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The EchOH

The Official Biannual Report from the Ohio Chapter of SCCM

The Ohio Chapter of the Society of Critical Care Medicine

INSIDE THIS ISSUE

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Message from the President

I feel honored and grateful to have served as President of the Ohio Chapter of SCCM this year. I am blessed to have worked with such a vibrant and diverse executive board and committee chairs.

I would like to thank our executive board members for their dedication to the Chapter this year: Sonal Pannu, MD (*Past-President*), Markisha Wilder, MS, APRN-CNP (*President-elect*), Megan Phelps, PharmD (*Secretary*), Michael Rudoni, PharmD (*Treasurer*), and our Members-at-Large: Floria Chae, MD; Elisha Fleig Yin, MPAS, PA-C; Gretchen Sacha, PharmD; Kathryn Bash, MHSc, MSN, ACNPC-AG; Kshama Daphtary, MD; and Suzanne Bennet, MD.

And, without the excellent leadership of our committees, we could not have had such a successful year. So, a huge shoutout to Oscar Perez, MD (*Chair of Communications*), Dalton Kuebel, PharmD (*Chair-elect of Communications*), Keaton Smetana, PharmD (*Chair of Membership*), Jessica Elefritz, PharmD (*Chair-elect of Membership*) and Anjay Khandelwal, MD (*Chair of Education*)!

Message from the President

The PAST

I have been involved in the leadership of the Ohio Chapter of SCCM since 2018, first as Secretary, then President-elect and now President. It has been incredibly rewarding to see how much the Chapter has grown, both in membership and in our offerings. In the first year after resurrecting the Chapter (2018-19), we offered ONE educational event. This past year we held 2 half-day symposia (Spring Research and Fall Education), 2 journal clubs, 2 webinars and hosted regional networking events in Cincinnati, Cleveland, and Columbus. And we recognized our members with cookies 😊 and the Critical Care Excellence and Outstanding Member Awards.

The FUTURE

The excitement from our Chapter continues in 2023. We will host our meet and greet event at SCCM Congress this month, our first since the pandemic! In 2019, the last time we were able to attend in person, we had no idea what we as a critical care group were about to face. And now we are finally able to regroup and celebrate all that our members have achieved over the past three years.

We will be hosting a webinar following Congress, as well as two journal clubs to close out the academic year. You can also look forward to the Spring Research Day and Fall Symposium again this year. We also have some new excitement to share this year as well, including expanded awards to recognize our junior members!

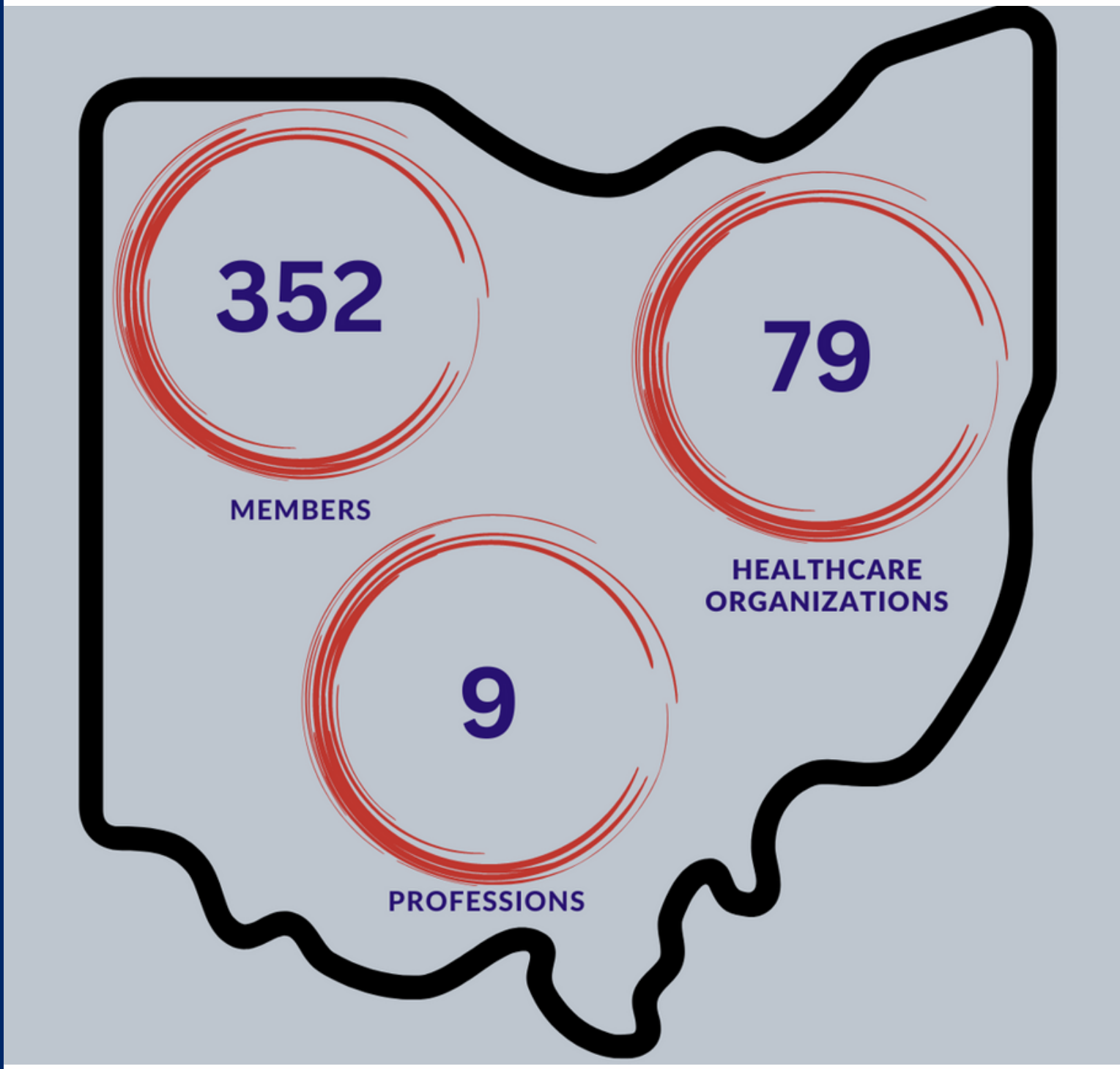
We encourage you to attend our annual business meeting on **February 13th, 15:00-16:00**. We want to hear from you, our members! Your input and ideas will help shape the next year for the Chapter and ensure the Chapter is meeting your needs.

Finally, a sincere thank you for allowing me to lead our Chapter through another successful year. You are no doubt in excellent hands as Markisha Wilder transitions in the role as President at our business meeting in February.

With Gratitude,

Claire Murphy, PharmD, FCCM
President, Ohio Chapter
Administrative Lead – Critical Care
Lead Specialty Practice Pharmacist – Critical Care
The Ohio State University Wexner Medical Center

Membership Updates



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The Ohio Chapter of the Society of Critical Care Medicine

Congress Highlights

Ohio Chapter
ANNUAL MEETING NETWORK EVENT

Date:	**January 23, 2023**
Time:	**16:30 - 18:30 (PST)**
Facility:	**Hilton Union Square, San Francisco, CA**
Room:	**Continental Ballroom Section 1**

This event will be held during the Society of Critical Care Medicine's 2023 Critical Care Congress. Open to anyone interested in learning more about the Ohio Chapter of SCCM and wanting to network with colleagues in the region. Light hors d'oeuvres and refreshments will be provided.

Ohio Chapter Members at 2023 SCCM Congress

Ingrid M. Anderson, MD
Rainbow Babies & Children's Hospital
Presentation(s):
- Critical Care Ultrasound: Pediatric and Neonatal Skills Course

Thursday, January 19, 2023; 7:00 AM – 5:30 PM PT
- Critical Care Ultrasound: Pediatric and Neonatal Skills Course

Friday, January 20, 2023; 7:00 AM – 5:30 PM PT

Joshua Arnold, PharmD, BCCCP, BCPS
The Wexner Medical Center at The Ohio State University, United States
Presentation(s):
- Effect of Albumin Replacement on Vasopressor Duration in Septic Shock Patients With Hypoalbuminemia

Sunday, January 22, 2023; 9:00 AM – 10:00 AM PT

Stephanie Bass, PharmD, BCPS, BCCCP
Cleveland Clinic Foundation
Presentation(s):
- Evaluation of High-Dose Intravenous Desmopressin in the Medical Intensive Care Unit

Saturday, January 21, 2023; 8:45 AM – 9:45 AM PT
- Evaluation of Response to High-Dose Vitamin K Administration

Saturday, January 21, 2023; 10:00 AM – 11:00 AM PT

Suzanne Bennett, MD, FCCM
University of Cincinnati College of Medicine
Presentation(s):
- Building the Matrix: Expanding Through Networking and Outreach

Sunday, January 22, 2023; 12:40 PM – 12:55 PM PT
- Summary and Group Discussion

Sunday, January 22, 2023; 1:10 PM – 1:25 PM PT
- Atrial Fibrillation: Comparing Current, Evidence-Based Management Considerations

Sunday, January 22, 2023; 3:15 PM – 4:15 PM PT

James Besunder, DO, FCCM
Akron Children's Hospital
Presentation(s):
- Physiology-Based Ventilator Computer Decision Support Outperforms Clinicians in an In Silico Trial

Saturday, January 21, 2023; 2:45 PM – 3:45 PM PT

Amar Bhatt, MD
The Wexner Medical Center at The Ohio State University, United States
Presentation(s):
- Spontaneous Coronary Artery Dissection Following Orthotopic Liver Transplantation

Saturday, January 21, 2023; 2:45 PM – 3:45 PM PT

Richard D. Branson, MS, RRT, FCCM
University of Cincinnati Medical Center
Presentation(s):
- NEBulous Use of Bronchodilators

Sunday, January 22, 2023; 9:50 AM – 10:05 AM PT
- Help Me, I Can't Breathe: Special Considerations With Intubation, Ventilation, and Weaning the Trauma Patient With Severe Obesity

Sunday, January 22, 2023; 10:30 AM – 10:50 AM PT

Grace Conroy, PharmD, BCCCP
Cleveland Clinic
Presentation(s):
- Prospective Evaluation of Clevidipine Following Intracerebral Hemorrhage

Monday, January 23, 2023; 9:00 AM – 10:00 AM PT

Jacob Counts, BCCCP, PharmD
The Wexner Medical Center at The Ohio State University
Presentation(s):
- Effect of Albumin Replacement on Vasopressor Duration in Septic Shock Patients With Hypoalbuminemia

Sunday, January 22, 2023; 9:00 AM – 10:00 AM PT

Lauren M. Dehne, PharmD, BCCCP
University of Cincinnati Medical Center
Presentation(s):
- Evaluation of Subdissociative-Dose Ketamine for Procedural Sedation in the Emergency Department

Monday, January 23, 2023; 9:00 AM – 10:00 AM PT
- Evaluation of Tocilizumab for COVID-19 Treatment in the Intensive Care Unit

Monday, January 23, 2023; 9:00 AM – 10:00 AM PT

Bruce Doepker, PharmD
The Ohio State University Medical Center, United States
Presentation(s):
- Effect of Albumin Replacement on Vasopressor Duration in Septic Shock Patients With Hypoalbuminemia

Sunday, January 22, 2023; 9:00 AM – 10:00 AM PT

Chris Droege, PharmD, BCCCP, FCCM
UC Health/University of Cincinnati Medical Center
Presentation(s):
- Evaluation of Music Intervention to Reduce Sedation Exposure During Mechanical Ventilation

Saturday, January 21, 2023; 10:00 AM – 11:00 AM PT
- Risk Factors for Early-Onset MDRO Infections in Critically Ill Patients

Saturday, January 21, 2023; 10:00 AM – 11:00 AM PT
- Impact of Augmented Renal Clearance on Vancomycin in Critically Ill Trauma Patients

Sunday, January 22, 2023; 9:00 AM – 10:00 AM PT
- Evaluation of Tocilizumab for COVID-19 Treatment in the Intensive Care Unit

Monday, January 23, 2023; 9:00 AM – 10:00 AM PT

Molly Droege, PharmD, BCPS
University of Cincinnati Medical Center, United States
Presentation(s):
- Impact of Augmented Renal Clearance on Vancomycin in Critically Ill Trauma Patients

Sunday, January 22, 2023; 9:00 AM – 10:00 AM PT

Siddharth Dugar, MD, FCCM
Cleveland Clinic Foundation
Presentation(s):
- Novel Echocardiographic Phenotypes for Assessment of Systolic Function in Patients With Sepsis

Saturday, January 21, 2023; 11:15 AM – 0:15 AM PT
- Impact of Echocardiography on In-Hospital Mortality in Adult Sepsis and Septic Shock

Saturday, January 21, 2023; 2:45 PM – 3:45 PM PT
- Diagnosis and Imaging of Septic Cardiomyopathy

Saturday, January 21, 2023; 9:50 AM – 10:05 AM PT
- Research Methodology in Critical Care

Saturday, January 21, 2023; 3:00 PM – 3:40 PM PT
- The POCUS Quality Assurance Process: Primer and Implementation Steps

Monday, January 23, 2023; 3:50 PM – 4:10 PM PT

Abhijit Duggal, MD
Cleveland Clinic
Presentation(s):
- Protocols Alone Are Not Enough: Using Implementation Science to Support Standardized ARDS Care

Sunday, January 22, 2023; 2:30 PM – 3:30 PM PT
Monday, January 23, 2023; 11:15 AM – 12:15 PM PT
- Protocolized Care for Acute Respiratory Distress Syndrome: Before and During the Pandemic

