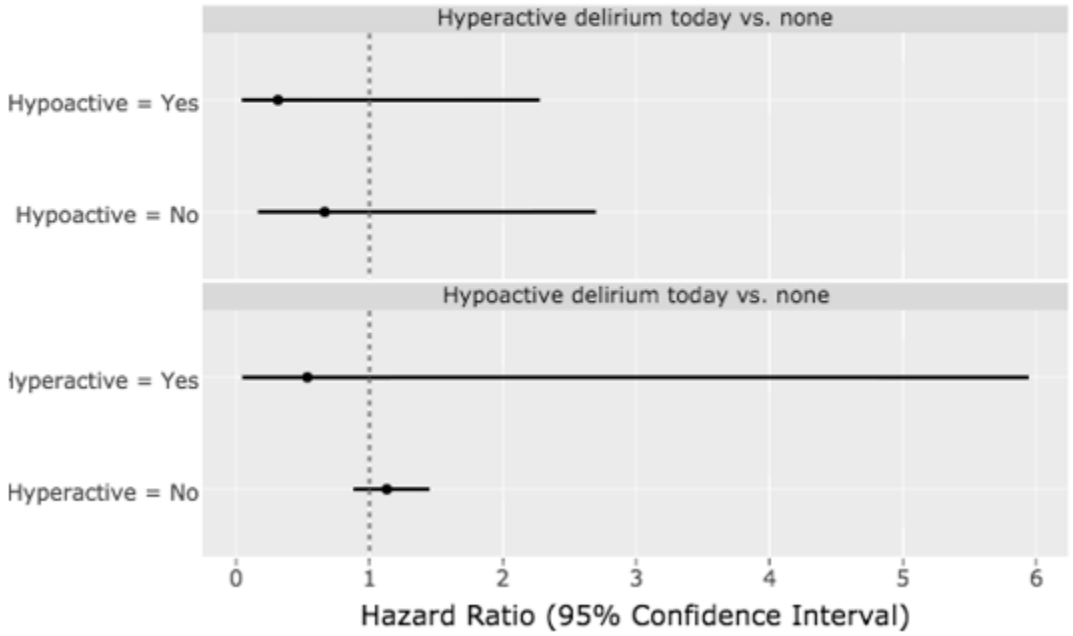
2. Crit Care Med 2009;37:1898-905.

3. Am J Respir Crit Care Med 2002;166:1338-44.
4. JAMA 2001;286:2703-10.
5. J Clin Exp Neuropsychol 1998;20:310-9.

Figure 1: Hazard Ratios (95% CIs) for Motoric Subtypes, 12m Mortality among All Patients



CC 69 (2205)

The Likelihood of Receiving Lung Protective Ventilation Depends on Type and Location of ICU Within a University Hospital System

Robert F Groff, MD[1], Craig Jabaley, MD[1], Vanessa Moll, MD[1], Jayashree Raikhelkar, MD[1], James Blum, MD, FCCM[2]

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Introduction: Current evidence supports the use of lung protective ventilation strategies, including the limitation of tidal volumes (Vt) relative to predicted body weight (PBW), for critically ill patients with acute respiratory distress syndrome (ARDS).(1,2) Furthermore, lung protective ventilation strategies may improve outcomes for mechanically ventilated, critically ill adults without ARDS.(3,4) Despite these benefits, variability in practice exists among individual providers with respect to mechanical ventilation strategy in the intensive care unit (ICU).(5) Herein we have examined adherence to tidal volume delivery recommendations as one element of lung protective ventilation strategies among 15 separate ICUs across a large university healthcare system.

Methods: We conducted a retrospective database analysis of mechanical ventilation strategies among intubated patients in 15 adult ICUs spanning 4 Emory Healthcare (Atlanta, GA) hospitals between 2012 and 2016. A clinical data warehouse was queried to extract each recorded epoch of delivered Vt per PBW in the included ICUs. Ventilatory parameters, including set and delivered Vt, are recorded by respiratory therapists in the electronic medical record either coincident with changes or during routine rounding as per standard protocol. A box plot analysis was constructed with significance assessed by ANOVA and a subsequent Tukey's test to examine individual areas of statistical significance. All descriptive statistics, comparative statistics, and figures were generated using RStudio (R Foundation for Statistical Computing, Vienna, Austria).

Results: The data warehouse query returned 337,984 values ranging from 2.16 to 13.6 ml/kg PBW with a mean value of 7.8 ml/kg PBW. There was significant variability in Vt delivery depending on the location and type of ICU being evaluated (Fig 1, p=<0.01). The spectrum of delivered tidal volumes was represented according to frequency by histogram (Fig 2). Patients were more likely to receive lung-protective ventilation if care was being supervised by a physician with board certification in critical care medicine.

Conclusion: Both the location and type of ICU influenced mechanical ventilation strategy within a large university critical care center. Adherence to a lung protective ventilation strategy was not uniform, and the probability increased with the presence of a critical care physician rounding in the ICU.

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3. Jama. 2012;308(16):1651-9.
4. Critical care. 2014;18(2):211.
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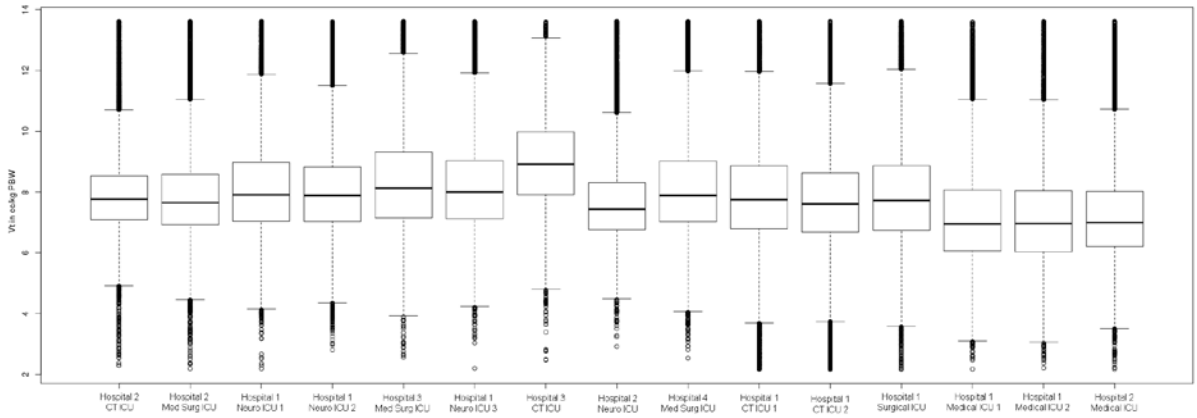

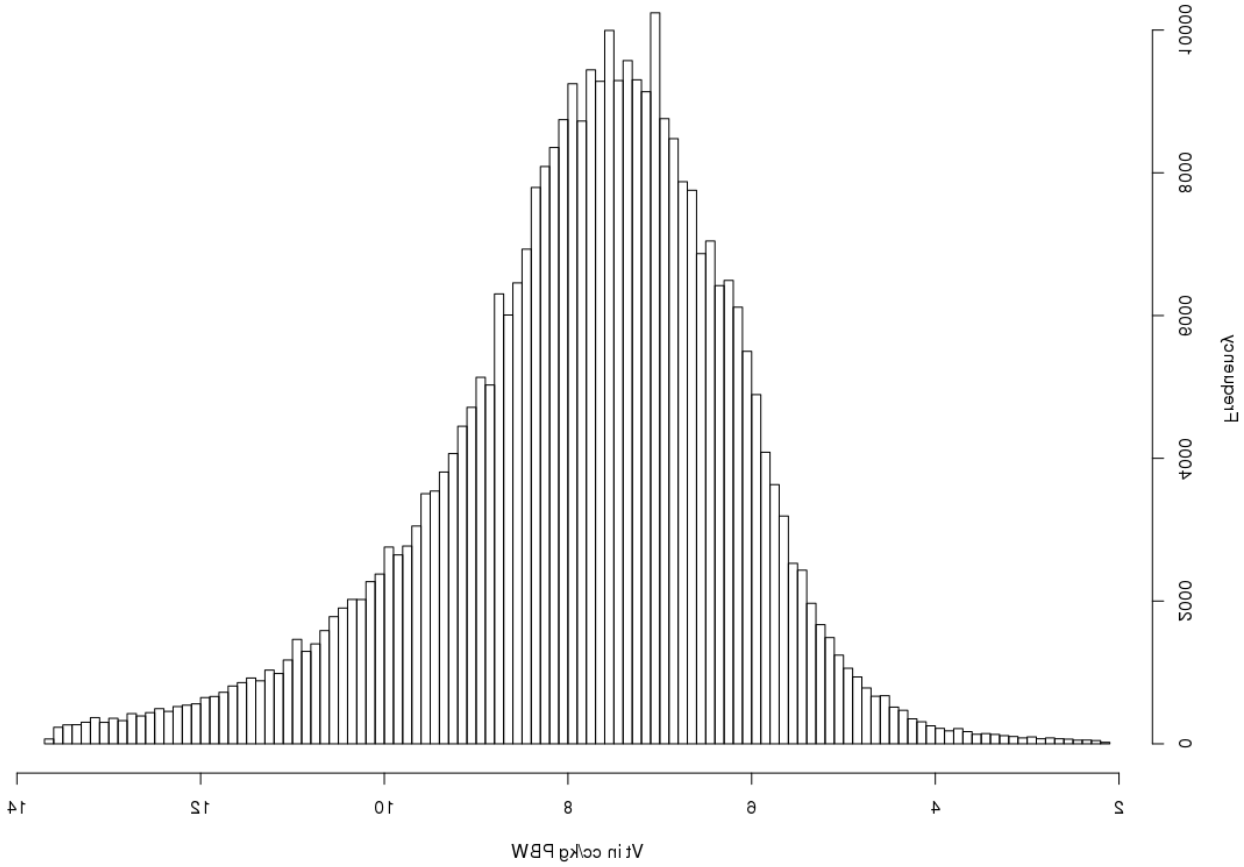
Frequency
0
2000
4000
6000
8000
10000
2
4
6
8
10
12
14
Vt in cc/kg PBW

CC 70 (1984)

Veno-Venous Extracorporeal Life Support May Be Considered for Patients With Acute Respiratory Failure Associated With Cardiac Arrest

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Introduction: Veno-venous (VV) Extracorporeal life support (ECLS) has been used to salvage patients with severe acute respiratory failure, including acute respiratory distress syndrome, that is refractory to standard therapy. If a patient sustains a cardiac arrest due to respiratory insufficiency, but returns to spontaneous circulation. It is unclear if veno-arterial ECLS should be performed or VV ECLS would be preferred.

Methods: This study was performed in a tertiary academic medical center and approved by the Institutional Review Board and the requirement for written informed consent was waived. We conducted a retrospective study of all consecutive patients presenting for VV ECLS from outside hospitals through our ECLS program who sustained a cardiac arrest prior to ECLS insertion from June 1, 2008 until May 13, 2016. We collected data including age, size, etiology of respiratory failure, modified SOFA scores and outcomes on each patient.

Results: A total of 22 patients sustained cardiac arrest prior to implementation of VV ECLS. Data on the duration of cardiac arrest prior to ECLS implementation was available on 14/22 patients. The duration of cardiac arrest varied from 1-45 minutes. Survival to discharge was 59.1% (13/22).

Conclusion: VV ECLS may be considered in patients with severe acute respiratory failure associated with cardiac arrest and return of spontaneous circulation. Our outcomes were comparable or superior to other large series and the annual outcomes reports the Extracorporeal Life Support Organization. Further research is needed to compare VA ECLS to VV ECLS in this patient population.

Reference(s):

1. Peek GJ, Mugford M, Tiruvoipati R, et al.: Efficacy and economic assessment of conventional ventilatory support versus extracorporeal membrane oxygenation for severe adult respiratory failure (CESAR): a multicentre randomised controlled trial. Lancet. 374:1351-1363, 2009.
2. Organization ELS: ECLS Registry Report International Summary. accessed at www.elso.org on January 30, 2017.