Monday, January 23, 2023; 11:15 AM – 12:15 PM PT

Joshua Frazier, MD
Nationwide Children's Hospital, United States
Presentation(s):
- The Ability of Clinical Data to Predict Infection in Children on Mechanical Circulatory Support

Sunday, January 22, 2023; 9:00 AM – 10:00 AM PT
- Utility of sTREM-1 and Presepsin to Predict New Infection on Mechanical Circulatory Support

Sunday, January 22, 2023; 11:15 AM – 12:15 PM PT

Ohio Chapter Members at 2023 SCCM Congress

Anthony Gerlach, PharmD, FCCM
Ohio State University Wexner Medical Center
Presentation(s):
- Not Another Rash

Saturday, January 21, 2023; 10:05 AM – 10:20 AM PT

Joao Gomes, MD
Cleveland Clinic
Presentation(s):
- Prospective Evaluation of Clevidipine Following Intracerebral Hemorrhage

Monday, January 23, 2023; 9:00 AM – 10:00 AM PT

Mark W. Hall, MD, FCCM
Nationwide Children's Hospital At Ohio State University
Presentation(s):
- Year in Review: Pediatrics

Saturday, January 21, 2023; 12:30 PM – 1:30 PM PT
- Adaptive Immune Function and Immunoparalysis in Children With Septic Shock

Saturday, January 21, 2023; 5:15 PM – 5:30 PM PT
- Personalized Immunotherapy Approaches in COVID-19

Tuesday, January 24, 2023; 10:35 AM – 10:50 AM PT
- Age-Based Variability of Absolute Lymphocyte Count in Children With Septic Shock

Sunday, January 22, 2023; 11:15 AM – 12:15 PM PT

Rana B. Hejal, MD (she/her/hers)
University Hospitals Cleveland Medical Center
Presentation(s):
- Evaluation of High-Dose Insulin for the Treatment of Hypertriglyceridemic Pancreatitis

Saturday, January 21, 2023; 8:45 AM – 9:45 AM PT
- Tocilizumab for COVID-19 in the Medical Intensive Care Unit: Maternal and Fetal Outcomes

Sunday, January 22, 2023; 10:15 AM – 11:15 AM PT
- Ketamine for Sedation in Mechanically Ventilated Patients

Sunday, January 22, 2023; 11:15 AM – 12:15 PM PT
- Interpreting Tests That You (May) Have Never Heard Of

Monday, January 23, 2023; 3:05 PM – 3:20 PM PT

Brian Hoffman, PharmD, BCCCP
ProMedica Toledo Hospital, United States
Presentation(s):
- Ketamine for Sedation in Mechanically Ventilated Patients

Sunday, January 22, 2023; 11:15 AM – 12:15 PM PT

Lacey Hood, PA-C, (she/her/hers)
Cleveland Clinic
Presentation(s):
- Outcomes of Complicated Parapneumonic Effusions Treated With Intrapleural Tissue Plasminogen

Monday, January 23, 2023; 11:15 AM – 12:15 PM PT

Molly Howsare, DO
Presentation(s):
- A Case Report on Superior Mesenteric Artery Thrombosis in a COVID-19 Patient

Monday, January 23, 2023; 10:00 AM – 11:00 AM PT

Priyanka Jain, M.D.
Dayton Respiratory Center, United States
Presentation(s):
- A Report of Disseminated Histoplasmosis in an Immunocompromised Patient Following COVID-19 Infection

Monday, January 23, 2023; 11:15 AM – 12:15 PM PT

Aanchal Kapoor, MD
Cleveland Clinic Foundation, United States
Presentation(s):
- Protocols Alone Are Not Enough: Using Implementation Science to Support Standardized ARDS Care

Sunday, January 22, 2023; 2:30 PM – 3:30 PM PT

Dalton Kuebel, PharmD, BCCCP
University of Cincinnati Medical Center
Presentation(s):
- Evaluation of Music Intervention to Reduce Sedation Exposure During Mechanical Ventilation

Saturday, January 21, 2023; 10:00 AM – 11:00 AM PT
- Risk Factors for Early-Onset MDRO Infections in Critically Ill Patients

Saturday, January 21, 2023; 10:00 AM – 11:00 AM PT

Bradley Marino, MD, MPP, MSCE, MBA
Cleveland Clinic Children's, Ohio, United States
Presentation(s):
- Post-Intensive Care Syndrome in Pediatrics Is Common in Children With Congenital Heart Disease

Sunday, January 22, 2023; 2:30 PM – 3:30 PM PT

Danielle Marut, PharmD, BCCCP
Cleveland Clinic, United States
Presentation(s):
- Evaluation of High-Dose Intravenous Desmopressin in the Medical Intensive Care Unit

Saturday, January 21, 2023; 8:45 AM – 9:45 AM PT

Piyush Mathur, MD, FCCM
The Cleveland Clinic
Presentation(s):
- Quantitative and Qualitative Evaluation of Artificial Intelligence-Based Critical Care Publications

Saturday, January 21, 2023; 10:00 AM – 11:00 AM PT
- Integrating Machine Learning and AI in Healthcare

Monday, January 23, 2023; 9:00 AM – 9:40 AM PT

Monty Mazer, MD
University Hospitals Rainbow Babies' and Children's Hospital, United States
Presentation(s):
- Host Immune Endotyping in Pediatric Acute Respiratory Failure

Saturday, January 21, 2023; 2:45 PM – 3:45 PM PT
- Tetanus in an Unvaccinated Five-Year-Old Amish Child

Sunday, January 22, 2023; 11:15 AM – 12:15 PM PT

Eduardo Mireles-Cabodevila, MD
Cleveland Clinic - Respiratory Institute
Presentation(s):
- Abnormalities in Patient Ventilator Settings

Sunday, January 22, 2023; 11:20 AM – 11:35 AM PT
- Clinical Burnout and How This Might Be Mitigated

Sunday, January 22, 2023; 2:30 PM – 3:10 PM PT
- Outcomes of Complicated Parapneumonic Effusions Treated With Intrapleural Tissue Plasminogen

Monday, January 23, 2023; 11:15 AM – 12:15 PM PT
- Protocolized Care for Acute Respiratory Distress Syndrome: Before and During the Pandemic

Monday, January 23, 2023; 11:15 AM – 12:15 PM PT

Simon Mucha, MD, FACP
Cleveland Clinic
Presentation(s):
- Cytokine Release Storm Following Immune Checkpoint Inhibitor Use Managed With Tocilizumab in the ICU

Saturday, January 21, 2023; 8:45 AM – 9:45 AM PT
- Protocols Alone Are Not Enough: Using Implementation Science to Support Standardized ARDS Care

Sunday, January 22, 2023; 2:30 PM – 3:30 PM PT

Eric W. Mueller, PharmD, FCCP, FCCM
University of Cincinnati Medical Center
Presentation(s):
- Evaluation of Music Intervention to Reduce Sedation Exposure During Mechanical Ventilation

Saturday, January 21, 2023; 10:00 AM – 11:00 AM PT
- Impact of Augmented Renal Clearance on Vancomycin in Critically Ill Trauma Patients

Sunday, January 22, 2023; 9:00 AM – 10:00 AM PT

Claire V. Murphy, PharmD, BCPS, FCCM
The Ohio State University Wexner Medical Center
Presentation(s):
- Effect of Hydrocortisone on Outcomes in Immunocompromised Patients With Septic Shock

Monday, January 23, 2023; 9:00 AM – 10:00 AM PT
- Burn and Wound Management

Monday, January 23, 2023; 2:50 PM – 3:05 PM PT

Nicholas L. Pesa, MD
University Hospitals
Presentation(s):
- Strategies to Help Female and Underrepresented-in-Medicine Trainees Launch Successful Post-Graduation Careers

Saturday, January 21, 2023; 1:15 PM – 1:25 PM PT

Ohio Chapter Members at 2023 SCCM Congress

Andreea Popa, PharmD, BCPS, BCCCP
University Hospitals Cleveland Medical Center
Presentation(s):
- Evaluation of High-Dose Insulin for the Treatment of Hypertriglyceridemic Pancreatitis

Saturday, January 21, 2023; 8:45 AM – 9:45 AM PT
- Tocilizumab for COVID-19 in the Medical Intensive Care Unit: Maternal and Fetal Outcomes

Sunday, January 22, 2023; 10:15 AM – 11:15 AM PT
- Ketamine for Sedation in Mechanically Ventilated Patients

Sunday, January 22, 2023; 11:15 AM – 0:15 AM PT

Kenneth Remy, MD, MSc, MSCI, FCCM
Case Western Reserve University/University Hospitals Cleveland Medical Center
Presentation(s):
- Brain Death Ancillary Test: An Ethical Dilemma

Saturday, January 21, 2023; 10:00 AM – 11:00 AM PT
- Challenges in Institutional Approval Process for a Multinational Study: The Global PARITY

Saturday, January 21, 2023; 2:45 PM – 3:45 PM PT
- Host Immune Endotyping in Pediatric Acute Respiratory Failure

Saturday, January 21, 2023; 2:45 PM – 3:45 PM PT
- Estimating the Global Prevalence of Pediatric Acute Critical Illness in Resource-Limited Settings

Sunday, January 22, 2023; 2:30 PM – 3:30 PM PT
- Foundational Immunology for the ICU

Monday, January 23, 2023; 2:45 PM – 3:45 PM PT

Timothy D. Rice, PharmD (he/him/his)
University of Cincinnati Medical Center
Presentation(s):
- Impact of Augmented Renal Clearance on Vancomycin in Critically Ill Trauma Patients

Sunday, January 22, 2023; 9:00 AM – 10:00 AM PT

Michael A. Rudoni, PharmD, BCPS, BCCCP
Cleveland Clinic
Presentation(s):
- Evaluation of High-Dose Intravenous Desmopressin in the Medical Intensive Care Unit

Saturday, January 21, 2023; 8:45 AM – 9:45 AM PT
- Evaluation of Response to High-Dose Vitamin K Administration

Saturday, January 21, 2023; 10:00 AM – 11:00 AM PT
- Predictors of Bradycardia With Dexmedetomidine Use

Sunday, January 22, 2023; 10:15 AM – 11:15 AM PT

Gretchen L. Sacha, BCCCP, PharmD
Cleveland Clinic
Presentation(s):
- Predictors of Bradycardia With Dexmedetomidine Use

Sunday, January 22, 2023; 10:15 AM – 11:15 AM PT

Steven L. Shein, MD, FCCM
Rainbow Babies & Children's Hospital
Presentation(s):
- Brain Death Ancillary Test: An Ethical Dilemma

Saturday, January 21, 2023; 10:00 AM – 11:00 AM PT
- Arterial Catheter Complications in a Large, Contemporary, Multicenter PICU Dataset

Saturday, January 21, 2023; 2:45 PM – 3:45 PM PT
- Host Immune Endotyping in Pediatric Acute Respiratory Failure

Saturday, January 21, 2023; 2:45 PM – 3:45 PM PT
- Lung-Protective Ventilation Adherence in Children With PARDS and Lower Respiratory Tract Infection

Saturday, January 21, 2023; 2:45 PM – 3:45 PM PT
- Multicenter Validation and Refinement of the Critical Bronchiolitis Score

Sunday, January 22, 2023; 10:15 AM – 11:15 AM PT
- The Pandemic and Its Mediation for Research Collaborations

Monday, January 23, 2023; 3:10 PM – 3:30 PM PT

Madiha Syed, MD
Cleveland Clinic Foundation
Presentation(s):
- Peripheral Vasopressor Infusion for Shock: A Quality Assessment Project in a Community ICU

Sunday, January 22, 2023; 10:15 AM – 11:15 AM PT

Donna Tanner, RRT, MBA, RRT-ACCS (she/her/hers)
Cleveland Clinic, Cardiothoracic Anesthesiology
Presentation(s):
- Crosstalk Theater: COVID-19 Phenotypes: Is Ventilator Management Different?

Sunday, January 22, 2023; 12:00 PM – 12:45 PM PT

Yasir Tarabichi, MSCR
Metro Health Medical Center, United States
Presentation(s):
- Assessment of Readmission Risk Factors After Index Hospital Discharge for COVID-19 Patients

Saturday, January 21, 2023; 5:30 PM – 5:45 PM PT

Elizabeth C. Taylor, PharmD, BCCCP
Presentation(s):
- Ketamine or Traditional Continuous Anesthetics in Refractory or Super-Refractory Status Epilepticus

Sunday, January 22, 2023; 11:15 AM – 12:15 PM PT

Chiedozie I. Udeh, MBA, MBBS, MHEcon
Cleveland Clinic Foundation
Presentation(s):
- Working in an Interracial Environment: How to Make It Work

Sunday, January 22, 2023; 2:30 PM – 3:10 PM PT
- Navigating Your Critical Care Career as an International Medical Graduate in the United States

Monday, January 23, 2023; 12:30 PM – 1:15 PM PT

Joshua Veith, MD
Cleveland Clinic
Presentation(s):
- Protocols Alone Are Not Enough: Using Implementation Science to Support Standardized ARDS Care

Sunday, January 22, 2023; 2:30 PM – 3:30 PM PT

Vidula T. Vachharajani, MD, FCCP, FCCM
Cleveland Clinic Lerner College of Medicine
Presentation(s):
- Sirtuins and Immunometabolism in Sepsis

Saturday, January 21, 2023;10:50 AM – 11:05 AM PT
- Ethanol Represses LC3-Associated Phagocytosis via Sirtuin 2 in Human Macrophages

Saturday, January 21, 2023; 3:45 PM – 4:00 PM PT
- SIRT2 Represses LC3-Associated Phagocytosis in Ethanol-Exposed Macrophages via PFKP

Sunday, January 22, 2023; 9:00 AM – 10:00 AM PT

Kevin M. Wohlfarth, PharmD, BCPS, BCCCP, BCCP
ProMedica Toledo Hospital, United States
Presentation(s):
- The Impact of Adjunctive Ketamine on Sedation Requirements in Ventilated Patients With COVID-19

Sunday, January 22, 2023; 11:15 AM – 12:15 PM PT
- Comparison of Intracranial Hematoma Expansion in Patients on Warfarin vs. Direct Oral Anticoagulants

Monday, January 23, 2023; 9:00 AM – 10:00 AM PT

Andrew Yates, MD
Associate Professor of Pediatrics
Nationwide Children's Hospital, United States
Presentation(s):
- The Ability of Clinical Data to Predict Infection in Children on Mechanical Circulatory Support

Sunday, January 22, 2023; 9:00 AM – 10:00 AM PT
- Utility of sTREM-1 and Presepsin to Predict New Infection on Mechanical Circulatory Support

Sunday, January 22, 2023; 11:15 AM – 12:15 PM PT

**Please note: names included are based on the Ohio Chapter roster at the time of this publication. Any omission of current Ohio Chapter members from this list is unintentional.*

2022 Member Publications

Peer-Reviewed Publications by Members of the Ohio Chapter

We're proud to have active members who contribute extensively to the literature and influence the way we understand and practice critical care medicine. Scan the QR code below to review a list of the publications from 2022 by Ohio Chapter members.