CC 71 (2270)

Modes of Mechanical Ventilation Vary Between Intensive Care Units Within a University Healthcare System

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Introduction: Physician preferences and selected modes of mechanical ventilation (MV) both before and during weaning have varied historically.(1) Although little evidence exists to support the superiority of one ventilatory mode over another during routine MV, synchronized intermittent mandatory ventilation (SIMV) has been associated with longer weaning times.(2) Interest is currently growing in the application of novel automated ventilation modes as a means by which to facilitate weaning.(3, 4) Furthermore, recent guidelines advocate for noninvasive ventilation (NIV) in conjunction with weaning and separation from MV.(5) The extent to which these trends and guidelines have been clinically adopted remains uncertain. Given the lack of clear consensus as to the optimal MV mode, if any, we hypothesized that modes of MV would be inconsistent both between individual intensive care units (ICUs) and types of ICU.

Methods: We conducted a retrospective database analysis to examine MV strategies across 15 adult ICUs in 4 Emory Healthcare (Atlanta, GA, USA) hospitals. A clinical data warehouse was queried to retrieve de-identified MV parameters for the included ICUs between 2012 and 2016. Ventilator parameters, including the mode of MV, are recorded per protocol by the respiratory therapist upon the initiation of MV, change in ventilator settings, or during routine rounds. The mode of MV and location were retrieved for each recorded epoch. Modes outside of 12 common categories are reported as 'other,' and epochs without a recorded MV mode are reported as 'unknown.' MV mode selection categorical data were examined with a chi-square test of goodness-of-fit. Stacked gar graphs were generated for data visualization. Data analysis and figure generation were accomplished with RStudio (RStudio, Inc., Boston, MA).

Results: The warehouse query identified 559,762 epochs. Across all ICUs, assist control (AC) was the most common strategy (52.8%), followed by adaptive support ventilation (ASV, 23.1%), pressure support ventilation (11.8%), and SIMV (5.2%). NIV accounted for 5.2% of all recorded values. MV mode utilization was not equally distributed amongst the included ICUs ($P = <0.01$, Fig 1). Similarly, MV modes were not equally distributed between types of ICU ($P = <0.01$, Fig 2). As a proportion of total epochs, ASV was more common in neuroscience and surgical ICUs compared to cardiothoracic, medical, and mixed medical-surgical ICUs (56.6% vs 7.9%). NIV represented the greatest proportion of MV epochs in medical (8.9%) and mixed medical-surgical (8.7%) ICUs. Utilization of MV and the approach to MV varied between hospitals within the health system (Fig 3).

Conclusion: In keeping with prior epidemiological studies, AC remained the most common mode of MV; however, our prevalence of SIMV was lower than the reported historical prevalence of just over 30%.(1) This could conceivably be due to the incorporation of more contemporary weaning approaches. Utilization of ASV was largely confined to a single hospital, and NIV was most heavily utilized in medical and mixed medical-surgical ICUs. Overall there was significant variability with regard to the selection of MV modes even within a single healthcare system. Our study has the limitations inherent to any retrospective database examination, and this preliminary query did not ascertain the amount of time over which each MV mode was delivered.

Reference(s):

1. American Journal of Respiratory and Critical Care Medicine. 2000;161(5):1450-8.
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3. CHEST. 2015;147(6):1503-9.
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5. CHEST. 2017;151(1):166-80.

Figure 1: Frequency of Ventilator Mode by ICU

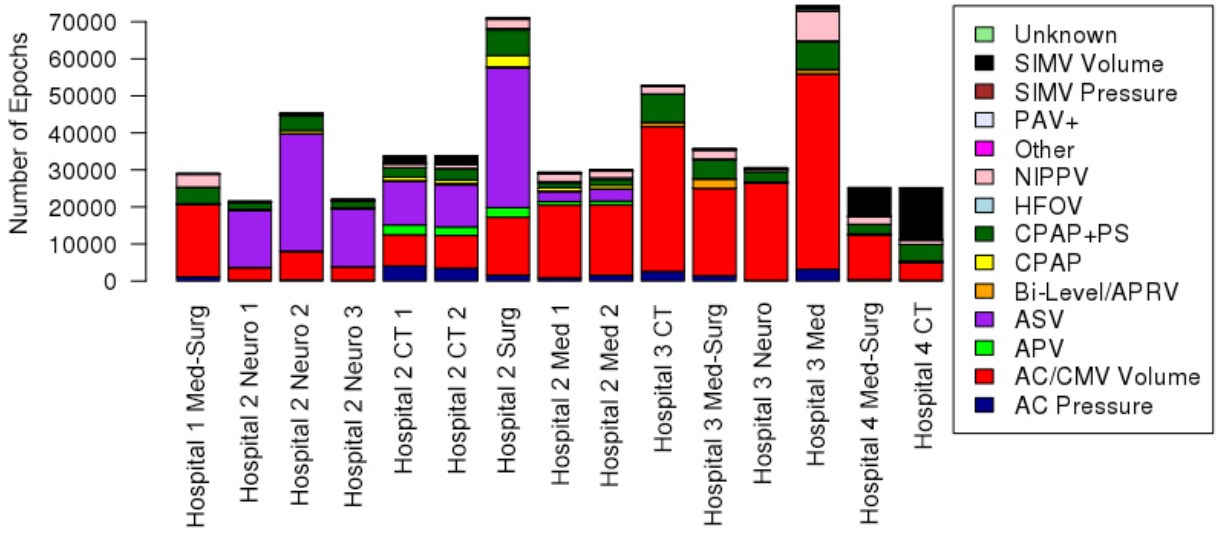


Figure 2: Frequency of Ventilator Mode by ICU Type

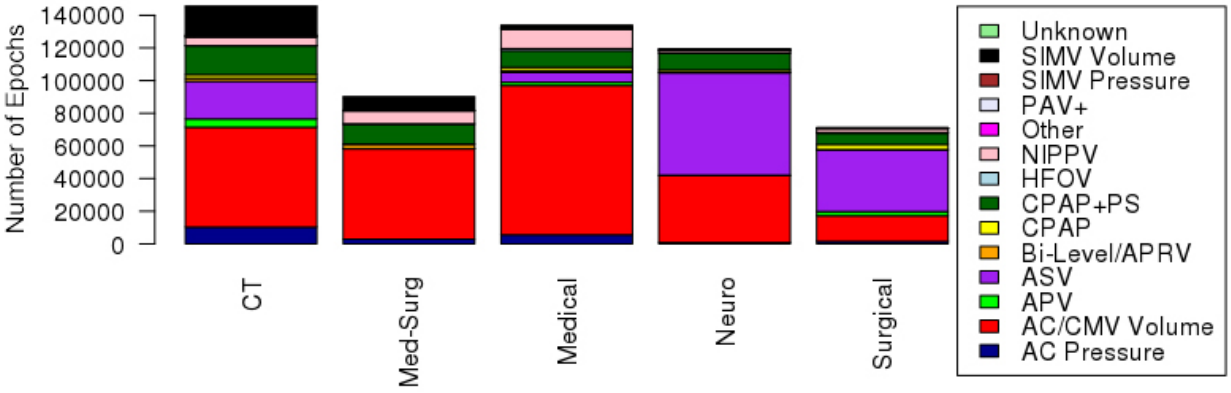
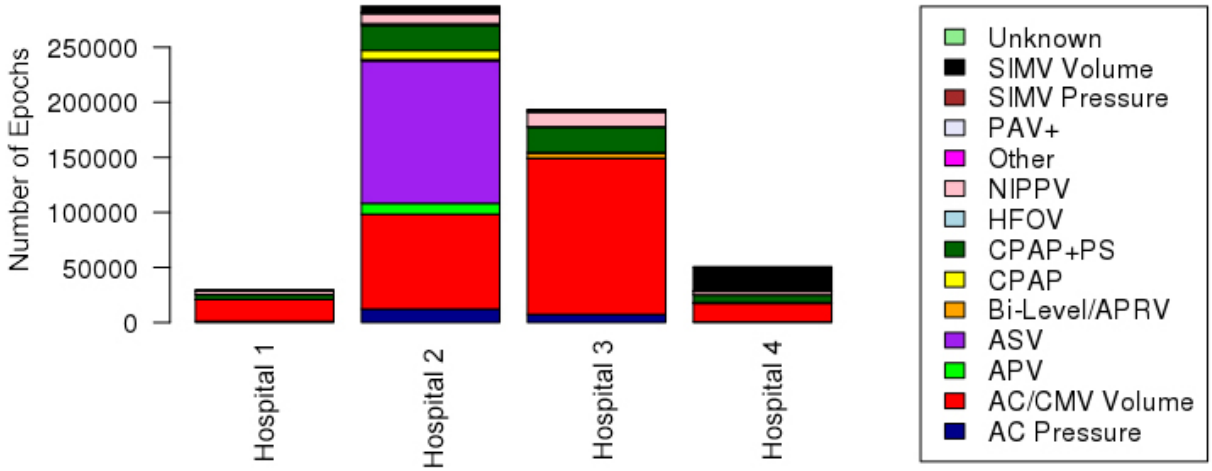


Figure 3: Frequency of Ventilator Mode by Hospital



CRITICAL CARE 4

Posters: 72-77

Moderator: Avneep Aggarwal, MD, and Miguel Cobas, MD, FCCM

CC 72 (2243)

Frequency of Arterial, Central Venous and Pulmonary Artery Catheter Placement During Kidney Transplantation: A National Database Analysis

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Introduction: The frequency of invasive hemodynamic monitoring during kidney transplantation varies between institutions (1). Although routine intraoperative placement of arterial catheters is not recommended (2), recommendations regarding central venous pressure monitoring are not clear (1). Some authors believe that a central venous catheter is indicated (3), despite typically minor intraoperative hemodynamic changes (4). We aimed to explore the frequency of intraoperative placement of arterial, central venous and pulmonary artery catheters during kidney transplantation using data from National Anesthesia Clinical Outcomes Registry (NACOR).

Methods: We carried out a retrospective analysis of NACOR data from 2010 to 2014. Clinical Classification Software code 105 was used to identify cases of kidney transplantation and Current Procedural Terminology codes were used to identify placement of arterial (36620), central venous (36555, 36556) and pulmonary artery (93503) catheters. We used logistic regression to assess for potential time trends in the frequency of intraoperative placement of vascular catheters and to test for association between facility type, patient characteristics and the likelihood of vascular catheter placement.

Results: We identified 10,580 cases of kidney transplantation performed in 100 facilities. Placement of an arterial catheter was reported in 1,700 (16.1%), central venous catheter in 2,580 (24.4%) and pulmonary artery catheter in 50 (0.5%) cases. Both arterial catheter and central venous catheter were placed in 999 (9.4%) cases. In 7,290 (68.9%) cases of kidney transplantation no intraoperative invasive monitoring was reported. The characteristics of cases are presented in Table 1. With each subsequent year of the observation period the likelihood of having an arterial catheter was 0.86 times lower than in the previous year (OR 0.86; 95% CI 0.83 - 0.90, $p < 0.001$). There were no significant trends in the proportions of kidney transplantation cases performed with central venous or pulmonary artery catheter. An increase in one unit on ordinal American Society of Anesthesiologists Physical Status scale increased the likelihood of central venous catheter placement by 19% (OR 1.19; 95% CI 1.15 - 1.22, $p < 0.001$). Within individual facilities that reported at least 50 cases of kidney transplantation, the

percentages of cases performed with arterial, central venous and pulmonary artery catheters ranged from 0% to 86%, 0% to 90% and 0% to 3%, respectively (Figure 1).

Conclusion: Approximately one quarter of kidney transplantation procedures in the USA are performed with a central venous catheter. Arterial catheters are placed less commonly, and their utilization is downtrending. However, the frequency at which arterial and central venous catheters are placed varies from 0 to approximately 90% between institutions. Such variability deserves consideration, given the potential complications of arterial and central venous catheter placement and the lack of sufficient evidence to support their utility.