2022

Literature Summary

Agents Intervening Against Delirium in the Intensive Care Unit (AID-ICU)

Summarized by: Stephanie R. L. Ciapala, Pharm.D., BCCCP

Haloperidol for the Treatment of Delirium in ICU Patients

Andersen-Ranberg NC, Poulsen LM, Perner A, et al. Haloperidol for the Treatment of Delirium in ICU Patients. *N Engl J Med*. 2022;387(26):2425-2435. doi:10.1056/NEJMoa2211868

This multicenter, blinded, placebo-controlled trial investigated the impact of haloperidol versus placebo on the number of days alive and out of the hospital at 90 days. Adult patients admitted to the ICU and who had a positive delirium screening at any point during ICU stay based on Confusion Assessment Method for the ICU or the Intensive Care Delirium Screening Checklist were included. Patients were randomized to receive placebo or intravenous haloperidol 2.5 mg three times daily and as needed (up to 20 mg daily) while delirious until discharge or death in the ICU and up until 90 days after randomization. Rescue medication with propofol, benzodiazepines, or alpha-2 agonists were permitted.

The primary outcome was number of days alive and out of the hospital within 90 days after randomization. Secondary outcomes included number of days alive without delirium or coma, the number of days alive without mechanical ventilation, serious adverse reactions, and rescue medication use.

A total of 1000 patients were enrolled, of whom 987 were included in the analyses (501 haloperidol, 486 placebo). Baseline characteristics were similar between groups with 447 experiencing hyperactive delirium and 540 with hypoactive delirium at the time of randomization. Patients received a median of haloperidol 8.3 mg for 3.6 days in the haloperidol group, and 9 mg haloperidol equivalent for 3.3 days in the placebo group. Both groups received similar cumulative doses and as needed administrations.

There was no difference in the mean number of days alive and out of the hospital at 90 days between the haloperidol and placebo groups (35.8 vs. 32.9 days; adjusted mean difference 2.9; 95% CI -1.2 to 7.0; P=0.22). The primary outcome was similar between groups after adjustments for prespecified delirium risk factors at baseline, and was also similar between subgroups including delirium subtype, age, sex, admission type, presence of delirium risk factors, and disease severity. Mortality at 90 days was 36.3% in the haloperidol group compared to 43.3% in the placebo group (adjusted absolute difference -6.9%; 95% CI -13.0 to -0.6), though conclusions regarding this result cannot be drawn. All secondary outcomes were similar between groups.

The authors concluded that haloperidol did not reduce the number of days alive and out of the hospital at 90 days compared to placebo in patients with delirium in the ICU.

Awareness During Paralysis after RSI in the ICU

By: Kari Gorder, MD

Rapid sequence intubation (RSI) is an intubation technique which involves the administration of a rapidly acting neuromuscular blocking agent (NMBA) in concert with analgosedation to quickly achieve control of a patient's airway. It is frequently used for emergent airways in non-fasting patients and is standard practice in the emergency department and for many patients in intensive care unit (ICU) settings.[1] However, the practice is not without risks, including patient awareness or recall during paralysis.

Awareness during paralysis refers to the recollection of sensory perception during active neuromuscular blockade and is associated with a significant rate of long-term negative outcomes, including posttraumatic stress disorder and depression. Historically, most research on awareness during paralysis has occurred in patients undergoing intubation in the operating room (OR), with a reported occurrence rate of less than 1%.[2] However, recent studies have highlighted the prevalence of this disturbing complication in the emergency department (ED), the results of which can be extrapolated to the ICU setting.

The 2021 ED-AWARENESS study was a single-center, prospective cohort study which investigated the rate of awareness during paralysis after intubation with RSI in the ED. The authors found a 2.6% prevalence of possible or definite awareness. More recently, Driver and colleagues published an article in CHEST which reported a 7.6% rate of possible or definite recall of awareness in a cohort of almost 900 patients.[3]

What could explain this significantly higher rate of awareness during paralysis compared to historic controls in the operative setting? The answer likely comes down to patient characteristics and variation in sedation practices. Patients requiring emergent airway control in the ED or ICU are more likely to be critically ill and hemodynamically unstable, which could result in underdosing of intravenous sedation during or after RSI. Patients in the operating room also tend to receive inhalational anesthesia and benzodiazepines, with previous studies demonstrating a higher rate of awareness for patients in the OR who received IV sedation only. With regards to management, there is a wide variety in practice patterns surrounding RSI and post-intubation analgosedation in the ED and ICU. The ED-AWARENESS study found that the use of rocuronium was associated with a higher rate of post-intubation awareness compared to a shorter-acting alternative like succinylcholine, although this has not been found in other studies. Institutional variation in peri-intubation sedation practices may also affect the rate of this phenomenon.

continued on page 11...

Given the complex nature of patient recall during the critical illness period and the clinical challenges that many critically ill patients pose, this is a challenging problem to address. However, avoiding awareness under paralysis whenever possible should be a goal of any provider who performs RSI. While there are no definitive best-practice guidelines for post-intubation sedation, a few practical suggestions can be gleaned from the literature — primarily, being aware of the phenomenon and combating it proactively. Identification of patients who may be at a higher risk is key; Driver et al. noted that a greater pre-intubation level of consciousness was associated with a higher rate of awareness under paralysis. Some studies have reported a delay in initiation of post-intubation analgosedation of almost an hour. For planned intubations, IV infusions of analgosedation agents should be prepared and readily initiated, especially for patients who receive longer-acting NMBAs like rocuronium. While the intubation of hypotensive patients is complex, as a rule, sedation should not be underdosed for RSI even for unstable patients, and the use of push-dose pressors may facilitate a hemodynamically neutral intubation with a lower risk of patient awareness. Finally, protocolization of post-intubation analgosedation processes may lower rates of awareness under paralysis, as standard hemodynamic monitoring may miss this phenomenon.

In sum, RSI is a common and safe method of facilitating timely airway control in critically ill patients. However, awareness under paralysis is a known complication of the use of NMBAs and may be more prevalent in the ED and ICU patient population than previously appreciated. As awareness under paralysis is associated with significant psychologic sequalae, avoidance of this complication is paramount. Providers who perform RSI in the ICU must be proactive in the anticipation, identification, and mitigation of awareness under paralysis, primarily through the use of thoughtful post-intubation sedation practices.

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Continuous Ketamine Infusion:

Current Evidence for Use in the Critically Ill

By: Joseph Zachary, MD

Ketamine is a non-competitive N-Methyl-D-Aspartate receptor antagonist originally developed in 1962 as a phencyclidine derivative.[1] The discovery that ketamine has anesthetic properties with an improved safety profile compared to barbiturates made it popular as a general anesthetic and battlefield anesthetic in the 1970s.[2] Racemic ketamine is FDA approved for the induction and maintenance of general anesthesia, while nasal administration of the S-enantiomer is approved for the management of treatment resistant major depressive disorder.[3-4] Off-label use of ketamine as an analgesic has been shown to be efficacious in treating acute pain and reducing opioid requirements in the emergency department setting.[5-8] Current literature regarding the use of continuous ketamine infusions in critically ill patients is reviewed here.

In 2018, guidelines for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption (PADIS) released by the Society of Critical Care Medicine (SCCM) reviewed the evidence for use of ketamine in pain management.[9] These guidelines were based on three studies, the first being a randomized control trial with low-dose ketamine infusions in perioperative surgical ICU patients.[10] Due to the lack of additional randomized control trials involving ICU patient populations, two non-ICU systematic reviews of ketamine administration in conjunction with opioid patient-controlled analgesia were included.[11-12] Though the evidence suggested an overall benefit regarding reduced morphine consumption, due to the low quality of evidence SCCM could only make a conditional recommendation for the adjunctive use of ketamine in specifically surgical ICU patients.

The PADIS guidelines coincided with the release of the Consensus Guidelines on the Use of Intravenous Ketamine Infusions for Acute Pain Management.[13] The Ketamine Guidelines Committee reviewed evidence from a broad patient pool that included pediatrics, patients with sickle cell disease, opiate-tolerant patients, and patients at risk for respiratory suppression during opioid administration. The committee also reviewed dose effects of ketamine and defined a dose range that is subanesthetic to limit negative side effects such as delirium and emergence phenomenon. They concluded that there is moderate evidence to support the use of subanesthetic doses of ketamine in the range of up to 1 mg/kg/hr for IV infusions and 0.35 mg/kg boluses for the treatment of acute pain; however, in the critically ill, this recommendation was limited to surgical ICU patients.

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In 2020, Critical Care Medicine published an even broader review of literature regarding continuous ketamine infusions for the treatment of acute pain, sedation, status asthmaticus, status epilepticus, and alcohol withdrawal syndrome.[14] Observational studies suggest a benefit to ketamine infusion in the treatment of refractory status epilepticus, but sparse randomized clinical trials and disagreement on the appropriate effective dose limit recommendations for its use.[15-17] Ketamine infusions in alcohol withdrawal may reduce total benzodiazepine dose in patients suffering delirium tremens, though seventy two percent of patients in one study required intubation.[18-19] Two retrospective reviews evaluating ketamine infusions for sedation showed reduced rates of propofol in the mechanically ventilated, however one systematic review also showed an increase in adverse effects.[20-22] These findings may be confounded by the wide dose range evaluated in each setting.

The best current evidence supports continuous ketamine infusions in ICU patients as an adjunct to opioids for acute pain control when a decrease in opioid dosing is desired. The appropriate dosing regimen to achieve subanesthetic analgesia in ED patients, ICU patients, and patients with critical limb ischemia ranged from 0.1 mg/kg/hr up to 0.6 mg/kg/hr.[5-10,23-24] Use of continuous ketamine infusions greater than 1 mg/kg/hr for the treatment of conditions other than acute pain were limited by tachycardia, sialorrhea, and psychomimmetic effects. The Adjunct low-dose ketamine infusion vs standard of care in mechanically ventilated critically ill patients (ATTAINMENT) trial is currently reassessing the safety and efficacy of low dose ketamine infusions vs standard of care for analgosedation.[25] The results of this trial may expand recommendations for sedation with infusions of ketamine in the ICU in the future. Continuous ketamine infusions are a promising treatment for pain, however as an adjunct for sedation further studies delineating ideal dosing regimens is required.

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National Lorazepam Shortage? Calm Down, We Have You Covered

By: Grace M. Conroy, Pharm.D., BCCCP and Michael A. Rudoni, Pharm.D., BCPS, BCCCP

Benzodiazepines potentiate the effects of gamma-aminobutyric acid (GABA), an inhibitory neurotransmitter, by interacting with the allosteric benzodiazepine binding sites on GABA receptors. Activation of the $GABA_A$ receptor subtype produces anxiolytic, sedative, muscle relaxant, and anticonvulsant properties making benzodiazepines important agents for managing a number of conditions encountered in the critically ill. In June 2022, a national drug shortage of intravenous (IV) lorazepam—the preferred treatment for status epilepticus (SE)—forced many hospitals to conserve supply and find alternatives.[1-2] A critical assessment of the pharmacokinetic and pharmacodynamics characteristics of other medications within the drug class was necessary to inform recommendations for appropriate substitutions.

Lorazepam is an intermediate-acting benzodiazepine (half-life: ~14 hours) that undergoes phase II conjugation into inactive metabolites, often making it a preferred choice in the elderly and in those with significant hepatic dysfunction.[3-4] In the intensive care unit (ICU), lorazepam can be administered intermittently via several routes (e.g., oral, IV, intramuscular, sublingual) or as a continuous infusion, and is most commonly prescribed for sedation, alcohol withdrawal, and seizure cessation. Anticonvulsant effects are achieved within 5-10 minutes following IV administration with sustained activity due to slower central nervous system (CNS) redistribution—the result of its relatively lower lipid solubility—making IV lorazepam effective for acute seizure control in hospitalized patients.[5-8]

One challenge faced during the lorazepam shortage was determining an equipotent dose of an alternative intravenous benzodiazepine. Ensuring the appropriate dose of emergent antiepileptic therapy is critical to achieve early termination of seizure activity. Prolonged duration of uncontrolled SE results in a sustained hyper-excitatory state, causing tissue hypoxia, neuronal damage, and potentiation of cardiovascular and pulmonary complications.[9-10] Unfortunately, unlike other classes of high-risk medications (e.g., opioids), equipotent doses of benzodiazepines are poorly described.[11] Conversions have been proposed (Figure 1) but vary widely according reference and require careful consideration of half-life, metabolites, and patient-specific factors.[12-14] These are likely better suited to provide clinicians with general estimates of relative potencies rather than precise mg-to-mg equivalency.