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2. Bennett K et al. Anaesthesia for renal transplantation: an update. Anaesthesia & Intensive Care Medicine 2015;16(7):334-8.
3. Ricaurte L et al. Organ Transplant Group.. Anesthesia and kidney transplantation. Transplant Proc. 2013 May;45(4):1386-91.
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Figure 3. Distribution of individual facilities by reported proportion of kidney transplantation cases performed with specific types of vascular catheters.*
* Among facilities that reported 50 or more cases of kidney transplantation. (x or x) - number x is included; [x or x] - number x is excluded.

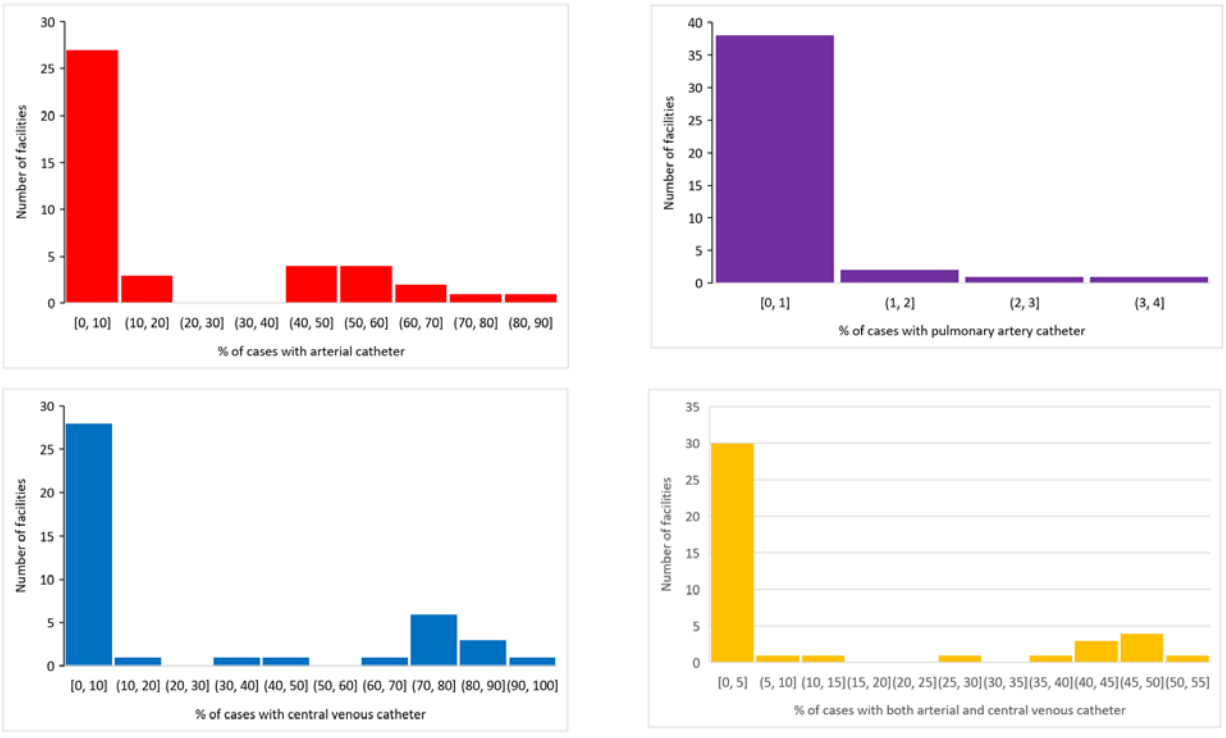

Table 1. Characteristics of cases included in analysis

	Arterial line		Central venous line		Pulmonary artery catheter		No invasive monitoring	
	n	%	n	%	n	%	n	%
Total	1,700	-	2,580	-	50	-	7,290	-
Patient age								
Mean age (SD)	50.0 (16.4)		50.4 (15.3)		54.7 (12.7)		49.9 (15.2)	
Age < 18	91	5.7	98	3.8	-	-	273	3.8
Age 19 - 49	591	36.9	993	38.6	13	26.0	2,906	40.2
Age 50 - 64	615	38.4	1,012	39.4	26	52.0	2,782	38.5
Age 65 - 79	297	18.5	459	17.9	11	22.0	1,254	17.3
Age 80+	8	0.5	10	0.4	-	-	18	0.3
Sex								
Male	974	60.8	1,534	59.6	34	68.0	4,129	59.8
Female	628	39.2	1,038	40.4	16	32.0	2,774	40.2
ASA PS								
I-II	61	4.8	115	5.1	3	7.1	436	8.1
III-V	1,202	95.2	2,146	94.9	39	92.9	4,976	91.9
Case duration								
Median case duration, minutes (IQR)	290 (233 – 355)		272 (224 – 324)		290 (246 – 384)		264 (216 – 318)	
Facility type								
University hospital	641	37.7	794	30.8	7	14.0	3,705	51.2
Large community hospital	314	18.5	377	14.6	2	4.0	1,009	13.9
Medium community hospital	64	3.8	95	3.7	6	12.0	777	10.7
Small community hospital	-	-	-	-	-	-	1	0.01
Specialty hospital	125	7.4	212	8.2	1	2.0	29	0.4
Other	555	32.7	1,101	42.7	34	68.0	1,719	23.7
Time of day								
Day shift (07:00-17:00)	1,170	68.8	1,765	68.4	30	60.0	4,774	65.5
After hours shift (17:01 - 06:59)	530	31.2	815	31.6	20	40.0	2,516	34.5
Day of the week, official holiday								
Weekday	1,406	82.7	2,093	81.1	42	84.0	5,900	80.9
Weekend	294	17.3	487	18.9	8	16.0	1,390	19.1
Urban/rural zip code								
Urban	565	33.2	1,101	42.7	23	46.0	2,653	36.4
Rural	99	5.8	153	5.9	2	4.0	360	4.9
Urban/rural	764	44.9	1,282	49.7	22	44.0	2,648	36.3
Not reported	272	16.0	44	1.7	3	6.0	1,629	22.4
SD – standard deviation; ASA PS – American Society of Anesthesiologists Physical Status; IQR – interquartile range.								

CC 73 (2050)

Presence of Heparin: Platelet Factor 4 Autoantibodies is Associated with Hypercoagulability

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Introduction: Thrombocytopenia following cardiothoracic surgery (CTS) is common and potentially caused by a number of etiologies. Cardiopulmonary bypass (CPB) mandates anticoagulation, usually with heparin, and thus engenders a risk of heparin-induced thrombocytopenia (HIT). HIT is characterized by thrombocytopenia, hypercoagulability, and poor outcomes. (1) Screening for HIT is performed by identifying autoantibodies against heparin:platelet factor 4 (PF4) complexes and then confirmed via serotonin release assay (SRA), in which functional activation of platelets is recognized. (2) Typically, no further action is taken for patients who have anti-PF4 antibodies but a negative SRA. (3) We hypothesized that patients undergoing CTS who have anti-PF4 antibodies may be hypercoagulable, independent of HIT, and therefore predisposed to thrombosis. We performed an exploratory study to potentially correlate hypercoagulability, as identified using rotational thromboelastometry (ROTEM) assays, with the presence of anti-PF4 antibodies.

Methods: After IRB approval, we conducted a prospective, observational study of adult patients recovering from CTS with thrombocytopenia, defined as a platelet count < 75,000/ÃŽÂ¼L. Patients were excluded if verbal consent could not be obtained from patient or surrogate. ROTEM assays, including EXTEM, INTEM, and FIBTEM, were performed immediately following enrollment. The decision to obtain anti-PF4 and/or SRA testing was left to the team caring for the patient. Throughout hospitalization, medical records were reviewed for thrombotic complications. Our primary outcome was the difference in maximal clot firmness (MCF), measured by EXTEM, INTEM, and FIBTEM ROTEM assays, between patients with and without anti-PF4 antibodies (PF4+ and PF4-, respectively), as determined by two sample t-testing. The occurrence of thrombotic complications was a secondary outcome. Power calculation was deferred, given the study's exploratory nature.

Results: A total of 33 patients were enrolled from September 2015 - December 2016. Of these, 20 were screened for HIT and therefore had PF4 results. The remaining 13 patients were excluded. Of the 20 included, 9 were PF4+ and 11 were PF4-. Of the PF4+ patients, 1 was positive and 1 was indeterminate for HIT by SRA. As seen in Figure 1, the mean EXTEM MCF of PF4+ patients was 60.9 +/- 0.7 compared to 51.6 +/- 9.7 in PF4- patients ($p < 0.05$). The mean INTEM MCF was 59.1 +/- 9.9 for PF4+ and 50.5 +/- 10.6 for PF4- (ns). The mean FIBTEM MCF for PF4+ was 30.0 +/- 13 and 17.8 +/- 9.1 for PF4- patients ($p < 0.005$). 17 patients developed thrombotic complications, 7 of whom were PF4+. There was no difference in MCF among any ROTEM sequence between those who did and those who did not develop thrombotic complications.

Conclusion: In this exploratory study, we found a significant increase in MCF among thrombocytopenic patients following CTS who were PF4+ compared to those who were PF4-. Of importance, only 1 patient was confirmed to have HIT. Thus, PF4+ patients were hypercoagulable independent of the development of HIT. In this study, a majority of both PF4+ and PF4- patients developed thrombotic complications, without a significant difference between the 2 groups. The implications of this are unclear, in part due to the fact that no formal screening process was used. Further study, appropriately powered, in both thrombocytopenic and non-thrombocytopenic patients is necessary to confirm the association of PF4+ and increased hypercoagulability.

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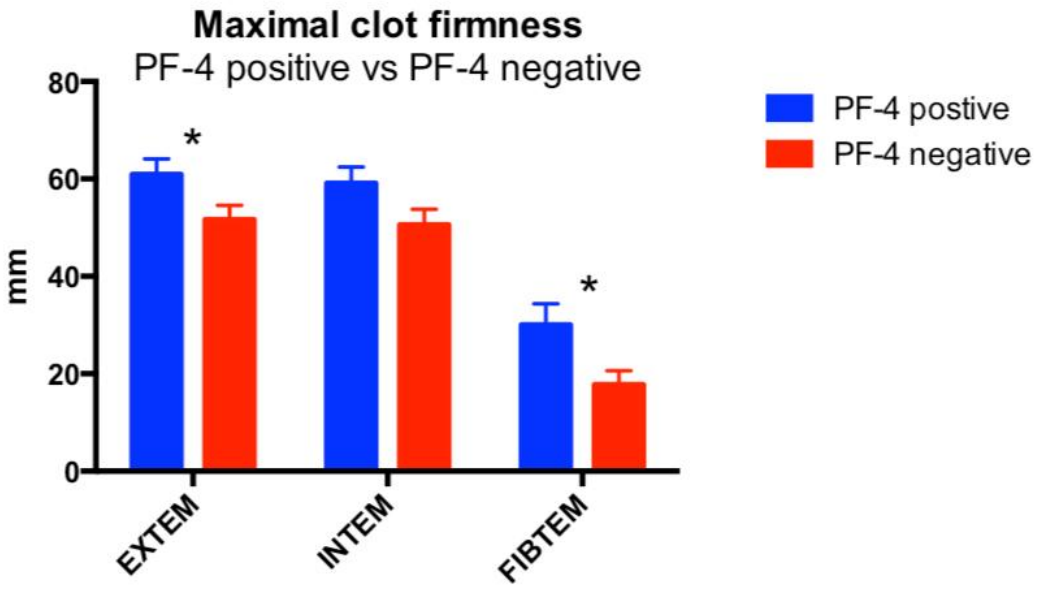

Figure 1: The mean maximal clot firmness (MCF) by ROTEM assay, compared between PF-4 positive and PF-4 negative patients. All assays had a significantly higher MCF in PF-4 positive patients.

CC 74 (1165)

Anaphylactic Shock Following Isosulfan Blue Dye Injection During Breast Surgery

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Introduction: Isosulfan blue dye, injected subcutaneously, is commonly used for sentinel lymph node mapping during surgical resection of tumors including breast carcinoma, melanoma, and vulvar carcinoma. Anaphylaxis to this dye has been described previously(1-7) with reported incidence 0.1-2%(1,4,8). Isosulfan blue, as a triarylmethane dye, is structurally similar to triarylmethane dyes commonly found in household products(9) such as cosmetics and detergents. For this reason, sensitization acquired from household product exposure may later result in anaphylaxis during surgical dye injection(2).

Case Report: A 22-year-old female with infiltrating ductal carcinoma of the left breast was scheduled to undergo sentinel lymph node biopsy, followed by left simple mastectomy and reconstruction. Shortly after isosulfan blue dye was injected, she developed severe hypotension that ultimately responded to intravenous epinephrine. Serum tryptase level was 24.4 ug/L. She was transferred to the intensive care unit intubated, quickly weaned off of her epinephrine infusion, and extubated 19 hours following the anaphylactic reaction.

Conclusion: Anaphylaxis should exist on the differential diagnosis for any patient receiving isosulfan blue who subsequently develops hypotension. The incidence is even higher when patent blue dye is used for lymph node mapping but lower with methylene blue. Anaphylactic patients should be monitored for the potential later development of a biphasic reaction. Routine prophylaxis has not been shown to reduce the incidence of isosulfan blue anaphylaxis. The most prudent strategy is to monitor patients vigilantly following intraoperative isosulfan blue administration and treat quickly with epinephrine if anaphylaxis is suspected. REFERENCES CITED 1. Allergic reactions to isosulfan blue during sentinel node biopsy-a common event. 2001;130(3):439-442. 2. Dyed but Not Dead. 2012; 12(2): 135-140. 3. Anaphylaxis to isosulfan blue. 2002;88(1):64-66. 4. Adverse reactions to isosulfan blue during selective sentinel lymph node dissection in melanoma. 2000;7(5):361-6. 5. Life-threatening anaphylaxis following subcutaneous administration of isosulfan blue 1%. 1985;4(2):219-221. 6. Case of Severe Anaphylactic Reaction Secondary to Isosulfan Blue Dye Injection. 2015 ; 15(2): 183-186. 7. Isosulfan Blue Dye Anaphylaxis Presenting as Impaired Ability to Ventilate via a Laryngeal Mask Airway. 2014;3(1):1-2. 8. Can methylene blue only be used in sentinel lymph node biopsy for breast cancer? 2006;12(5):428-430. 9. Drug Allergy: Clinical Aspects, Diagnosis, Mechanisms, Structure-Activity Relationships. 2013, pp. 291-2.

Reference(s):

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6. Case of Severe Anaphylactic Reaction Secondary to Isosulfan Blue Dye Injection. 2015 ; 15(2): 183-186.
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9. Drug Allergy: Clinical Aspects, Diagnosis, Mechanisms, Structure-Activity Relationships. 2013, pp. 291-2.

CC 75 (2215)

Fatal Septic Shock Following an Outpatient Cystoscopy

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Introduction: Approximately 25% of sepsis cases originate from the genitourinary tract. Most cases are caused by Gram-negative bacilli, primarily Escherichia coli (50%), Proteus spp. (15%), and Enterobacter and Klebsiella spp. (15%); rarely, other bacteria, including Gram-positive organisms, are implicated1. We present a woman who had recently self-discontinued chronic steroid therapy for rheumatoid arthritis and presented for outpatient cystoscopy and removal of a ureteral stent placed five weeks earlier in the setting of E. coli pyelonephritis. Post-procedure, she developed septic shock, with blood cultures positive for Pseudomonas aeruginosa, Actinomyces sp., and Veillonella parvula.

Methods: Patient RS was a 66-yo woman with PMHx rheumatoid arthritis requiring chronic steroid therapy and limiting her functional status; hypothyroidism; non-alcoholic steatohepatitis; anemia; esophageal candidiasis; and stable small pericardial effusion. Her complex abdominal surgical history included a sleeve gastrectomy for morbid obesity, ultimately converted to roux-en-Y gastric bypass due to delayed leak, c/b marginal ulcer and massive hemorrhagic shock requiring emergent surgery and gastro-jejunal anastomosis, c/b chronic low-output enterocutaneous fistula. RS developed pyelonephritis requiring hospitalization and cystoscopy with left double-J ureteral stent placement. Urine culture grew E. coli sensitive to meropenem and gentamicin. She was scheduled for another cystoscopy with stent removal and laser lithotripsy 5 weeks later. Following discharge, she noted malaise, nausea, and anorexia with 15-lb weight loss. About 4 weeks prior to repeat cystoscopy, she self-discontinued prednisone due to perceived lack of efficacy. Stress-dose steroids were mentioned in preoperative internist and anesthesiologist notes but never administered. The cystoscopy was performed under general anesthesia with uneventful tracheal intubation. Meropenem was given pre-procedure. Post-induction hypotension resolved with phenylephrine. Meperidine was given for rigors after extubation. In the PACU, the patient developed hypotension, tachycardia, hypoglycemia, and fever to 38.5C. Hydrocortisone 100mg, crystalloid intravenous fluid, albumin, and vasopressors were administered. Labs showed WBC 0.80 k/uL, procalcitonin 29.1 ng/uL, lactate 4.5 mmol/L, troponin 0.11 ng/mL. A presumed diagnosis of urosepsis was made, and she was admitted to the SICU. Hydrocortisone and meropenem were continued, and vancomycin, ciprofloxacin, and fluconazole were added. She was reintubated and on 3 vasopressors by POD1. Troponins peaked at 1.23. TTE revealed akinesis and severe hypokinesis of multiple walls. MVO2 79%. Findings were deemed likely secondary to demand ischemia in the setting of septic shock. On POD 2/3, additional antibiotics were added: daptomycin, gentamicin, micafungin, metronidazole, & colistimethate. The patient developed multi-organ failure, was transitioned to comfort care, and expired POD 4.

Results: Blood cultures grew Actinomyces, Pseudomonas aeruginosa, & Veillonella parvula (see Table 1).

Conclusion: Urosepsis was considered to be the most likely cause of death, with a possible loculated fluid collection or infected stone serving as a nidus for infection and rendering the patient unresponsive to aggressive antibiotic therapy. Intra-abdominal sepsis was deemed much less likely, even with a known enterocutaneous fistula, given the temporal relationship of the sepsis to genitourinary tract instrumentation

Reference(s):

1. Approach to a Patient with Urosepsis. 1(1): 57-63. 2009
2. Veillonella parvula Meningitis. 31 (3): 839-840. 2000.
3. Acute pyelonephritis and secondary bacteraemia caused by Veillonella during pregnancy. pii: bcr-2012-007364.
4. Actinomycotic brain abscess in immunocompetent patient. pii: S0009-7411(16)30088-3. 2016.
5. Actinomyces and Related Organisms in Human Infections. 28(2): 419-442. 2015.
6. Pelvic actinomycosis: Diagnostic and therapeutic aspects. 44(3):168-74. 2016.

POD 0 BLOOD CULTURE RESULTS

ORGANISM	SUSCEPTIBILITIES	RESISTANCE
Pseudomonas aeruginosa	Cefepime, ciprofloxacin, gentamicin, meropenem, piperacillin/tazobactam	None reported
Actinomyces sp.	Ampicillin/sulbactam, cefoxitin, penicillin G	Clindamycin, metronidazole
Veillonella parvula	Unavailable	Unavailable

CC 76 (1772)

Initiating an Evidence Based Extubation Protocol Reduced the Incidence of Unintended Postoperative Intubations (UPIs)

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Introduction: UPIs are defined by any unplanned intubation and ventilator support within 30 days of the principal operative procedure. UPIs are one component of postoperative pulmonary complications (PPCs), which are the leading cause of death and increase in healthcare expenditure in surgery. The UPI rate is determined by the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP). The ACS NSQIP semiannual report demonstrated that our institution had a yearly UPI rate 50% higher than the national benchmark at 30 days. This prompted a quality improvement (QI) initiative to reduce our institution's UPI rate. This involved determining the causation of every UPI during that year and subsequently implementing an appropriate extubation protocol based on the findings.

Methods: The ACS NSQIP collects and analyzes 135 variables to generate benchmarks and incidence rates for a multitude of conditions. The methodologies have been validated, but the data set is limited in that it is a small sampling of rare events. The data is given in terms of rates (not actual cases) and must be extrapolated to reflect the total patients involved, which could limit one's ability to determine causation. Several methods were used to elucidate details from the NSQIP report which included: ventilator usage in the post-anesthesia care unit, billing/coding information, manual electronic medical record review, and ventilator usage in the surgical intensive care unit (SICU).

Results: Using the aforementioned methods, it was determined that every reported incidence of UPI during that year occurred in the SICU. A standardized extubation protocol (detailed in the Discussion section) was subsequently developed and promptly instituted in the SICU. During that time, the UPI rates had improved by 50% for the 24 and 48 hour timeframes (Figure 1).

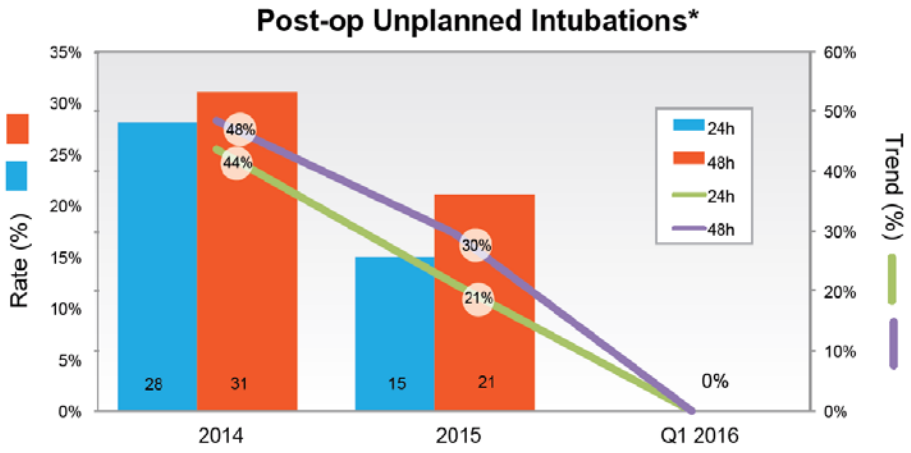
Conclusion: UPIs are a major source of morbidity and mortality for surgical patients. The optimal rate of UPIs is debatable, but national benchmarks from quality programs (such as the ACS NSQIP) are an essential part of QI for determining where issues exist and the efficacy of interventions. Use of weaning protocols have demonstrated the reduction of the duration of mechanical ventilation by 25%, weaning duration by 78%, and length of stay in the ICU by 10%. First, the patient needs to be assessed 'readiness to wean.' If the patient meets the inclusion criteria, a spontaneous breathing trial should be performed at the outlined settings. The patient should be assessed every hour as tolerated and weaning parameters should be obtained. If the patient passes the spontaneous breathing trial, proceed with extubation (Figure 2). Post-surgical patients requiring admission into the intensive care unit and ventilator support present a unique challenge in regards to UPIs. Post-operative ventilator requirements

can typically be attributed to the acute surgical intervention performed (versus intrinsic chronic pathology). This presents the opportunity for aggressive weaning from mechanical ventilation as the patients recover from surgery. Our institution demonstrated a 50% reduction in the UPI rate over the last year after implementing a standardized extubation protocol. Improvements in this area will directly affect patient outcomes, healthcare costs, and institutional performance (Figure 3).