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Midazolam and diazepam are other common benzodiazepines prescribed in the ICU with several important differences compared to lorazepam. Both are highly lipophilic resulting in rapid onset of action. Midazolam is considered a short-acting benzodiazepine (half-life: ~3 hours), however, its effects may be prolonged with continuous infusions due to accumulation of the parent compound in peripheral tissues or to impaired renal clearance of active metabolites.[15-16] The quick onset and long duration of action of diazepam make it a popular drug for managing severe alcohol withdrawal since it offers rapid dose escalation and what some refer to as an “auto-taper.”[14-15,17-18] Similar to lorazepam, injectable diazepam is formulated with propylene glycol (PG). Due to the risk of PG-toxicity, providers are advised to avoid high rates of lorazepam infusions (>7-10 mg/hr). Since diazepam has a long half-life and an active metabolite (desmethyldiazepam), continuous infusions are impractical which minimizes the risk of diazepam-related PG-toxicity unless doses exceed 800 mg/day.[19]

Drug shortages do not just create operational obstacles for health systems, but can be linked to medication errors, patient harm, and suboptimal pharmacotherapy regimens. [20] Additionally, shortages of drugs used for medical emergencies can be particularly challenging given the critical need of a suitable alternative and the widespread provider education required to prevent any therapy delays. Managing drug shortages cannot be done solely by purchasing or management teams but requires interprofessional collaboration. With the widespread utilization of lorazepam, critical care pharmacists, intensivists, and nurses should collaborate with colleagues from epilepsy, emergency medicine, and neurology disciplines to determine a suitable first-line alternative for SE or sedation for mechanically ventilated patients.

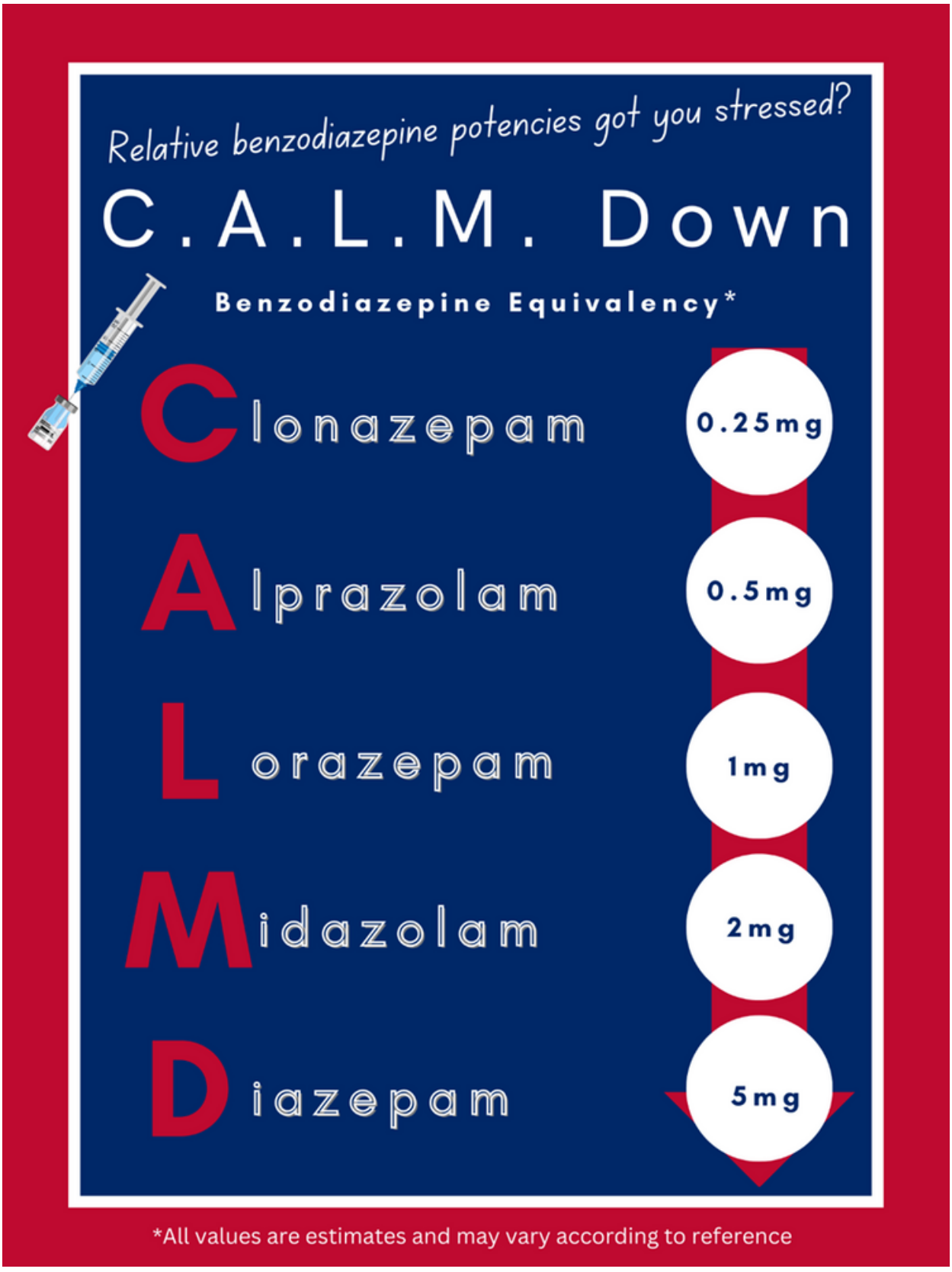

Figure 1. Benzodiazepine Equivalency

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Member Spotlight

Critical Care Excellence Award Winner

Bruce Doepker, PharmD, BCPS

Bruce Doepker is a Pharmacy Specialist in the Medical Intensive Care Unit (MICU) at The Ohio State University Wexner Medical Center (OSUWMC). He earned his Doctor of Pharmacy degree from The Ohio State University College of Pharmacy and completed his Pharmacy Practice Residency at Riverside Methodist Hospital. He first began working at OSUWMC in Thoracic Surgery and Intensive Care in 2005, prior to moving into the MICU in 2007. He also has had an appointment as an Assistant Clinical Profession at The Ohio State University College of Pharmacy since 2006.

At the Ohio Chapter Fall Symposium, Dr. Doepker was recognized as the winner of the Critical Care Excellence Award based on his contributions to critical care over the course of his career. At his practice site, Dr. Doepker has been instrumental in the development of institutional protocols and guidelines, leading research projects as a primary investigator, and providing interdisciplinary education in addition to the high-quality and evidence-based care he provides to patients every day. His areas of focus include sedation/analgesia/delirium, sepsis, toxicology, and hematologic disorders in the critically ill population. He has been an author on over 15 peer-reviewed publications over his career and precepted more than 30 pharmacy residents. Currently, Dr. Doepker serves as the co-chair for the Pharmacy Research Advisory Committee at OSUWMC, which is responsible for soliciting research ideas and providing guidance on the research process to pharmacy residents and specialists. He also oversees a series of lectures on pharmacy resident research which is delivered each year. Dr. Doepker continues to educate pharmacy students at The Ohio State College of Pharmacy through frequent rotation precepting and providing lectures during the critical care module as well as critical care elective course. He was even selected as Preceptor of the Year in 2006.

Dr. Doepker has been an active member of the Society of Critical Care Medicine (SCCM) since 2004. He has submitted and presented abstracts for many research and quality projects at SCCM's Annual Congress. He has also served on the Education Committee for the Clinical Pharmacy and Pharmacology section. Congratulations, Dr. Doepker, and thank you for your contributions to critical care!

Research Day Abstracts

1. ICU Telemedicine and Clinical Risks Associated with 30-Day Mortality: a Retrospective, Cohort Study
2. A Pilot Randomized Trial using Electronic Alerts for Titration of Oxygen Levels (TOOL)
3. Predictors for Withdrawal of Life-Sustaining Therapies in Traumatic Brain Injury Patients
4. Reducing Antibiotic Administration Delays for Newly Septic Inpatients Being Transferred to the MICU
5. Efficacy of Continuous Infusion Ketamine for Analgosedation in the Medical Intensive Care Unit
6. Ketorolac Utilization and Associated Adverse Events in Critically and Non-Critically Ill Patients
7. Pharmacist Managed Vancomycin Therapy at a Tertiary Academic Medical Center
8. Methicillin-resistant Staphylococcus aureus eradication protocol in patients with cystic fibrosis
9. Methylene Blue and Thiamine for Ifosfamide Myoclonus-Encephalopathy Syndrome: Case Report
10. Evaluation of Dexmedetomidine Dosing in Obese Critically Ill Patients With Neurologic Injury
11. Predictors of Response to High-Dose Vitamin K Administration
12. Role of MRSA/MSSA PCR nasal swab in antibiotic de-escalation in critically ill immunocompromised and immunocompetent patients with pneumonia
13. Evaluation of Dexmedetomidine Dosing on Temperature in Obese Critically Ill Patients
14. The Distressed Community Index is not Associated with Mortality in Critically Ill Patients with Sepsis
15. Assessment of Cerebral Autoregulation Using Invasive and Non-Invasive Methods of Intracranial Pressure Monitoring
16. An Unusual Case of Non-traumatic Subperiosteal Hemorrhage
17. Validation of a Non-invasive Method Using Mechanical Extensometer for the Estimation of Intracranial Compliance
18. Effects Of Passive Cycling on Cerebral Hemodynamics in Patients with Acute Brain Injury
19. Ketamine for Sedation in Mechanically Ventilated Patients
20. Evidence Based Recommendations for Stop the Bleed Placement in Schools
21. Impact of Magnetic Resonance Imaging on the Management of Patients with Moderate-Severe Traumatic Brain Injuries
22. A Syndrome of the Trephined: Reversible Paradoxical Herniation After Trendelenburg
23. Delayed Hemothorax Due to Paraspinal Intercostal Artery Laceration: Recurrent Shock in the Complex Polytrauma Patient
24. Reoccurrence of Pituitary Epidermoid Cyst with Pituitary Apoplexy Following Resection
25. Traumatic brain hemorrhage patients with mild TBI are diverse: Who can avoid an ICU admission?
26. A Case Report on Superior Mesenteric Artery in a COVID-19 Patient
27. CMV Hepatitis in Cards Patient; a Rare Co-Infection Causing Transaminitis
28. Understanding the Need for a Broad Differential Diagnosis: a Case of Pneumonic Tularemia
29. Evaluation of Response to Weight-Based Dosing Strategies of Continuous, Fixed-Rate Atracurium Infusions in Critically Ill, Obese Adults with Acute Respiratory Distress Syndrome

1

ICU Telemedicine and Clinical Risks Associated with 30-Day Mortality: a Retrospective, Cohort Study

C Udeh, CM Canfield, AS Brown, EC Wurm, R Sreedharan, P Chahar, PA Stephens, EF Kaiser, S Perez-Protto, FN Factora, JS Hata
Cleveland Clinic

Introduction: ICU telemedicine (ICU-TM) has expanded throughout the U.S addressing critical care coverage demands. Its impact, however, on clinical outcomes remains controversial. This study evaluated the association of ICU telemedicine exposure or non-exposure with relevant clinical factors with 30-day mortality.

Methods: This retrospective, cohort study included 153,987 consecutive ICU patients from 9 regional hospitals with APACHE scoring included within an institutional, ICU dataset from 2014 to 2020. Analyses included summary statistics for demographics, 30-day mortality, multivariate logistic regression modeling, and survival analysis.

Results: For the entire cohort the unadjusted 30-day mortality proportion was significantly different between patients with ICU telemedicine (5.5%) or without ICU telemedicine ICU's (6.9%) with a risk ratio of 0.80 (95% CI 0.77, 0.84) (p <0.0001). The mortality rate for ICU-TM and no ICU-TM was 2.45/1000 versus 3.18/1000 patient-days respectively (p < 0.0001). Multivariate logistic regression modeling showed that ICU telemedicine exposure was associated with reduced 30-day mortality (OR 0.82, 95% CI 0.77, 0.87). Within the final model increased risk was seen with cardiac arrest admission (1.42, 95% CI 1.26, 1.59), weekend admission (OR 1.29, 95% 1.18, 1.41), emergency admission (1.18, 95% CI 1.12, 1.24), race (non-white) (OR 1.11, 95% CI 1.05, 1.17), sepsis (OR 1.06, 95% CI 1.00, 1.12), day 1 APACHE score (OR 1.03, 95% CI 1.03, 1.03), and ICU LOS, (OR 1.01, 95% CI 1.01, 1.02). Risk reduction occurred with hospital LOS(OR 0.95, 95% CI 0.95, 0.96), surgical admission (OR 0.67, 95% CI 0.63, 0.72), coma (OR 0.48, 95% CI 0.36, 0.64) and 2 interaction terms (weekend admission with ICU telemedicine (OR 0.80, 95% CI 0.72, 0.90) and afterhours admission with ICU telemedicine (OR 0.78, 95% CI 0.73, 0.82)). Model validation showed a C-statistic of 0.77. Secondary analyses showed that ICU and hospital length of stays were significantly reduced in the ICU telemedicine group (-1.6 days, 95% CI -1.5, -1.7) and -2.1 days (95% CI -1.9, -2.4), respectively.