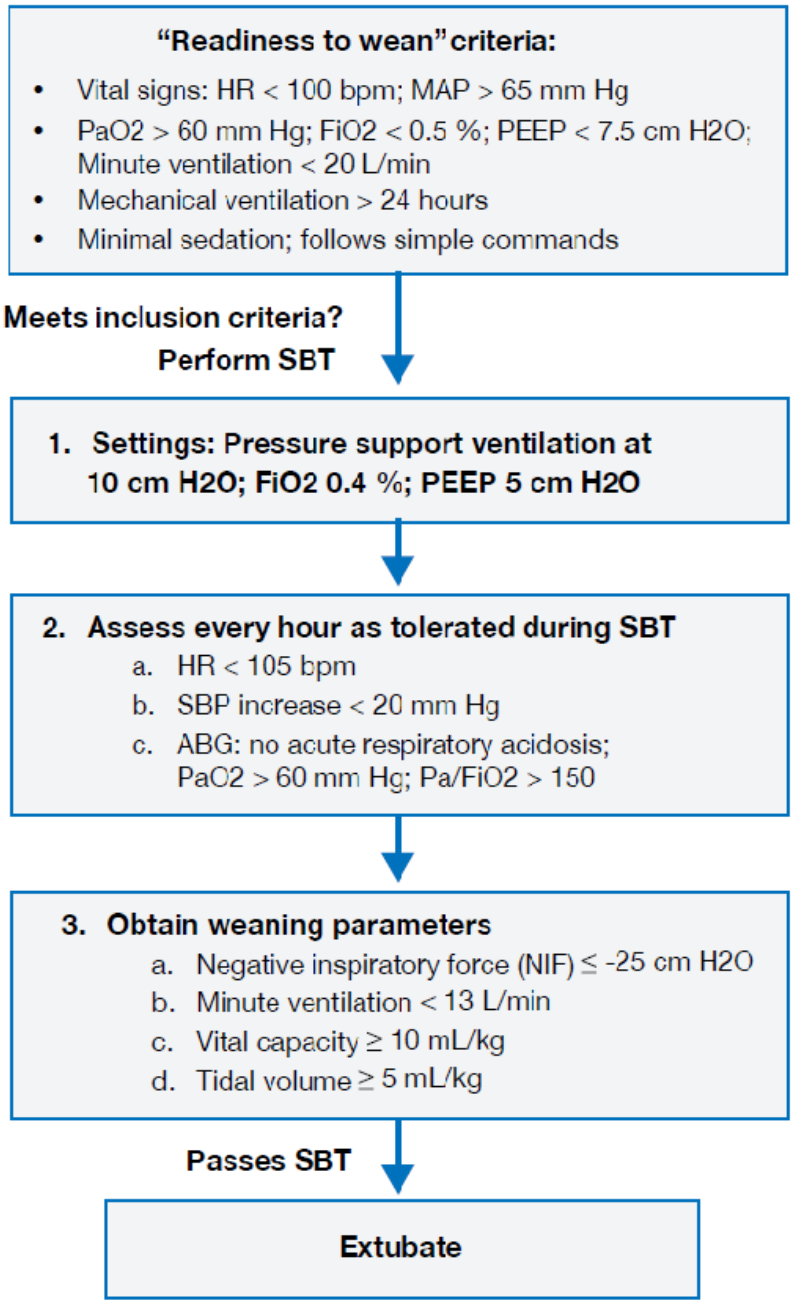
Reference(s):

1. Blackwood B, Burns KE, Cardwell CR, O'Halloran P. Protocolized versus non-protocolized weaning for reducing the duration of mechanical ventilation in critically ill adult patients. Cochrane Database Syst Rev. 2014 Nov 6;(11):CD006904. doi: 10.1002/14651858.CD006904.pub3.
2. McConville JF, Kress JP. Weaning patients from the ventilator. N Engl J Med. 2013 Mar 14;368(11):1068-9. doi: 10.1056/NEJMc1300398.

FIGURE 1



Weaning Protocol



CC 77 (1467)

Blinding, Randomization, and Power in Critical Care Medicine Animal Studies

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Introduction: Despite a significant increase in the volume of basic biomedical research over the past decade, there has been limited translational success into clinical medicine 1. Furthermore, reproducibility of animal research is exceedingly low2. In critical care medicine, it has been illustrated in small retrospective studies on animal research that methodology, study design, and reporting is often insufficient3. The purpose of our study was to compare reporting of blinding, randomization, and power calculations in critical care medicine research involving animals in 2005 vs. 2015. We hypothesized that these study design characteristics were more frequent in the more recent studies.

Methods: We performed a PubMed search for animal studies in all critical care journals published in 2005 and 2015 and graded the study design quality based on the presence of blinding, randomization, and power calculations. We required respective journals to have ten or more articles involving animals in both years to be included in the study. Chi-square tests and logistic regression were used for the analysis. P values were adjusted for multiple comparisons and 98.3% confidence intervals were reported. For 80% power and adjusting for three comparisons (alpha=0.017) to detect an absolute increase between 2005 and 2015 for blinding, randomization, and power calculations of 12%, 13%, and 21% respectively, a sample size of 282, 614, and 218 respectively would have been required.

Results: A total of 820 articles in 7 critical care journals were included. In 2005, there were 478 articles evaluated: blinding, randomization, and power calculations were reported in 19%, 35%, and 2% of studies. For the 342 articles evaluated for 2015, 35%, 47%, and 9% performed these metrics. The increase in proportion for the 3 metrics tested was statistically significant (adjusted $p<0.001$, 0.002, and <0.001). The odds of a power analysis being performed increased 4.5 times (1.8, 10.9), odds of randomization increased 1.6 times (1.15, 2.29), and odds of blinding increased 2.27 times (1.54, 3.33) between the two time periods.

Conclusion: Only a minority of the studies analyzed described critical study design features to reduce common sources of bias. Our finding that reporting quality significantly increased from 2005 to 2015 however is quite encouraging. Future research should assess if efforts to reduce bias in experimental critical care research lead to higher rates of translation from bench to the ICU bedside.

Reference(s):

1. Survey of the quality of experimental design, statistical analysis and reporting of research using animals. PLoS One 2009;4:e7824

2. Reproducibility in science: improving the standard for basic and preclinical research. Circ Res 2015;116:116-26.

3. Anesthesia and Monitoring in Small Laboratory Mammals Used in Anesthesiology, Respiratory and Critical Care Research: A Systematic Review on the Current Reporting in Top-10 Impact Factor Ranked Journals. PLoS One 2015;10:e0134205.

CRITICAL CARE & AIRWAY MANAGEMENT & TECHNOLOGY, COMPUTING AND SIMULATION, EQUIPMENT MONITORITING

Posters: 78-82

Moderator: Erin Hennessey, MD

CC 78 (2104)

Predicting Mortality in Stroke Population Within The First Few Hours Of Admission

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Introduction: Stroke is one of the major medical emergencies with a high risk for morbidity leading to disability and mortality. Due to risk of neurological disability and mortality, it is essential to rapidly initiate acute care and consider multi-disciplinary advanced care for complex stroke patients. In this study, we asked the question whether it is possible to predict the mortality of stroke patients within their first few hours of hospital admission.

Methods: With the approval of the Human Studies Committee at the University of Louisville (IRB #: 13.0396), we performed a retrospective analysis from the Stroke Quality Database. Patients who were admitted between 2007 and 2012 were included. Hospital mortality was used as the main outcome. Patients' demographics, baseline illnesses, confounding factors, home medications, baseline neurological assessment scores, and basic laboratory values on admission were included in the analysis as potential factors. Multivariate analysis was performed to assess the independent contributing factors of mortality. Data is presented as odds ratios and 95% confidence intervals.

Results: About 10% of our stroke patient population died during their hospital stay. Multivariate analysis was performed in 1,267 patients. NIH Stroke Scale on admission, mRankin Scale, high WBC levels, elderly age (age≥65), bleeding stroke types (ICH and SAH), recurrent stroke, atrial fibrillation, hemorrhagic conversion of stroke, baseline use of Ca channel blockers, and beta-blockers independently contributed to in-hospital mortality (Table).

Conclusion: Stroke patients' baseline characteristics, hospital admission neurological assessment scales, and laboratory values on admission help to predict in-hospital mortality. Therefore, it is essential to rapidly initiate acute care for high-risk and complex stroke patients. Additionally, focusing on the modifiable factors such as managing blood pressure, heart rate control, preventing secondary hits due to hemorrhagic conversion of stroke, and treating acute infections may help to decrease acute stroke mortality. However, at this point, these are hypotheses to be tested in the future.

Reference(s):

1. Long-term survival in older critically ill patients with acute ischemic stroke. Crit Care Med 2009 Dec;37(12): 3107-13.

2. Ventilator-associated pneumonia in critically ill stroke patients: frequency, risk factors, and outcomes. J Crit Care. 2011 Jun;26(3):273-9

Table: Multivariate Regression Analysis Results – Independent Contributors of In-house Stroke Mortality

Factors	Odds Ratio	95% CI	p
NIHSS	1.08	1.03 - 1.12	< 0.001
mRankin	6.34	3.48 - 11.56	< 0.001
Age >64 years	5.51	2.66 - 11.41	< 0.001
WBC >11	3.36	1.82 - 6.21	< 0.001
ICH & SAH (vs. IS)	10.40	1.81 - 59.68	0.009
Recurrent Stroke	5.64	1.75 - 18.20	0.004
A Fib	2.73	1.27 - 5.87	0.010
Hemorrhagic Conv.	2.57	1.17 - 5.66	0.010
Ca-Ch.Blocker Use	2.00	1.09 - 3.66	0.025
Beta-Blocker Use	1.92	1.06 - 3.49	0.033

NIHSS: NIH Stroke Scale; mRankin: modified Rankin Scale; WBC: white blood cells; ICH: intracerebral hemorrhage; SAH: subarachnoid hemorrhage; IS: ischemic stroke; A Fib: atrial fibrillation; Ca-Ch: calcium channel

AM 80 (1866)

Anterior Mediastinal Mass: To Bronch or Not to Bronch?

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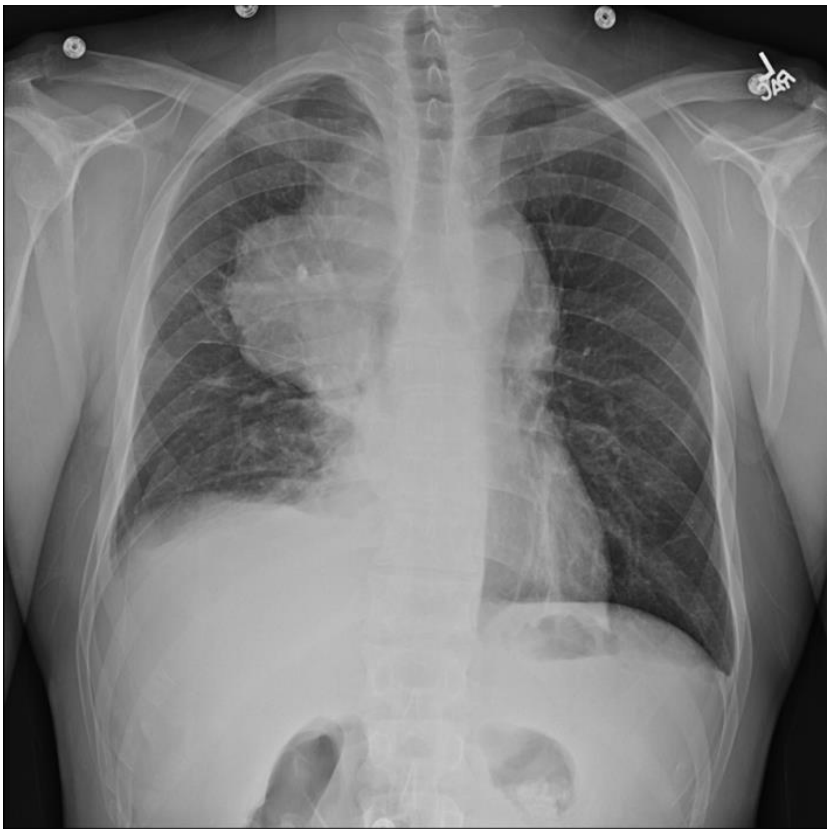
Introduction: Proving anesthesia to patients with mediastinal masses is difficult as there is great potential for cardiopulmonary collapse due to the unique pathophysiology of the disease process. Anterior mediastinal masses may be benign or malignant and most commonly arise from lymphoma, thymoma, and germ cell tumors. Due to the many structures traversing the anterior mediastinum, compression of vital structures including the superior vena cava, great vessels, and airway are hallmark of the disease. Here, we discuss a case scheduled for bronchoscopy in a patient with a large anterior mediastinal mass and the anesthetic implications.