Conclusions: In this large patient cohort, exposure to ICU telemedicine appeared one of several factors associated with reduced 30-day mortality of ICU patients.

2

A Pilot Randomized Trial using Electronic Alerts for Titration of Oxygen Levels (TOOL)

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The Ohio State Wexner Medical Center

Introduction: Liberal oxygenation although harmful is prevalent in patients with invasive mechanical ventilation (MV). Utilization of electronic medical records based alerting mechanisms have been used to improve processes in the intensive care unit.
Methods: We conducted an unblinded, randomized control trial comparing oxygen titration in patients with MV using electronic alert based notification vs standard of care. All patients with MV admitted to the Medical ICU were included. In the intervention group, oxygen changes were made based on electronic alerts and decision support. If patients developed a peripheral oxygen saturation greater than 92% when they were given fractional oxygen of 0.5 or more then, alerts in the form of pages were sent to the CISCO phones of respiratory therapists, at thirty minute intervals. In the control arm, respiratory therapists titrated fractional oxygen by one-time physician's orders in the EMR, using the current standard of care. Duration of hyperoxemia was noted. Patients were followed till ventilator liberation or transfer outside the intensive care unit.

Results: Over six months, 174 patients were assessed for eligibility among them 39 patients were excluded (programming errors of the electronic alerts, refusal/inability to obtain consent, co-enrollment, change of ICU). Out of 135 randomized patients, 72 were in the intervention arm and 63 in the control arm. Respiratory therapists responded to 38% of the alerts. During mechanical ventilation, exposure to hyperoxemia significantly reduced in the intervention group median of 6.3 hours. (13.5 [IQR 6.2-29.4] vs 21.2 [IQR 9.6-37.4] p<0.05). Episodes of hypoxemia, improved by increasing oxygen occurred after 5% of the alerts.

Conclusions: Results of this pilot study showed our titration strategy using electronic alerts was feasible with pragmatic enrollment, recruitment and randomization. However, precise titration was difficult within a peripheral oxygen saturation target range of 88-92%, specifically in patients with severe hypoxemia. Alert compliance was moderate and alert fatigue was seen. Preliminary efficacy was noted with reduction in the duration of hyperoxemia and a trend towards early weaning.

3

Predictors for Withdrawal of Care in Traumatic Brain Injury Patients

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Introduction/Hypothesis: Many patients with severe traumatic brain injuries (TBI) undergo withdrawal of care (WOC) or transition to comfort measures, but no formal guidelines exist, making this a difficult decision for providers and families. We hypothesized that WOC would be associated with neurosurgical procedures as well as non-patient institutional and geographic factors.

Methods: All patients with a head AIS score ≥ 3 were identified from 2016 Trauma Quality Improvement Program (TQIP) data. We analyzed factors that might be associated with WOC including procedure type (craniotomy, ICP monitor, both craniotomy and ICP monitor, or no intervention (NI)), age, gender, race, insurance, Glasgow Coma Scale (GCS) score, and mechanism of injury. Region was included to account for potential cultural variations across the US. Adjusted logistic regression was performed to examine factors associated with WOC.

Results: 69,053 patients were identified. The median age was 56 [34-73], 66% male, 77% with isolated TBI, and 7.8% had WOC. WOC was more likely in those who had craniotomy (10%), ICP (20%), and both (17%) as compared to NI (6%, all comparisons $p<0.05$). WOC was independently associated with gender, insurance status, race, GCS, region, and mechanism of injury.

Conclusions: Surgical procedures were associated with increased odds of WOC, indicating that earlier interventions may be more beneficial. Additionally, WOC is independently associated with gender, insurance, age, race, GCS, and mechanism of injury, suggesting that additional factors beyond patient injury characteristics play a significant role in WOC decisions. Our findings suggest that future work regarding WOC guidelines in severe TBI should be examined and implemented.

4

Reducing antibiotic administration delays for newly septic inpatients being transferred to the MICU

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Background: Sepsis is a disease state associated with high mortality, and prompt administration of antibiotics remains a key tenet of management. There are limited data describing the incidence of antibiotic delays among patients who develop sepsis after hospital admission (referred to as having sepsis not present on admission or NPOA sepsis); existing literature has largely focused on patients who present acutely to the emergency department with sepsis. Our team aimed to (1) report the incidence of significant delays from order to administration of broad-spectrum antibiotics among patients transferred from the regular nursing floor (RNF) to the medical ICU (MICU) with concern for acute infection and (2) develop and implement interventions to decrease the rate of antibiotic delays.

Methods: After collecting baseline data, we assembled a multidisciplinary group to review antibiotic administration processes utilized in patients transferred to the MICU with concern for acute infection. After reviewing obstacles to timely antibiotic administration, we developed a three-phase intervention focusing on identifying patients at the time of MICU transfer, implementing an enterprise sepsis checklist, and utilizing caregivers trained in difficult intravenous access to assist with checklist compliance. We abstracted times of antibiotic order and administration and compared pre-intervention and post-intervention groups with respect to these times.

Results: We identified 86 patients in our pre-intervention group and 166 patients in our post-intervention group. Overall, there was no difference between the two groups with respect to incidence of >1 hour delay (57% vs. 55%). There was a significant reduction in the average time from antibiotic order to administration in the post-intervention group (2.32 hours vs. 1.54 hours, $p=0.0461$).

Discussion: We developed a mechanism to track and intervene upon antibiotic administration delays among patients transferred to the MICU with concern for acute infection. We saw a statistically significant reduction in time from antibiotic order to administration in this patient population. Additional studies are needed to determine the impact of these interventions on patient-centered outcomes.

5

Efficacy of continuous infusion ketamine for analgosedation in the medical intensive care unit

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Introduction: To evaluate the efficacy of continuous infusion ketamine for analgosedation versus opiate-based sedation in patients by comparing the percentage of time within target sedation range.

Methods: A single-center, retrospective analysis of mechanically ventilated patients admitted to the medical intensive care unit (MICU) was conducted. Patients who received ketamine as the primary sedative agent were compared to those that received an opiate infusion with or without propofol. Patient data were propensity-weighted on the inverse probability of receiving ketamine, and the treatments were compared across outcomes using logistic or median regression, as appropriate.

Results: There were 169 patients included, 57 in the ketamine group and 112 in the opiate-based sedation group. There was no significant difference in median percentange of time at Richmond Agitation-Sedation Score (RASS) goal for ketamine treatment versus opiate-based sedation (38.9% vs. 33.9%, p=0.62). Patients treated with ketamine had a higher frequency of over-sedation (median difference: 9.6% (95% CI: -3.9 to 16.6), p=0.012). More patients had Critical Care Pain Observatoin Tool (CPOT) scores at goal in the ketamine group (median difference: 13.3% (95% CI: -7.7 to 34.3), p=0.042).

Conclusions: There was no statistically significant difference in the percentage of time at target level of sedation between continuous infusion ketamine and opiate-based sedation.

6

Ketorolac Utilization and Associated Adverse Events in Critically and Non-Critically Ill Patients

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Introduction: Ketorolac is a non-steroidal anti-inflammatory drug utilized in acute pain management. Use of ketorolac is limited by its adverse effect profile, which includes gastrointestinal bleeding (GIB) and acute kidney injury (AKI). The purpose of this study was to evaluate the incidence of AKI and GIB in patients receiving intravenous (IV) ketorolac at University Hospitals Cleveland Medical Center (UHCMC) and to further characterize comorbidities pre-disposing patients to adverse events.

Methods: This Institutional Review Board approved project was a single-center retrospective chart review analyzing patients receiving at least one dose of IV ketorolac at UHCMC between September 1, 2018 and August 31, 2019. Patients were evaluated for occurence of AKI and GIB. Patient-specific risk factors and ketorolac dosing information were evaluated to determine factors associated with highest risk of adverse events from ketorolac.

Results: Among a sample of patients receiving at least one dose of IV ketorolac, 8% (n=8) developed AKI, with no patients developing GIB. Of the patients who developed AKI, duration of therapy ranged from 1-3 days, with total ketorolac doses ranging from 15 mg to 120 mg. Three of the patients had a combination of coronary artery disease and diabetes mellitus, one patient had cirrhosis, and four had no conditions pre-disposing them to AKI. When considering concurrent medications, three patients were taking piperacillin-tazobactam plus vancomycin and four patients received IV contrast.

Conclusions: The incidence of AKI found in this chart review (8%) was higher than incidence seen in similar literature. Common characteristics of patients developing AKI included concurrent use of vancomycin and piperacillin-tazobactam, use of IV contrast, and diagnosis of both coronary artery disease and diabetes mellitus.

7

Pharmacist Managed Vancomycin Therapy at a Tertiary Academic Medical Center

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Introduction: In November 2019, a pharmacist managed vancomycin dosing service was implemented at University Hospitals Cleveland Medical Center (UHCMC), replacing provider managed dosing. The purpose of this study was to evaluate compliance to an institutional vancomycin dosing and monitoring guideline before and after the implementation of this service at UHCMC.

Methods: This was a single-center, retrospective cohort study. It included patients 18 years and older who received ≥ 3 doses of intravenous vancomycin. The provider managed cohort included patients initiated on vancomycin between October 1, 2018 and December 31, 2018. The pharmacist managed cohort included patients initiated on pharmacist-to-dose vancomycin between November 18, 2019 and December 31, 2019. Each group was randomized to include 100 patients. The primary outcome was appropriate initial dosing of vancomycin based off of institutional guidelines. Secondary outcomes included vancomycin levels in goal range, patients reaching goal trough, time to therapeutic trough, and patients with acute kidney injury during therapy.

Results: For the primary endpoint, the provider managed cohort had appropriate initial doses in 53% of patients, compared to 94% in the pharmacist managed cohort (p= <0.001). The percentage of vancomycin levels within goal range was 26% for the provider managed cohort and 38% for the pharmacist managed cohort (p=0.004). The pharmacist managed cohort had a higher percentage of patients reach therapeutic trough concentrations (51% vs 33%, p=0.009) and had an improved time to therapeutic trough concentration (57 vs 100 hours, p=0.036). The rate of acute kidney injury was similar between the provider and pharmacist managed groups (10% vs 6%, p=0.29).

Conclusions: Adherence to institutional guidelines was found to be significantly improved following the implementation of a pharmacist managed vancomycin dosing protocol. Percentage of vancomycin levels within goal range, time to therapeutic level, and percentage of patients reaching goal therapeutic levels were also improved in the pharmacist managed cohort. These results are similar to previously published literature demonstrating the positive impact of pharmacist management of vancomycin dosing.

8

Methicillin-resistant Staphylococcus aureus eradication protocol in patients with cystic fibrosis

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Background: Staphylococcus aureus is one of the most common microorganisms reported to cause lung infections in patients with cystic fibrosis. Infection with methicillin-resistant Staphylococcus aureus (MRSA) is associated with faster decline in lung function due to its chronic presence after the first infection.
At the Mountain State Cystic Fibrosis Center, a MRSA eradication protocol was developed to treat pediatric and adult patients with newly acquired MRSA infections. The protocol consisted of two oral antibiotics, sulfamethoxazole-trimethoprim or doxycycline, in addition to rifampin, for 14 days. Oral decontamination with chlorhexidine gluconate 0.12% oral rinse for 14 days, a topical whole body cleanse with chlorhexidine solution for 5 days, intranasal mupirocin for 5 days, and environmental household cleaning for 21 days were also components of the protocol.

Methods: This study's aim was to evaluate the effectiveness of the MRSA eradication protocol with a primary objective of MRSA culture status at day 28 and day 90. This project retrospectively identified patients who had completed the 21 day MRSA eradication protocol. In addition, patients with newly acquired MRSA cultures were prospectively identified.

Results: Of the 13 patients analyzed for treatment success or failure, 6 (46%) had negative MRSA cultures at day 28 of the protocol. A majority of the patients (4 patients, 67%) that had treatment success at day 28 continued to be MRSA negative at day 90.

Conclusion: It was concluded that eradication of MRSA is possible at day 28 and day 90 after a 21 day treatment regimen.

9

Methylene Blue and Thiamine for Ifosfamide Myoclonus-Encephalopathy Syndrome: Case Report

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Introduction: Ifosfamide is an alkylating agent used to treat many cancers. The incidence of any neurologic complication is 10-30%. However, generalized myoclonus with or without encephalopathy is exceedingly rare.

Case: A 64 year old male with Large B Cell Lymphoma status post 6 cycles of R-CHOP presented with relapsed stage IV disease. He was initiated on R-ICE therapy with a standard dose of ifosfamide 5000mg/m2 over 24 hours. On Cycle 1, Day 3 he had an acute change in his mental status and worsening renal function preventing further chemotherapy administration. He was alert but unable to vocalize answers to questions. Ifosfamide toxicity was suspected, and he received one dose of Methylene Blue 50 mg IV and started on broad spectrum antibiotics. Within 12 hours he became stuporous, developed generalized myoclonic jerks, and periodic upward deviation of his eyes. Due to concern for airway protection, he was intubated. He was started on a Methylene Blue 50mg IV every 4-6 hours and Thiamine 200mg IV every 8 hours. A non-contrast brain CT scan was negative for acute pathology. Continuous video EEG monitoring in the absence of sedation and analgesia revealed generalized burst suppression pattern without epileptiform discharges. By 72 hours, due to rapid renal failure from acute tubular necrosis, and no improvement in myoclonus or encephalopathy he was initiated on renal replacement therapy. After Methylene Blue 50mg IV x 40 doses and Thiamine 200mg IV x 9 doses followed by Thiamine 100mg orally every 8 hours, his myoclonus resolved 11 days after onset. After 6 weeks, his renal function and encephalopathy recovered despite many complications including disseminated intravascular coagulation, septic shock, and delirium.

Discussion: Case reports show that ifosfamide neurotoxicity is either self-limited with drug cessation or rapidly improved with Methylene Blue and Thiamine (typically within 72 hours). This case adds to the sparse literature on prolonged recovery following ifosfamide, and myoclonus-encephalopathy as a manifestation of neurotoxicity.

Conclusion: Methylene Blue, Thiamine, and renal replacement therapy are not always associated with rapid improvement in ifosfamide neurotoxicity.

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Evaluation of Dexmedetomidine Dosing in Obese Critically Ill Patients with Neurologic Injury

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Introduction/Hypothesis: Dexmedetomidine (Precedex™) is a selective alpha2-adrenergic agonist that is often used in critical care units due to its ideal sedative properties which includes light, dose-dependent sedation, anxiolysis, and analgesia without the risk of respiratory depression. Due to the ideal properties of dexmedetomidine, there has been an increased interest in its use for light sedation in critically ill patients. The primary objective is to assess the ability of achieving goal intensive care unit (ICU) sedation in obese patients who are solely on dexmedetomidine before and after an institutional change in dosing from actual body weight (ABW) to adjusted body weight (AdjBW).

Methods: This single center, retrospective study included patients ≥ 18 years old, admitted to the neurological critical care unit (NCCU) for a neurological condition (e.g. seizure, ischemic/hemorrhagic stroke, anoxic brain injury, etc.), required dexmedetomidine for at least 8 hours as a sole continuous infusion sedative, and weighed > 120% of their ideal body weight. The percentage of Richmond Agitation Sedation Scale (RASS) measurements within goal range (-1 to +1) during the first 48 hours or until discontinuation (prior to 48 hours) while on dexmedetomidine as the sole sedative agent were compared between patients that were dosed on ABW and those dosed on AdjBW.

Results: 140 patients were included (ABW cohort: 68 patients and AdjBW cohort: 72 patients) and 161 patients were excluded. There was no statistical difference between the two groups in percent of RASS measurements in goal range (53.2% vs. 55%; p-value: 0.78). There was also no statistical difference in mean dosing weight (99.2 ± 26 vs. 96.8 ± 20.9 kg; p-value: 0.55). The average dose of dexmedetomidine required to achieve 1st in goal RASS score was (0.4 ± 0.3 vs. 0.4 ± 0.3 mcg/kg/hour; p-value: 0.98), also with no statistical significance. The max dose of dexmedetomidine was not statistically different between the two groups (0.7 ± 0.4 vs. 0.8 ± 0.4 mcg/kg/hour; p-value: 0.24).

Conclusion: Our findings show no statistical difference in the percent of RASS measurements within goal after the initiation of dexmedetomidine as the sole sedative agent dosed based on AdjBW compared to ABW in obese critically ill patients with a neurological injury.

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Predictors of Response to High-Dose Vitamin K Administration

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Introduction: Essential to the coagulation pathway, vitamin K is used to correct clotting factor deficiencies and for reversal of warfarin-induced bleeding. In practice, and particularly for cirrhosis-associated coagulopathy, high-dose IV vitamin K is often given on consecutive days despite limited evidence to support repeated dosing and potential risks with parenteral administration. This study sought to characterize differences in responders and non-responders to high-dose vitamin K to better guide dosing strategies in patients with coagulopathy.

Methods: This was a case-control study of hospitalized adults (≥18 years) who received vitamin K 10 mg IV daily for three days for treatment of coagulopathy, defined as an international normalized ratio (INR) of greater than 1.5. Patients with an INR < 1.5 or ≥30% lower than baseline following the first dose of vitamin K were considered responders and compared to non-responders. The primary outcome was the change in INR over time with subsequent IV vitamin K doses. A linear mixed-effects model (LMM) compared the reduction of INR on follow-up time points between groups. Secondary outcomes included factors associated with response to IV vitamin K and the incidence of safety events.

Results: There were 497 patients included in this study, and 182 patients responded to the first dose of IV vitamin K. Most patients were white males (73%) with a mean age of 54 ± 15 years. Most patients had underlying cirrhosis (91.5%), with a MELD score of 23.9 ± 10.6. The INR decreased from 1.87 (adjusted least square mean from LMM, 95% CI 1.73-2.03) to 1.61 (95% CI 1.49-1.74), which was a 16.5% reduction from baseline to day 3 (95% CI 12.6%-20.5%). In responders, the INR decreased from 1.89 at baseline (95% CI 1.74-2.04) to 1.40 (1.3-1.5) on day 3 (95% CI 1.30-1.50). In non-responders, the INR decreased from 1.97 at baseline (95% CI 1.83-2.13) to 1.85 on day 3 (95% CI 1.72-1.99). Predictors of response included lower weight, absence of cirrhosis, and lower bilirubin. There was a low incidence of safety events observed in this study.

Conclusions: In this cohort of which the majority were patients with cirrhosis, the overall adjusted change in INR over 3 days was 0.3, which did not vary much clinically between responders and non-responders.

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Role of MRSA/MSSA PCR nasal swab in antibiotic de-escalation in critically ill immunocompromised and immunocompetent patients with pneumonia

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Introduction: MRSA PCR nasal screening is used to guide antimicrobial therapy de-escalation for pneumonia due to its high negative predictive value (NPV). Immunosuppressed patients are more susceptible to infection, but little is known regarding the accuracy of MRSA nasal screening in them. The aim of this study is to investigate the sensitivity, specificity, positive predictive value (PPV) and NPV of MRSA nasal screen in immunosuppressed and immunocompetent patients.

Methods: This study was a single-center, retrospective cohort study of adult patients with pneumonia admitted to an ICU between 7/1/2016 and 6/30/2019. Patients with a MRSA nasal screen collected within 7 days of a positive respiratory culture were included. Patients who received nasal decolonization before collection of the nasal swab were excluded. Patients were considered immunosuppressed if they had an immunocompromising disease state or were on chronic immunosuppressive medications. The primary outcome was the NPV of the MRSA screen in both groups. Secondary outcomes included incidence of MRSA pneumonia, mortality, ICU length of stay (LOS), hospital LOS, duration of empiric MRSA therapy, and number of vancomycin levels collected.

Results: 225 patients were included in the study (63 immunosuppressed and 162 immunocompetent). Baseline characteristics of age, sex, Charlson Comorbidity Index, and history of MRSA/MSSA were similar in both groups. In immunosuppressed patients, the MRSA screen had a sensitivity of 46.7%, a specificity of 91.7%, a PPV of 63.6% and a NPV of 76.2%. In immunocompetent patients, it had a sensitivity of 65.2%, a specificity of 91.4%, a PPV of 55.6%, a NPV of 94.1%. There were significant differences between groups relating to the length of stay prior to pneumonia diagnosis. 15.9% of immunosuppressed patients and 29% of immunocompetent patients had a LOS > 5 days (p=0.04).

Conclusions: This study found that the NPV of the MRSA nasal screen was lower for the immunosuppressed group compared to the immunocompetent group, which may limit its use for antimicrobial de-escalation. It also found that immunosuppressed patients presented with pneumonia earlier in their hospital stay. Clinical outcomes including mortality, hospital LOS and ICU LOS were similar between groups. More research is needed to determine the value of MRSA screenings in immunosuppressed patients.

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Evaluation of Dexmedetomidine Dosing on Temperature in Obese Critically Ill Patients

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Introduction: Previous literature showed an association between hyperthermia and dexmedetomidine (DEX) use for ICU sedation in non-obese patients. The purpose of this study is to evaluate DEX's effect on body temperature in obese critically ill patients.

Methods: This single center, retrospective, cohort study included patients ≥18 years, admitted to a surgical or medical ICU, received DEX for at least 8 hours as a single continuous infusion sedative, and weighed ≥120% of ideal body weight. Patients were excluded if they had a fever (≥38°C) and positive cultures within 48 hours of DEX initiation. Temperature prior to DEX initiation, temperature maximum (Tmax) within 24 hours of DEX initiation, and Tmax at hours 24-48 after DEX initiation were evaluated. The primary endpoint was fever within 48 hours of DEX initiation. Statistical analyses were performed by Fisher's exact test for nominal data presented as percentage or Mann-Whitney U-Test for nonparametric data presented as median [25-75% IQR].

Results: A total of 186 patients were included for evaluation. Forty-two patients (22.5%) had a fever during the first 48 hours of DEX. There was no difference in median weight between the groups (99.4 [90.6-122.4] vs 97.6 [81.6-114.2] kg, p=0.6). The median change from baseline temperature within 48 hours was 0.5 [0.1-0.8] °C, p<0.001. Demographics were similar except median age (56 [45-63] vs 61 [49.5-68] years; p=0.028) was significantly lower in those that were febrile. While the median duration of DEX was significantly longer (48 [31-48] vs 34 [22-48] hours; p=0.03) in the febrile group, the median DEX dosage was similar (0.53 [0.32-0.68] vs 0.45 [0.28-0.7] mcg/kg/h, p=0.11). Significantly more patients in the febrile group received NSAIDs and/or acetaminophen (45.2% vs 11.8% p<0.0001). In multiple regression analysis, duration of DEX and baseline temperature were significant predictors of development of fever with an adjusted odds ratio of 0.96 (95% CI 0.94-0.99, p=0.018) and 0.15 (95% CI 0.071-0.33, p<0.001), respectively.

Conclusions: Our study suggests that there is a statistically significant increase in body temperature from baseline for obese patients on DEX. Duration of DEX and baseline temperature were found to be risk factors for development of fever in this population. Further studies are warranted.

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The Distressed Community Index is Not Associated with Mortality in Critically Ill Patients with Sepsis

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Introduction: Over 1,000,000 people are affected by sepsis annually, with many requiring ICU admission. The impact of socioeconomic factors on outcomes following sepsis is unclear. The distressed communities index (DCI) is a composite score which attempts to quantify socioeconomic well-being by zip code. The primary objective of this study was to evaluate the association between DCI and mortality in patients admitted to the surgical ICU (SICU) with sepsis.

Hypothesis: Community distress is predictive of worse outcomes in patients with sepsis.

Methods: We conducted a retrospective analysis of institutional data for patients diagnosed with sepsis or septic shock admitted to the SICU. "Distressed" communities were defined as a DCI in the top quartile of our cohort (n=331), while "non-distressed" were below the median DCI (n=661). Baseline demographic and clinical characteristics were compared based on this stratification. Primary outcomes included in-hospital and 90-day mortality, incidence of respiratory or renal failure, and discharge disposition. Multivariate regression analyses were performed to identify independent variables associated with outcomes.

Results: Overall 90-day mortality was 28.6% (n=284). The low DCI cohort was older (61.214.9 vs. 57.216.9 years), more likely to be Non-Hispanic White (90% vs. 76%), more likely to be transferred, and less likely to have significant liver disease or COPD. Initial SOFA scores were comparable (5 (4-8) vs 6 (4-8), p=0.75), as were rates of vasopressor use (38% vs 36%, p=0.54). Incidence of respiratory and renal failure, and discharge disposition were equivalent between groups. Low DCI patients had comparable in-house (24% vs 23%) and 90-day mortality (28% vs 30.2%). After regression analyses, DCI was not a significant predictor of mortality in this cohort.

Conclusions: Socioeconomic status has been consistently championed for inclusion when constructing risk models, evaluating resource utilization, comparing hospitals, and determining patient management. Using a robust index of community distress, we did not find an association between DCI severity and sepsis mortality, despite contrasting evidence in other disease processes. While the absence of DCI-related associations observed herein merits further investigation, this suggests that bundled care in sepsis management may mitigate healthcare disparities.

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Assessment of Cerebral Autoregulation Using Invasive and Non-Invasive Methods of Intracranial Pressure Monitoring

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Introduction: Pressure amplitude index (PAx - a descriptor of cerebrovascular reactivity) correlates the changes of pressure amplitude (AMP) of intracranial pressure (ICP) with changes in mean arterial pressure (MAP). While PAx can aid in prognostication after acute brain injuries as a tool for the assessment of cerebral autoregulation, invasive ICP is required for its calculation. Our aim was to evaluate the relationship between nPAx derived from a novel non-invasive device for ICP monitoring (nICP), with PAx derived from gold standard invasive methods.

Methods: We retrospectively analyzed ICP (external ventricular drain) and nICP (mechanical extensometer - Brain4Care Corp.) waveform morphology data collected in adult brain-injured patients with invasive arterial blood pressure monitoring admitted to the Neurointensive Care Unit between 1/2021 to 12/2021. PAx/nPAx were calculated as the moving correlation coefficient of 10-s averages of AMP or nAMP and MAP. AMP/nAMP was determined by calculating the fundamental Fourier amplitude of the ICP/nICP signals over a 10-s window, updated every 10s. The time series from all signals were first treated to remove movement artifacts. We then evaluated the relationship between invasive PAx and non-invasive nPAx using repeated measures correlation coefficient analysis. Bland-Altman was performed between these same parameters. Data was analyzed using ICM+ and RStudio software platforms.

Results: 24 patients were identified. Age was 53.5 years (IQR 40 – 70) with intracranial hemorrhage (84%) as the most common etiology. 21 (87.5%) patients underwent mechanical ventilation and 60% were sedated with median GCS (GCS) 8 (7 – 15). Mean PAx was .0296 ± 0.331 9 and nPAx wa 0.0171 ± 0.332. The correlation and agreement between PAx and nPAx was strong (R=0.70, p=<0.0005, 95% CI 0.687 - 0.717). Bland Altman analysis showed excellent agreement with bias of -0.18 (95% CI -0.026 to -0.01).