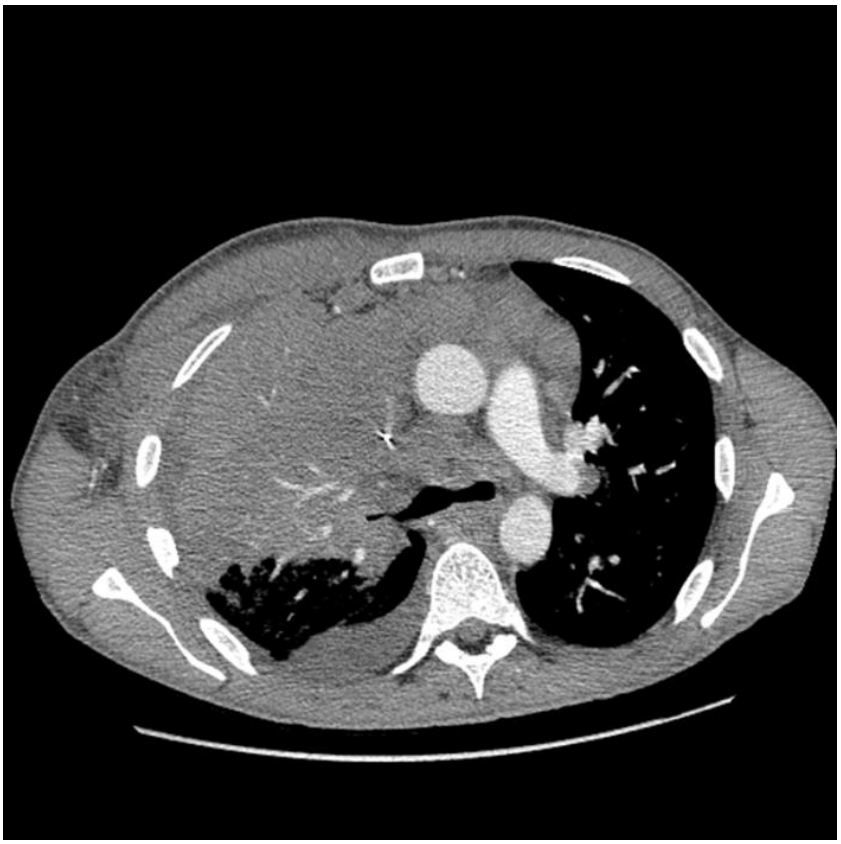
Results: A 40 year old gentleman with no significant past medical history presented to the hospital with night sweats, 15 pound weight loss, fevers, and dyspnea while supine. Chest radiography was obtained (figure 1A), which revealed an anterior mediastinal mass. The patient was admitted for further workup, including chest computed tomography (figure 1B) and biopsy, the latter of which was diagnostic for classical non-Hodgkin lymphoma. After his initial round of chemotherapy, repeat chest radiography was suspicious for infection and a bronchoscopy was requested by the hematology service for diagnosis and to guide treatment process. The patient had hypoxia and dyspnea when lying greater than 70 degrees, so there was great apprehension to perform this procedure. Ultimately, dexmedetomidine and ketamine were used to successfully sedate the patient for the procedure.

Conclusion: Sedating patients with anterior mediastinal masses presents a considerable physiologic challenge for the anesthesiologist. Under ideal circumstances, all sedating agents should be avoided and procedures should be performed only if absolutely necessary to guide diagnosis and treatment. The maintenance of spontaneous ventilation is crucial to management of this patient population to avoid elevated intrathoracic pressure and cardiopulmonary collapse. Multiple therapeutic options should be available and backup plans should be in place with adequate resources present if providing general anesthesia to this patient population.

Reference(s):

1. Blank R., de Souza, D. Anesthetic management of patients with an anterior mediastinal mass: Continuing Professional Development. Can J Anesth (2011) 58:853-867.
2. Rath L., Gullahorn G., Connolly N., et al. Anterior Mediastinal Mass Biopsy and Resection: Anesthetic Techniques and Perioperative Concerns (2012) 16(4):253-242.





TCSEM 81 (1711)

Testing a Novel Manual Communication System for Mechanically Ventilated ICU Patients

Miriam A Goldberg, MEng[1], Leigh R Hochberg, MD, PhD[2], Dawn Carpenter, NP[1], Johnny Isenberger, MSN[1], Stephen Heard, MD[1], J. M Walz, MD[1]

[1]University of Massachusetts Medical School, Worcester, MA, [2]Brown University, Providence, RI

Introduction: Available communication methods for intubated patients in the ICU are insufficient to meet patient needs. In addition to the psychological strain patients incur due to extended inability to communicate, both ICU patients and their care providers report broadly unsuccessful communication attempts, resulting in less effective medical care and undue stress. [1, 2] Use of existing methods - including letter boards, writing, and mouthing words - for mechanically ventilated (MV) patients has led to a consensus that new methods are required. [3] Novel technologies and approaches may be used, in conjunction with human-computer interface -centered design approaches, to create a more intuitive and useful method of patient communication. We report on the testing of a new system designed to address the communication needs of MV patients that is currently being tested in a low- to medium-acuity surgical ICU. [4]

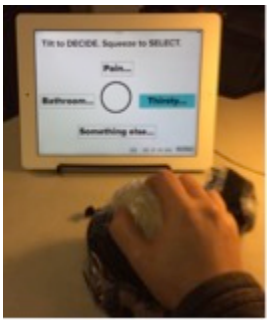
Methods: We have developed several generations of prototypes designed to address patient communication needs. Design of this device has focused on ICU-specific communication needs, including ICU-specific content, infection control, simple design, and capitalizing on motor movements that can be easily performed by most ICU patients. Initial testing, starting with non-MV patients able to give more detailed feedback, has begun in a low- to medium- acuity surgical ICU. Recently developed prototypes (Figures 1, 2) combine custom-built tablet software, focusing on the needs that nurses believe patients wish to express in the ICU setting, with a newly designed manually operated access device. The system is intended to produce visual and auditory output in order to allow patients to answer basic questions and effectively convey information.

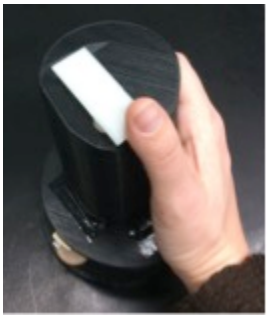
Results: Initial patient impressions are encouraging, particularly among patients who have recently experienced mechanical ventilation. The design decision to separate the access method from a visual output system (compared to usual tablet computer configurations, in which the access method is identical to the visual display) has been validated by observing patient needs. Many patients are unfamiliar with tablet software or struggle with manual dexterity required to access the tablet screen directly, further indicating the need for an external access method as part of the system. The content suggested by nurses via a previously conducted survey has been confirmed by patients as relevant to their experience.

Conclusion: A novel manually operated communication system has elicited both positive reviews and helpful feedback from patients. Ongoing iteration may yield a system that is particularly well adapted to the unique communication challenges of mechanically ventilated patients in the ICU.

Reference(s):

1. Am J Crit Care, 2012, 21(2), e21-e32
2. Heart & Lung: The Journal of Critical Care, 1994, 23(4) 323-27
3. Anesth Analg, 2016, 122(5S), S-424
4. Anesth Analg, 2016, 122(5S), S-470





TCSEM 82 (1718)

Principles of Augmentative & Alternative Communication System Design in the ICU Setting

Miriam A Goldberg, MEng[1], Leigh R Hochberg, MD, PhD[2], Dawn Carpenter, NP[1], Johnny Isenberger, MSN[1], Stephen O Heard, MD[1], J. M Walz, MD[1]

[1]University of Massachusetts Medical School, Worcester, MA, [2]Brown University, Providence, RI

Introduction: The ICU as a technology design setting requires specific and thoughtful awareness of patient-, caregiver-, and environment-related constraints. Designing an ICU-specific communication system, which involves additional layers of subjective impressions and user-specific preference compared to more technical medical interventions, involves an even deeper understanding of patient needs and desires, building on existing work exploring available technologies for use in this setting. [1, 2] We report our initial experience from a pilot study with a novel communication device engineered specifically to allow mechanically ventilated ICU patients to communicate with caregivers. [3]

Methods: We used a validated survey for nurses about communication purposes to explore the beliefs, attitudes, and desires of nurses with regard to the parameters of the technology design effort. [4] Many hours of observation and discussion were included in the conception and initial prototyping stages. Existing technologies available for communication assistance in the ICU - e.g, letter boards, writing on paper, and mouthing words - were both observed directly and asked about in discussions with nurses, and suggestions about the content for an eventual communication system were collected. ICU-specific design requirements were noted for incorporation into successive prototypes (Figures 1, 2). These requirements include adherence to infection control standards, accessibility to restrained patients, and availability to patients with motor weakness, contractures, edema, tremor, and/or neuropathy. In addition, the system must include a minimal learning curve, so that patients will be able to rapidly and intuitively understand how to use the system.

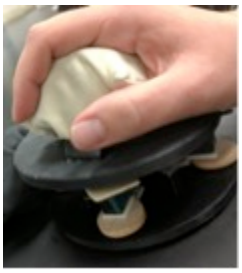
Results: Initial testing in the ICU has revealed additional considerations for technology design. For instance, many patients have visual impairments, necessitating that any images or text be large and high-contrast. Furthermore, patients benefit from a very short teaching/demo process due to their short attention span related to medication effects, fatigue, and underlying disease processes. Additionally, leveraging interfaces with significant similarities to what patients are already familiar with from everyday contexts appears to increase intuitiveness and reduce confusion. Nurses also mentioned that the system should, if at all possible, be accessible to at least some non-English-speaking patients. Finally, the wide variety of physical deficits that ICU patients experience requires that manually operated

devices be as flexible as possible in terms of type of manipulation required, so that a large cross section of patients can participate.

Conclusion: ICU patients are in significant need of communication systems that meet their unique needs. Building such a system requires awareness of many different constraints, including both general heterogeneity of patient needs and capabilities and the constraints of the ICU setting itself.

Reference(s):

1. Journal of Pediatric Rehabilitation Medicine: An Interdisciplinary Approach 3 (2010) 289-301
2. Am J Crit Care, 2012, March; 21(2): e21-e32
3. Anesth Analg, 2016, 122(5S), S-470
4. Anesth Analg, 2016, 122(5S), S-424



PERIOPERATIVE ANESTHESIA

Posters: 83-87

Moderator: Brenda Fahy, MD, MCCM, and Sean Josephs, MD

PA 83 (2271)

Case Report: Laparoscopic Cholecystectomy in a Patient With A Heartmate II

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Introduction: Non cardiac surgery (NCS) on patients with left ventricular assist devices (LVADs) is becoming more common as the number of patients with LVADs is increasing. There is little data and currently no guidelines on the perioperative management of such patients undergoing laparoscopic NCS. The challenges concerning NCS in patients with LVADs are perioperative management of anticoagulation and hemodynamic monitoring. Small studies have shown success undergoing NCS with the major perioperative complication being bleeding although early mortality is usually attributable to worsening preoperative organ dysfunction or unrelated events after discharge. Studies also indicate that multidisciplinary team optimization of patient preoperatively and risk benefit analysis for anticoagulation reversal, bridge, or continuance is essential.

Case Description: We describe the anesthetic management of a patient undergoing elective laparoscopic cholecystectomy. A 62 year old male with severe coronary artery disease requiring percutaneous intervention and ICD placement who developed heart failure secondary to severe ischemic cardiomyopathy and had a Heartmate II placed 50 months prior as a bridge to transplant. He was admitted to the hospital with decreased drainage from his percutaneous cholecystostomy tube, and the decision made to proceed with elective cholecystectomy. We optimized our patient on the cardiac floors preoperatively, held anticoagulation for 8 hours and in the operating room placed a pre induction arterial line using ultrasound guidance given his vessels lacked pulsatile flow. An LVAD nurse practitioner was present for the entire operation and made no changes were made to preoperative settings. Temporary defibrillator pads were placed after ICD function was temporarily discontinued and restored after operation. Central venous catheter was placed with ultrasound. We induced general anesthesia and managed hemodynamics with adequate crystalloid, colloid, and blood products to maintain preload, continuous infusion of vasopressors and inotropes to mitigate right heart failure and maintain organ perfusion.

Results: The patient was managed postoperatively in the cardiothoracic surgical intensive care unit, without excessive bleeding and restarted anticoagulation the day after surgery. He was transferred to the regular cardiac floors on the third postoperative day.

Conclusion: Patients with LVADs require multispecialty preoperative management to decide on the need for surgery, optimize, manage anticoagulation, and mitigate poor outcomes. Central venous catheters, arterial lines, and large bore IV access may be needed for all patients undergoing moderate to severe

risk surgery to maintain preload, closely monitor afterload, and avoid inadequate oxygenation. Also it is imperative to use ultrasound for placement of all invasive monitors as lack of pulsatile flow precludes palpation. Although perioperative management is challenging, patients with LVADs can safely undergo elective laparoscopic surgery, and our lessons learned may contribute to the development of management guidelines.

Reference(s):

1. Laparoscopic Cholecystectomy in a Patient with a Biventricular Cardiac Assist Device. JSLS (2005)9: 481-484
2. Laparoscopic cholecystectomy in a patient with an implantable left ventricular assist device. ZBr J Anaesth 2008; 100: 652-5
3. The Perioperative Management of Patients With Left Ventricular Assist Devices Undergoing Noncardiac Surgery. Mayo Clin Proc. July 2013 88(7): 674-682
4. Ventricular assist devices and non-cardiac surgery. BMC Anesthesiology (2015) 15: 185

PA 84 (1423)

2-Octylcyanoacrylate Adhesive for Prevention of Central Venous Catheter Infections

Aaron B Dahl, MD, Thomas Graetz, MD, Zach Cohen, MD

Barnes Jewish Hospital, St. Louis, MO

Introduction: The CDC suggests that the average rate of central catheter associated bloodstream infections (CLABSI) is about 5.3 per 1000 catheter days (1). Bacterial colonization of the catheter, an event that precedes catheter related blood stream infections (CRBSI), occurs in roughly 25%-30% of central venous catheters maintained for several days (2). 250,000 cases of CRBSI occur annually and cost $6000 to $90,000 per event, hence the significant interest in reducing this occurrence (1,3). Our group hypothesized that sealing the skin insertion site with 2-Octylcyanoacrylate adhesive would reduce CLABSI by creating a sterile barrier to decrease extraluminal colonization and the 'pistoning' of the catheter in and out of the skin. This backwards and forwards motion of the catheter is thought to promote bacteria entry into the vein (2,4).

Methods: This proof of concept study is being conducted under appropriate Washington University Institutional Review Board approval. The structural and material compatibility of 2-Octylcyanoacrylate and polyurethane catheters were investigated and deemed suitable. Raman spectroscopy and electron microscopy demonstrated no chemical or structural changes to the catheter from the 2-Octylcyanoacrylate adhesive following its removal with acetone after a 10-day dwell period. This indicates that neither the 2-Octylcyanoacrylate nor subsequent removal with acetone impacted the material integrity of the central venous catheters and supports the suitability of use in humans. The CDC definition of catheter colonization is met when the tip grows 15 or more CFU in a culture prepared using the roll plate method. We are utilizing catheter colonization primarily as a surrogate for infectious complications to determine feasibility of the technique and proof of concept. Subjects 18 years of age and older with plans to receive a multilumen subclavian or internal jugular central venous catheters are recruited from the preoperative holding areas. We exclude pregnant women, children, patients with catheters placed under emergent conditions, patients likely not to survive 3 days, those with skin disorder at the site of insertion, allergy to tissue adhesives or petroleum Jelly, patients unable to provide consent.

Results: We have enrolled 6 patients with subsequent daily catheter inspection for signs of 2-Octylcyanoacrylate cracking or loss of seal integrity which is our primary outcome. On preliminary evaluation seal integrity appears to be maintained for approximately 4 days. Attempts have been made to send all catheters to the microbiology lab for culture following removal, however, while 3 catheters were delivered to the microbiology lab only one catheter has been successfully processed and showed no bacterial growth.

Conclusion: 2-Octylcyanoacrylate does not undergo structural or chemical changes based on Raman and electron microscopy. Utilizing 2-Octylcyanoacrylate seals the skin insertion site of the catheter for approximately 4 days according to our proof of concept trial. Further investigation is necessary to determine if use of this skin sealant leads to a difference in the rate of catheter colonization or CLABSI.

Reference(s):

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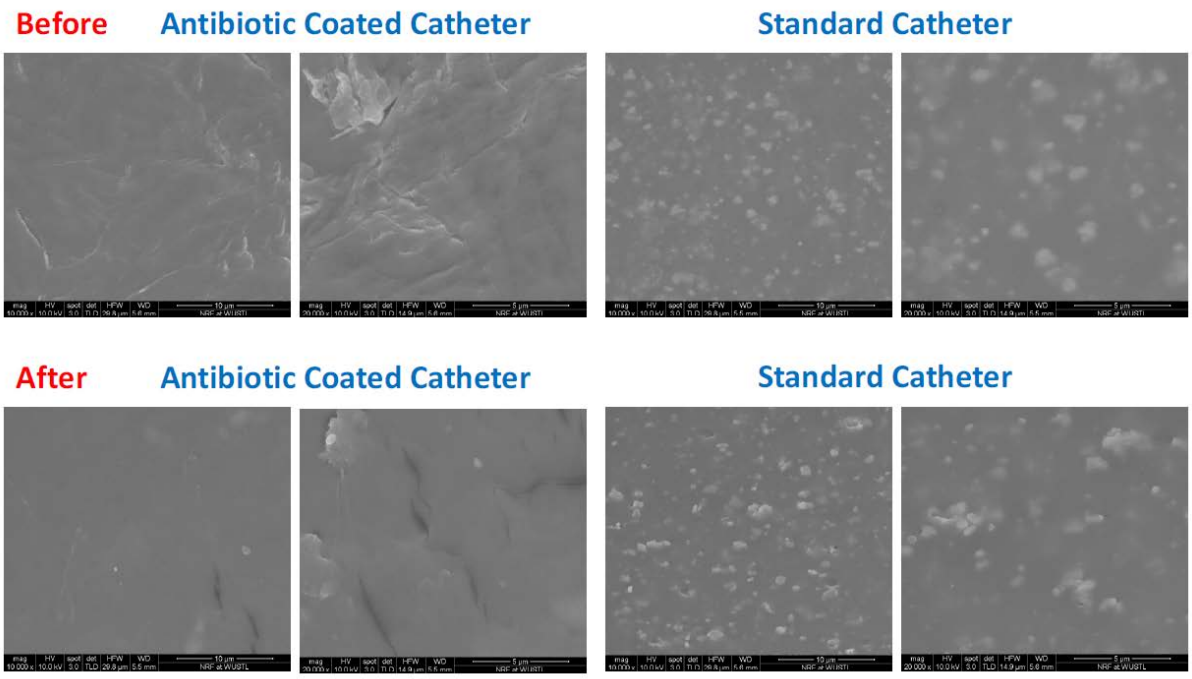

Figure 1: Electron microscopy demonstrated no chemical or structural changes to the catheter from the 2-Octylcyanoacrylate adhesive following its removal with acetone after a 10 day dwell period. This indicates that neither the 2-Octylcyanoacrylate adhesive nor subsequent removal of the 2-Octylcyanoacrylate with acetone impacted the material integrity of the central venous catheters.

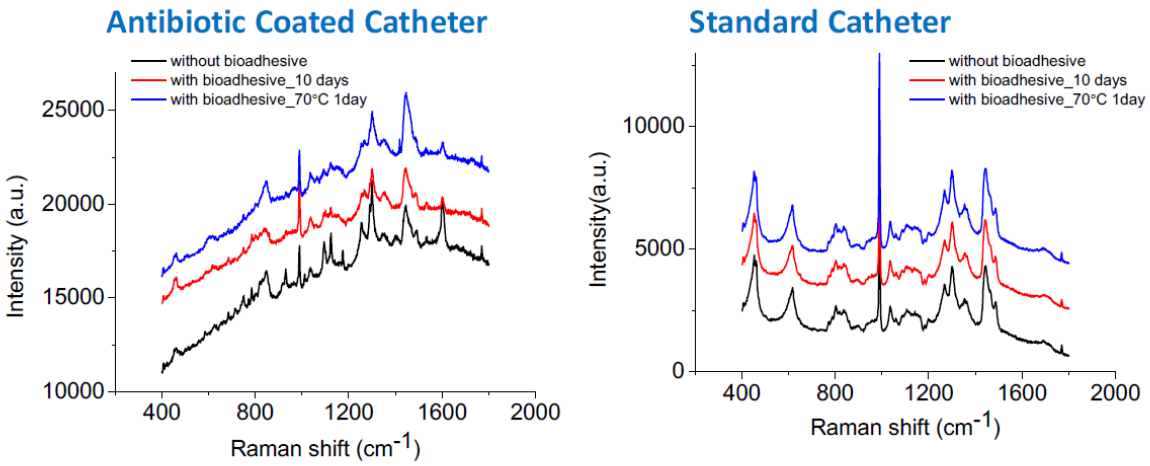

Figure 2: Raman spectroscopy demonstrated no chemical or structural changes to the catheter from the 2-Octylcyanoacrylate adhesive following its removal with acetone after a 10 day dwell period. This indicates that neither the 2-Octylcyanoacrylate adhesive nor subsequent removal of the 2-Octylcyanoacrylate with acetone impacted the material integrity of the central venous catheters.

Figure 3: Indwelling multilumen central catheter with the skin insertion point covered by 2-Octylcyanoacrylate adhesive

PA 85 (2227)

Preoperative Hemodynamic Assessment with Point of Care Transthoracic Ultrasound: Feasibility of Routine Use and Effects on Operating Room Efficiency

Jack Louro, MD[1], Amir Rowshanrad, MD[2], Miguel Cobas, MD[1], Roman Dudaryk, MD[3]

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Introduction: The use of point-of-care transthoracic echocardiography (TTE) is common in the intensive care and emergency room. Studies assessing the ability of surgical critical care physicians performing a limited TTE have demonstrated that the exam can be performed rapidly and yield new clinically important findings1. Recently, there has been interest in applying focused TTE in the perioperative setting to estimate preoperative fluid status by measuring IVC collapsibility before induction of general anesthesia2. In order to determine the feasibility of performing routine focused TTE for fluid status evaluations in the perioperative setting, we conducted a pilot study to assess image quality and time required to perform ultrasound exam in the preoperative holding area.

Methods: Patients presenting to the preoperative holding area at our Level 1 trauma center for non-emergent surgery under general anesthesia were enrolled in the study. Patients with chest or abdominal drains were excluded. A 3-window focused TTE was performed by a critical care anesthesiologist trained in transthoracic ultrasonography using a 5MHz phased array probe. Windows obtained included the parasternal (for long axis and short axis views), apical, and subxyphoid (for cardiac and IVC evaluation). The images were reviewed to assess cardiac function, effusion and IVC size. Data on the duration of the exam and quality of images obtained was recorded (Table 1).

Results: Eight patients were enrolled in the initial pilot study. Patients were undergoing orthopedic or acute care low risk surgeries. Images were acquired for all 8 patients. The average length of time to perform the exam was 8 minutes and 48 seconds. Good quality images at all three windows were obtained in only three patients (37.5%). In the parasternal and subxyphoid windows, useful images with some diagnostic quality were obtained in all patients. In the apical window, images were only obtained in 4 out of the 8 patients. IVC measurements were obtained using M-mode in all patients in the subcostal window (Figure 1).