Conclusion: Non-invasive PAx can be detected reliably using a novel nICP monitoring device as an index of cerebrovascular reactivity/autoregulation. Further study of the applications of this clinical tool is warranted with the goal of early therapeutic intervention to improve neurologic outcomes following acute brain injuries.

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An Unusual Case of Non-traumatic Subperiosteal Hemorrhage

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Introduction: Subperiosteal orbital hemorrhage usually occurs in the setting of facial or orbital trauma. Non-traumatic subperiosteal hemorrhage (NTSH) has rarely been reported in literature. The proposed mechanism of NTSH is the transmission of sudden increase in cranial venous pressure to the orbital veins, which are valveless. Here we present a case who developed NTSOH following a dialysis fistula declotting procedure.

Case: A 37 year old right-handed woman with a past medical history significant for type 1 diabetes, end-stage renal disease, peripheral artery disease and hypertension presented for an elective revision of a clotted right upper extremity arteriovenous fistula. Periprocedurally, she had acute eye pain, bilateral complete vision loss and emesis. CT orbits revealed large heterogeneously hyperdense lesions in the bilateral orbital apex extending anteriorly along the roof of the orbit, concerning for hemorrhage. Cultures obtained through nasal endoscopy were negative for a bacterial or fungal infection involving the sinuses. Ophthalmology was consulted and she underwent bilateral canthotomy and lateral cantholysis. Postoperatively, she was started on systemic and topical ocular antihypertensives, as well as prophylactic antibiotics. Visual acuity remained poor with finger counting on OD and lack of consistent response to light on OS. Two weeks after hospitalization, she suffered a cardiac arrest requiring CPR, but ROSC could not be achieved. Autopsy studies revealed extensive thrombi in the left ventricle, right atrium, and mesenteric arteries.

Discussion: While several reports of NTSH associated with cardiac, vascular or endoscopic procedures have been described in literature, there are no reported cases describing NTSH after declotting and venoplasty of a dialysis fistula. It has been suggested that loose adhesions between the periosteum and orbital bones allow for the development of orbital subperiosteal hemorrhage, originating from the small veins crossing the subperiosteal space.

Conclusion: Acute presentation of NTSH warrants a thorough investigation for underlying vascular abnormality, venous congestion, infection and coagulopathy. Given the temporal relationship with the AV fistula repair procedure, our case highlights the importance of consideration of venous pressure changes secondary to a fistula repair procedure, superimposed on coagulopathy as a potential cause of NTSH.

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Validation of a Non-invasive Method Using Mechanical Extensometer for the Estimation of Intracranial Compliance

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Background: Intracranial compliance (ICC) refers to the relationship between changes in volume and the resultant changes in intracranial pressure (ICP). Knowledge of ICC can complement management of acutely brain-injured patients. Current methods for estimation of ICC require invasive ICP monitors. In the current investigation, we examine the use of a non-invasive ICP waveform device for the estimation of ICC.

Methods: We retrospectively analyzed ICP waveform morphology recorded by invasive (external ventricular drain) and non-invasive (mechanical extensometer) methods in adult patients admitted to the Neurointensive Care Unit between 08/2021 to 03/2022. Compliance was calculated as the amplitude of the fundamental component of cerebral arterial blood volume (estimated with concurrent transcranial Doppler recordings), divided by the amplitude of the fundamental component of the ICP waveform (for both invasive and non-invasive methods). The time series from all signals were first treated to remove movement artifacts. We then evaluated the relationship between invasive ICC and non-invasive ICC using repeated measures correlation coefficient analysis. Data were analyzed using ICM+ and RStudio software platforms. Based on Shapiro-Wilks normality tests, non-parametric measurements (median w/IQR) were presented.

Results: 11 patients were identified. The median age was 54 years (IQR 46.5 –68.5). The most common diagnosis was intracranial hemorrhage (91%) with a median GCS 5 (IQR 3 –9). Total median monitored time was 12 minutes (10.6-15.8). 9 patients were mechanically ventilated and 3 patients were sedated during monitoring. 4 patients had active ICP optimization with hyperosmolar therapy or sedation. Median invasive ICC was 0.36170 (IQR 0.033 – 0.8546) and 0.7399 (IQR 0.1193 – 2.327).The correlation between invasive ICC and non-invasive ICC was strong (R=0.83, p<0.0001, 95% CI 0.81-0.86).

Conclusion: Non-invasive cerebral compliance can be reliably estimated by combining TCD and non-invasive ICP monitoring with a mechanical extensometer in a statistically significant evaluation. Further study of the applications of this clinical tool seems warranted.

Acknowledgments: Mechanical extensometer sensor on loan from Brain4Care Corporation.

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Effects of Passive Cycling on Cerebral Hemodynamics in Patients with Acute Brain Injury

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Introduction/Hypothesis: Early mobility in critically ill patients has been shown to reduce length of hospital stay and hasten return to independence. There is a paucity of data on the effects of early mobility and exercise intensity on cerebral autoregulation in patients with acute brain injuries. Our aim is to explore this relationship.

Methods: Patients were monitored while using passive lower extremity cycle ergometry at different intensities (RPM). Heart rate (HR), arterial blood pressure (ABP), intracranial pressure (ICP), and cerebral perfusion pressure (CPP), were collected using ICM+ software. An index of CA (Pressure reactivity index-PRx), was calculated. Hemodynamic parameters and PRx were compared at baseline, 10rpm, 20rpm, 40 rpm and a cool down period. Statistical analysis of the means of the collected variables at various exercise intensities was assessed using the Tukey-Kramer test and multivariable models.

Results: 11 patients were monitored. Median age was 61 years (IQR 49.5 - 65). The most common diagnosis was subarachnoid hemorrhage (45%). Significant differences were seen in HR between baseline and 10rpm (78 bpm vs 73 bpm, p=0.015). Significant differences were seen in ABP between baseline and 10 (94mmHg vs 83mmHg, p=0.0003), 20 (77.3mmHg, p=0.0002), and 40rpm (77.1mmHg, p=0.0262) respectively. ICP also had significant change when transitioning between baseline and 10, 20, 40 rpm, and cool down period (p<0.0001). There was no significant change in PRx or CPP at the various RPMs. However, 36% of patients experienced an uptrend from baseline in PRx. 54% of patients had an abnormal PRx index (i.e. > 0.3) with any degree of physical activity.

Conclusions: Patients with acute brain injuries experienced significant differences in hemodynamics and ICP from baseline during early, passive mobility. A proportion experienced impaired CA during passive exercise; although, this was not statistically significant. Larger, prospective studies are warranted to study the relationship between early mobility and cerebral autoregulation.

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Ketamine for Sedation in Mechanically Ventilated Patients

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Introduction: The use of ketamine as a sedative agent has increased dramatically in patients who are mechanically ventilated (MV) due to COVID-19 in intensive care units (ICU). Ketamine primarily acts as a noncompetitive N-methyl-d-aspartate (NMDA) receptor antagonist. Ketamine is also a mu and kappa receptor agonist which results in analgesia, and modulate central sensitization, hyperalgesia, and opioid tolerance. In comparison to other sedatives, ketamine has a more favorable hemodynamic profile and does not produce significant respiratory depression. We hypothesized that ketamine when used as an adjunct in sedation has vasopressor and opiate sparing effect in MV population.

Methods: This was a single-center, retrospective, observational study conducted at a large academic medical center. All MV patients admitted to the medical ICU from October 1st, 2019 to October 31st, 2021 who received ketamine for sedation were be eligible for inclusion. Patients less than 18 and/or were on ketamine for indications other than sedation were excluded.

Results: Of 167 patients who had ketamine ordered, 76 (45.5%) patients were included and 91 (54.5%) met exclusion criteria. At the start of ketamine, 74 patients were on fentanyl, 27 (36.5%) of those patients were successfully weaned off fentanyl (10.8%) or had a decrease in infusion rate (25.7%). A total of 47 patients were on propofol, 39 (83%) patients were successfully weaned off propofol (55.3%) or had a decrease in infusion rate (25.7%). Seventeen patients were on midazolam infusions, of those, 12 (70.6%) patients were successfully weaned off (52.9%) or had a decrease in rate (17.6%). There were 15 patients on dexmedetomidine six (40%) patients were successfully weaned off (20%) or had a decrease in infusion rate (20%). The average time in hours from ketamine infusion start time to discontinuation for fentanyl, propofol, midazolam, and dexmedetomidine was 46.2, 11.7, 45.6, and 41.3 respectively. At the start of ketamine, 71 patients were on vasoactive agents and 67.6% were able to wean off or had a decrease in rate.

Conclusions: Ketamine as an adjunct analgosedative agent resulted in successful weans off co-sedative agents or in decreased infusion rates. It was particularly impactful on propofol and midazolam as more than 50% of patients on these two agents were successfully weaned off.

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Evidence Based Recommendations for Stop the Bleed Placement in Schools

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Introduction: The US has experienced a rapid increase in the incidence of school shootings with 112 documented in 2019. The leading cause of death from gunshot wounds is blood loss. Prevention of hemorrhagic shock often must occur within minutes, underscoring the need to educate and provide educators with lifesaving techniques. Stop the Bleed (STB) trains bystanders how to control bleeding while also providing lifesaving rapid response kits. The cost of bleeding control kits makes it critical to identify their best placement. There is a lack of recommendations on the most practical locations for kit placement as well as the quantity needed to prevent blood loss related mortality during school shooting events. This study aims to address both limitations by conducting a retrospective review of all school shootings to provide evidence-based recommendations for placement of kits.

Methods: This study was a retrospective review of publicly available firearm related incidences occurring on the property of K-12 schools in the United States from 2010 to May 2020. The primary goals were to determine where these incidences occur and the rate of injury and fatality at these locations. To meet inclusion criteria, firearm incidences must have occurred on school grounds and must have taken place between January 1, 2010 and March 30th, 2020. Data excluded were involving intentional property damage.

Results: A total of 521 school shootings were included in the study. Almost half of the shootings have occurred in the last three years. Most shootings occurred at high schools (61%) and in the states Texas, California and Florida. The majority were nonfatal shootings at 71%; while only 5% had greater than 1 fatality. A total of 47% of the shooting events had no injuries, with single persons injured 37% of the time. Parking lots were the most frequent site of shootings at 31.9%, classrooms at 9.2% and school transportation at 5.6%. Handguns were the most frequent used (67%), and males were the most common victims (74%).

Conclusion: High schools would be the choice of kit placement if budget and quantities were limited. Locations to place the kits would be at entrances to schools due to their proximity of parking lots, classrooms and school buses. Performing this review allowed an objective review of data to help allocate resources.

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Impact of Magnetic Resonance Imaging on the Management of Patients with Moderate-Severe Traumatic Brain Injuries

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Introduction: Traumatic Brain Injury (TBI) is the leading cause of death and disability in the United States, estimated to affect 2.8 million people annually. While Computed Tomography (CT) is the primary imaging modality in the management of TBI, Magnetic Resonance Imaging (MRI) is more sensitive than CT in the detection of hemorrhagic and non-hemorrhagic axonal lesions. The purpose of this study is to identify if MRI performed >24 hours after admission CT alters the clinical management of moderate-severe TBI. Secondary objectives included identifying discrepancies between MRI and CT findings and addressing the predictive value of new MRI findings and initiation of comfort measures.

Methods: This is a retrospective chart review of adult patients (>18) who presented to Cleveland Clinic Akron General between January 1, 2016 and December 31, 2018 with moderate-severe TBI. Moderate-severe TBI was defined as a head Abbreviated Injury Score (AIS) >3. Changes in clinical management were defined as craniotomy, placement of intracranial drain or pressure monitor, mannitol infusion, new anti-epileptic medication, or new discussion of care goals. Identified charts were reviewed by three independent reviewers for potential changes in clinical management.

Results: There were a total of 45 patients with moderate-severe TBI (AIS >3) who also had an MRI. Seven patients were excluded because MRI was completed within 24 hours of admission CT. Of the remaining 38 patients, MRI resulted in additional diagnoses compared to CT findings in one third of patients (n=13). Six patients (16%) had changes in their clinical care following MRI. Five of these six patients had new diagnoses including worsening subdural hematoma, subgaleal layering abscess, global hypoxic ischemia, and acute infarction not otherwise seen on CT. Changes to clinical care following MRI included placement of an intracranial drain (n=2), care withdrawal conversations (n=2), DAI exam (n=1), and administration of a new antibiotic (n=1).

Discussion: MRI has limited use for TBI patients in the initial 24 hours following admission. This study demonstrates that an MRI obtained > 24 hours after the admission CT, may alter management in moderate-severe TBIs.

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A Syndrome of the Trephined: Reversible Paradoxical Herniation After Trendelenburg

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Introduction: Sinking flap syndrome and paradoxical brain herniation are rare but known complications following cerebrospinal fluid (CSF) drainage procedures such as craniectomy, lumbar puncture, external ventricular drainage, and ventriculoperitoneal shunting. While decompressive craniectomy is typically performed to control intracranial hypertension, removing a portion of the skull disrupts the typical tenants of the Monro-Kellie doctrine. Following craniectomy, the brain, now only covered by a layer of skin, is subject to the effects of atmospheric pressure and the resultant disruption of normal CSF circulation and cerebral blood flow.

Case: We present a case of a 61-year-old male who underwent decompressive craniectomy following a traumatic right subdural hematoma with 0.8cm of shift, hemorrhagic contusion, and subarachnoid hemorrhage. The patient subsequently developed acute neurologic deterioration on postoperative day four with a sunken craniectomy site. Computed Tomography (CT) revealed concave brain parenchyma with a new midline shift, suggestive of paradoxical brain herniation. Interdisciplinary collaboration expedited this patient's care as he was placed in Trendelenburg position, which resulted in an immediate improvement in his pupillary response and mental status. He was then started on three percent hypertonic saline along with continuous saline infusion. Following these interventions, the patient experienced a return to baseline neurologic function.