Conclusion: Point of care TTE is a commonly used tool in the emergency department and intensive care unit aimed to rapidly answer specific questions regarding cardiac function or volume status. In a prior study of limited TTE by trauma surgeons, the 3-view exam took under 5 minutes to perform in the trauma bay or ICU1, which is shorter than this pilot study. One obvious difference in our exam protocol

is the use of M-mode to measure IVC diameter (Figure 1). In our study, obtaining the apical view was most challenging, which is consistent with another study in which good quality apical images were obtained in only a third of patients3. We identified other obstacles to performing echocardiography in the preoperative area, including orthopedic hardware and limited space around stretchers. Although preoperative limited TTE is feasible in the non-emergent surgical setting, challenges exist to obtaining diagnostic quality images in a timely fashion without impacting operating room efficiency.

Reference(s):

1. Ferrada P, et al. Limited transthoracic echocardiogram: So easy any trauma attending can do it. J Trauma. 2011;71: 1327-1332.
2. Zhang J, Critchley LA. Inferior vena cava ultrasonography before general anesthesia can predict hypotension after induction. Anesthesiology. 2016; 124:580-9.
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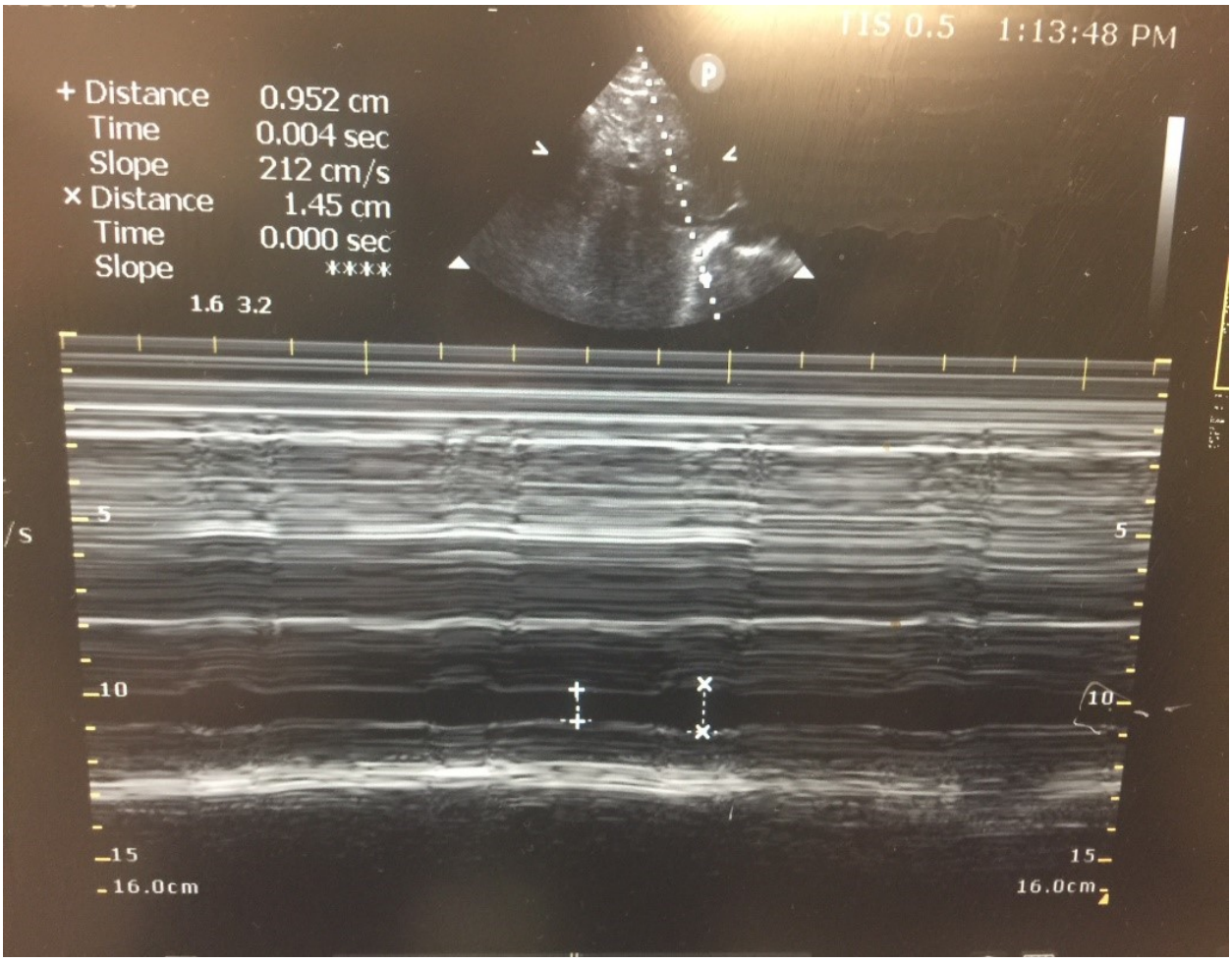

PA 86 (1297)

Should We Give Continuous Epidural Local Anesthetic During Pancreatic Surgery?

Annette Rebel, MD, Brooke Bauer, MD, Christopher J Mallard, MD, Brad Withers, MS, Sean Dineen, MD, Paul A Sloan, MD

University of Kentucky, Lexington, KY

Introduction: Enhanced Recovery After Surgery (ERAS) protocols emphasize a multimodal approach to perioperative analgesia and thus the use of epidural local anesthetic (ELA) analgesia is encouraged.1 However, there is concern that general anesthesia plus intraoperative ELA may result in increased blood loss and IV fluid requirements.2 The aim of this study was to quantify the effect of intraoperative ELA on IV fluid requirements, vasopressor use and clinical outcome.

Methods: After IRB approval, a retrospective data analysis was performed on patients undergoing open pancreaticduodenectomy (Whipple Procedure) for adenocarcinoma of the pancreas at a single University Hospital from January, 2015 to January, 2016. The patient collective was separated into two groups: patients not receiving epidural local anesthetic intraoperatively (no epidural or not used) [Control] and patients receiving epidural local anesthetic intraoperatively [LA]. The data were analyzed for frequency of hypotension and vasopressor therapy, intraoperative volume therapy, length of stay and postoperative complications (AKI, ileus, reoperation). Data are presented as mean (SD). T-test and Fisher Exact test were used to assess for statistical significance ($p<0.05$).

Results: 60 patients were included in the data analysis: Control n=33, LA n=27 patients. Patients in the LA group received Lidocaine 1% (n=14) or Bupivacaine 0.125% (n=13) as continuous infusion during the surgical procedure. Patient demographics and intraoperative variables did not differ amongst the groups (Table 1). The need for vasopressor therapy was not different between patients with epidural local anesthesia (LA) or without (Control) (Table 2). In both groups 11 patients received intravenous vasopressor therapy: the majority received phenylephrine (8 patients each). There was no difference in intraoperative intravenous fluid requirements. Postoperative pain control, time to ambulation and time to discharge were not different between groups. Four patients in the LA group and 6 patients in the CONTROL group developed AKI postoperatively, resolving by POD#2.

Conclusion: 1) Continuous intraoperative ELA infusion was not associated with an increased vasopressor use during open pancreaticoduodenectomy. 2) Intraoperative ELA use was not associated with an increased requirement for IV fluids. 3) Intraoperative ELA may be used intraoperatively as part of ERAS protocols. 4) Future studies are needed to explore possible advantages of opioid sparing anesthesia techniques (eg. ELA) for major abdominal surgery.

Reference(s):

1. Lassen K et al. Guidelines for Perioperative care for Pancreaticoduidenectomy Enhanced Recovery After Surgery (ERAS) Society Recommendations. World J Surg 2013;37:240-258.

2. Tzimas P et al. Epidural anesthesia and analgesia for liver resection. Anaesthesia 2013;68:628-35

Table 1: Demographics / Intraoperative variables

	N	Age [yrs]	ASA class	M:F ratio	OR duration [min]	EBL [ml]	IVF Crystalloids [ml]	Albumin 5% iv [ml]	PRBC [units]	UOP [ml]
Control	33	61.3±9.3	3±0.6	13:20	576±124	482±406	3885±2203	768±592	0.46±2.0	552±343
LA	27	57.4±12.0	2.9±0.5	15:12	619±120	471±357	3245±1501	954±613	0.07±0.4	570±302
p-value		0.16			0.18	0.92	0.20	0.24	0.33	0.82

Data are presented as mean ± SD, p-values are calculated by t-test.

Table 2: Outcomes

	N	Vasopressor frequency	Pain score [PACU]	Pain score [12hrs]	Pain score [24hrs]	Pain score [48hrs]	Time to ambulate [hrs]	Time to liquid diet [hrs]	Time to bowel activity [hrs]	Time to discharge [days]
Control	33	11/33	3.6±4.1	5.0±2.9	4.6±2.5	3.0±2.0	46.3±58.8	155±88	87±24	13.3±7.5
LA	27	11/27	4.7±4.1	3.8±2.8	4.2±3.2	3.3±2.4	29.3±15.1	144±94	97±35	11.1±4.7
p-value		0.60	0.31	0.12	0.59	0.65	0.15	0.65	0.21	0.18

Pain scores were assessed using the visual analog scale (0-10). Data are presented as mean ± SD, p-values are calculated by t-test or Fisher Exact test.

PA 87 (1948)

Utility of Scoring Tools and Type of Surgery in Predicting Complications and 30 Day Readmission in a Urology Perioperative Surgical Home

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[1]University of Massachusetts Medical School, Worcester, MA, [2]UMass Memorial Medical Center, Worcester, MA

Introduction: We established a urology perioperative surgical home (PSH) pilot at our medical center to improve perioperative care provided to urology patients undergoing cancer surgery (1). As part of this, we sought to identify factors knowable at the time of surgery that could help predict complications and readmission within 30 days.

Methods: We used logistic regression to predict each of hospital complications (e.g. bleeding, septic shock, stroke, renal failure) and readmissions from: the LACE risk score absent the length of stay (LOS) component (ACE), the SF-12 physical component score and surgery type (radical prostatectomy, radical nephrectomy and 'other'), for which prostatectomy was most common and routine, and radical nephrectomy was second most common and more complex. Because LOS is a component of the LACE score and we wanted a method to predict complications and readmissions prior to surgery, the LOS was stripped out. A higher ACE score and a lower SF-12 reflect a worse patient condition.

Results: We analyzed 197 PSH patients, of whom 24 (12.2%) were readmitted and 115 (58.4%) had at least one complication. ACE scores ranged from 0 to 7, SF12 from 20 to 61; 37% had radical prostatectomy and 20%, radical nephrectomy. The distinction between radical nephrectomy and other surgeries was never useful, and none of the potential predictors was individually associated with readmission at usual levels of significance, although fully 6 (27%) of the 22 people with SF12< 30 had complications. The point-estimates for the odds ratio (OR) associated with each 10-point decrease in SF12 was 1.32 (P = 0.16) and for a procedure other than radical prostatectomy was 2.24 (P = 0.15). In contrast, ACE, SF12 and radical prostatectomy (vs. other) were each strongly associated with complications (all P-values <0.002). In multivariable modeling, each unit increase in ACE increased the odds for a complication by about 20%, with OR and [95% Confidence Interval (CI)]: 1.20 [1.01 -1.43], p=0.03, while any surgery other than radical prostatectomy strongly elevated the odds chance of a complication, OR [95% CI]: 5.71 [2.9 - 11.6], p<0.001. Also, quintiles of a model that used ACE and radical prostatectomy to predict complications reveal increasing risk for both outcomes (Table 1).

Conclusion: With only 24 readmissions, we could not reliably identify predictors for this outcome. However, the ACE score and surgery other than radical prostatectomy together can be used to rank pre-operative patients by increasing risk for postoperative complications, and this ordering also correlates with increasing risk for readmission. Redeployment of resources to high-risk patients in the urology PSH may serve as a potential way to reduce these complications and, perhaps, readmissions as well.

Reference(s):

1. Crit Care Med 2016; 44 (Suppl): 1118.

Risk Quintiles*	N	% with any complication	% readmitted
Lowest risk	40	25.0	7.5
Low	40	42.5	7.5
Middle	39	61.5	12.8
High	38	78.9	15.8
Highest risk	40	85.0	17.5
*Based on predicting "complication" from radical prostatectomy vs other surgery and ACE score			

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