Discussion: While most authors describe a period of months to years following CSF drainage to the onset of sinking flap symptoms, this case clearly outlines the possibility of such a syndrome to occur in the immediate postoperative period.

Conclusion: Sinking flap syndrome is an important consideration at all points in patient care as this case shows this can occur much earlier following CSF drainage.

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Delayed Hemothorax Due to Paraspinal Intercostal Artery Laceration: Recurrent Shock in the Complex Polytrauma Patient

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Introduction: Thoracic injuries are a significant cause of morbidity and mortality and can result from blunt or penetrating trauma. Motor vehicle collisions (MVC) are the most common (80%) reported blunt trauma injuries and few (<10%) of require surgical intervention. This is a case of a patient with blunt trauma related injuries who developed a delayed hemothorax with hemodynamic instability following a MVC.

Case: A 61-year-old male was found unresponsive following a high speed MVC into a tree and arrived at the emergency department as a level 1 trauma activation. Chest x-ray was negative for pneumothorax or pleural effusion. Focused assessment with sonography for trauma (FAST) exam was positive for free fluid in Morrison's pouch. The patient was taken to the operating room (OR) for emergent exploratory laparotomy. Hemostasis was obtained, however the patient remained in persistent shock. Computerized tomography (CT) showed a large left-sided hemothorax with active hemorrhage from the left posterior paraspinal T10 intercostal artery. The initial treatment plan was for IR embolization. However, the patient decompensated and was brought to the OR for an emergent left thoracotomy. No active bleeding from the left intercostal artery was identified. Ventilation improved with evacuation of the hemothorax, and the thoracotomy wound was closed. The patient remained in the intensive care unit critically ill with minimal neurologic function. An electroencephalogram showed minimal brain activity and a CT brain confirmed a severe anoxic brain injury. Comfort care was decided after discussion with family and the patient was terminally extubated.

Discussion: Definitive management of vascular injury resulting from blunt chest trauma can be divided into operative control and endovascular stenting or embolization. In this case, the patient's hemodynamic instability prevented IR embolization or stenting of the hemorrhaging vessel. The continued bleeding and coincident consumptive coagulopathy required rapid adjustment of the treatment plan. The spontaneous cessation of arterial hemorrhage could be explained by vasospasm due to shock or possible.

Conclusion: Vascular injury from blunt trauma can lead to complex hemorrhage and localizing the source of the bleed is critical to controlling hemodynamic stability.

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Reoccurrence of Pituitary Epidermoid Cyst with Pituitary Apoplexy Following Resection

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Introduction: Pituitary apoplexy occurs when the pituitary gland (or pituitary tumor) undergoes infarction or hemorrhage. Bleeding or infarction into a hypophyseal adenoma results in compression of perisellar structures with often symptoms of pituitary insufficiency. Treatment for pituitary macroadenomas, especially with pituitary apoplexy, involves transsphenoidal resection with immediate institution of steroid replacement. Recurrence of pituitary adenoma is significantly less common than other pituitary tumors with most recurrences occurring between 1 and 10 years status-post resection. The case report presented here is unique in that the patient had rapid reoccurrence of tumor with subsequent recurrent pituitary apoplexy without a fatal outcome.

Case: A 42 year-old male with a past medical history of pituitary macroadenoma, status-post resection four months prior presented to the emergency department (ED) complaining of a constant headache of two weeks with blurry vision. The patient's extraocular movement and visual fields were intact, pupils were reactive bilaterally. He had left ptosis and difficulty independently opening his right eyelid. A computed tomography (CT) of the head re-demonstrated post-operative changes of a transphenoidal resection with cerebrospinal fluid density occupying the enlarged sella turcica. CT head appeared relatively unchanged and without acute process. The patient was released from the ED against medical advice and returned to the ED two days later due to the continuation of his symptoms and was admitted for an MRI of his brain. The MRI of his brain demonstrated new findings including mass effect to the optic chiasm with fluid in the sellar/suprasellar mass. The leading consideration for this finding on MRI was a hemorrhagic component with interval enlargement of the mass with the patient likely having pituitary apoplexy.

Discussion: The patient in this case presented with a reoccurrence of a pituitary tumor with resultant hemorrhage and compression of optic chiasm consistent with pituitary apoplexy. This case is unique in the fact that the patient had undergone complete resection of pituitary epidermoid cyst with resultant hypopituitarism and reoccurrence of tumor only four months following this surgical procedure.

Conclusion: Recurrence of pituitary apoplexy can occur at any time following resection.

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Traumatic brain hemorrhage patients with mild TBI are diverse: Who can avoid an ICU admission?

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Introduction: Management of mild traumatic brain injury (mTBI) with intracranial hemorrhage (ICH) often requires admission to an intensive care unit (ICU) until a repeat head computed tomography (RHCT) shows stabilization of ICH. ICU admission not only increases the risk of ICU delirium secondary to serial neurologic examinations, but it is also resource intensive and a significant cost burden on the hospital system. The primary goal was to evaluate the necessity of ICU admission in this patient population, defined as requiring an intervention following RHCT. Additionally, we sought to identify potential predictive characteristics of patients requiring ICU admission.

Methods: This was a retrospective cohort study including all adult patients admitted to the ICU with mTBI (GCS≥13) and radiographic evidence of ICH between April 2019, and March 2021, at a level 1 urban trauma center. Patients were excluded if they suffered from polytrauma, penetrating head injury, or required immediate surgical intervention. Data was abstracted from the electronic medical record and included demographics, injury details, imaging reports, hospital course details, medications, clinical progression, and interventions following RHCT. Risk factors were then analyzed to better identify patients at high risk for neurologic deterioration and subsequent critical intervention.

Results: A total of 233 patients met inclusion criteria. The majority of patients were white (89%), elderly (mean age 67), and suffered minor falls (76%). A total of 34 patients (14.7%) required critical intervention following RHCT. Multiple logistic regression showed that an initial GCS equal to 15 ($p<0.05$), Brain Injury Guidelines (BIG) Score < 3 ($p<0.005$), and midline shift < 5 mm ($p<0.001$) were all negative predictive factors for requiring intervention. Subgroup analysis revealed that isolated subdural hematomas ($p<0.05$) carried an increased risk for requiring intervention. Neither the use of anticoagulants nor antiplatelets impacted the predictive model.

Conclusion: Our findings suggest that, particularly in the elderly population, patients suffering from mTBI in the setting of a ground level fall with initial GCS equal to 15, BIG score < 3, Marshall score < 4, and midline shift < 5 mm, ICU admission can be avoided.

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A CASE REPORT ON SUPERIOR MESENTERIC ARTERY IN A COVID 19 PATIENT

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Introduction: This case report discussed and reviewed an atypical presentation of COVID 19 involving superior mesenteric artery thrombosis with associated ischemic colitis. Thrombosis had been reported in up to 50 percent of patients with severe COVID -19. The pathophysiology of thrombosis in COVID 19 infection may include increasing blood viscosity and endothelial damage.

Case: A 59-year-old male with GERD, hiatal hernia, and diverticulitis was presented with ten days history of abdominal pain and vomiting, which later became coffee ground in nature. He was diagnosed with COVID 19 seven days before his presentation. Lab work showed hypokalemia with lactic acidosis, polycythemia, leukocytosis, thrombocytosis, and elevated D dimer. Esophagogastroduodenoscopy demonstrated actively bleeding Mallory Weiss tear, successfully treated with bipolar circumactive probe cautery (BICAP). The patient's abdominal pain worsened, and a repeat CTA abdomen revealed a superior mesenteric artery thrombosis with thickening of the distal small bowel and ascending colon. Vascular surgery was consulted and performed catheter-assisted tPA thrombolysis to the SMA. Atrial fibrillation, diverticulitis, and other possible causes were eliminated as etiologies.

Discussion: Acute mesenteric ischemia is a rare abdominal emergency. Due to rapid deterioration, early diagnosis and treatment are momentous for management. Severe abdominal pain and hematemesis are the keys to starting the evaluation. Initial investigation should include basic labs with a coagulation profile; the most common abnormalities are polycythemia, metabolic acidosis, lactic acidosis, and leukocytosis. CTA provides exquisite detail of the vascular anatomy and beneficial information regarding other bowel pathologies. After diagnosis, definitive management with fluid resuscitation, antibiotics, and IV high dose unfractionated heparin, if not contraindicated, should be initiated immediately. Recently, catheter-directed procedures for intravascular thrombectomy have been used with tPA.

Conclusion: In our case, we attempted to emphasize the importance of a high index of suspicion with proper history, physical examination, and appropriate imaging for proper diagnosis and management of this life-threatening incident.

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CMV HEPATITIS IN CARDS PATIENT; A RARE CO-INFECTION CAUSING TRANSAMINITIS

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Introduction: CARDS is often associated with co-infection with other pathogens. We present a case of CMV hepatitis in an immunocompromised patient with COVID-19-associated acute respiratory distress syndrome. This case report emphasizes the importance of evaluating for CMV co-infection due to corticosteroid therapy in the treatment of COVID causing immunosenescence.

Case: A 48-year-old male with diabetes, hypertension, and congenital hydrocephalus status post VP shunt was admitted to the ICU for CARDS. The patient became febrile, tachycardic, and developed jaundice with a tender palpable liver. Patient had transaminitis, hyperbilirubinemia, and elevated ferritin levels. Hepatobiliary ultrasound and abdominal CT showed a poorly visualized gall bladder with hepatosplenomegaly. ERCP with stent with minimal improvement. Hepatitis panel, Wilson's disease, hemochromatosis and autoimmune disease with HLH work up was negative. A CMV panel was ordered and showed acute CMV infection with an immune response with the presence of CMV DNA. The patient was diagnosed with CMV hepatitis. The patient was treated with supportive management due to stable symptomatology. The MELD-NA and Child-Pugh scores indicated stable liver disease and no progression into fulminant liver failure. Hepatic enzymes improved and jaundice lessened as time progressed. Three weeks later, the patient showed seroconversion with evidence of disease resolution. He was transferred from the ICU to the sub-acute rehab facility in stable condition.

Discussion: CMV is a member of the Herpesviridae family, transmitted through bodily secretion, blood, or iatrogenically. Patients are often asymptomatic or mononucleosis-like syndrome but can vary up to severe illness. For CARDS patients, disease risk factors are increased due to corticosteroid use, prolonged mechanical ventilation, and lymphopenia. The most common tool to diagnose CMV is serology testing to diagnose active CMV infection and monitor response to therapy. Like most hepatitis, it is self-limiting, but immunocompromised patients may require treatment with antiviral medications. Acute fulminant hepatic failures that require emergency liver transplants have been reported.

Conclusion: With our case, we tried to explain physicians should be aware of CMV infection with an elevated hepatic enzyme in patients with CARDS.

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UNDERSTANDING THE NEED FOR A BROAD DIFFERENTIAL DIAGNOSIS: A CASE OF PNEUMONIC TULAREMIA

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Introduction: Tularemia is a rare infectious disease caused by *Francisella tularensis*. There are a variety of forms of tularemia with varying rates of contagiousness and mortality. Respiratory tularemia has a high mortality rate if left untreated and presents with non-specific viral like symptoms in conjunction with respiratory symptoms. Authors describe a patient presenting with flu-like respiratory symptoms diagnosed with acute respiratory distress syndrome (ARDS) due to *F. tularensis* to emphasize the importance of broad differential diagnosis in the COVID ARDS era.

Case: A 44-year-old male with a recent history of deer hunting 1 month before presentation, presented with a four-day history of night sweats, shortness of breath, productive cough with hemoptysis, and oliguria. Prior to admission, his initial symptoms were treated as chronic sinusitis. Vitals showed tachycardia, hypoxia, and tachypnea. Laboratory findings were significant for AKI, lactic acidosis, mild transaminitis, hyperbilirubinemia, and leukocytosis with predominant neutrophilia. CTA Chest showed bilateral diffused pulmonary edema. The patient's respiratory status worsened necessitating intubation. He progressed to severe ARDS per Berlin Criteria and eventually required pronation and paralyzing. Bronchoscopy was performed with bronchial lavage. Infectious and vasculitic work-up were negative. Patient was diagnosed with pulmonary *F. tularensis* via serological testing and treated with gentamycin. Ultimately, the patient was extubated, transitioned to oral doxycycline, and discharged home.

Discussion: *F. tularensis* is a potential biological weapon and is categorized as a Group A pathogenic agent. Approximately 250 cases of tularemia are reported to CDC each year. If not treated, respiratory tularemia has a mortality rate of up to 30%. Serological testing may be negative early in disease progression; therefore, early inflammatory markers with clinical suspicion are essential to appropriately evaluate for the disease. After prompt diagnosis, intravenous aminoglycosides must be started. DNA microarray has high specificity and sensitivity for rapid diagnosis of tularemia while being cost-effective.

Conclusion: With this case, we illustrate the gradual onset and rapid patient deterioration when treatment is delayed, yet, there is rapid recovery once appropriate treatment is used.

Evaluation of Response to Weight-Based Dosing Strategies of Continuous, Fixed-Rate Atracurium Infusions in Critically Ill, Obese Adults with Acute Respiratory Distress Syndrome

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INTRODUCTION: Neuromuscular blocking agents (NMBAs) remain a common intervention for patients with moderate-to-severe acute respiratory distress syndrome (ARDS). However, little data exist regarding the appropriate dosing weight for NMBAs. This study sought to compare change in oxygenation when using ideal body weight (IBW) versus actual body weight (ABW) to calculate dose of continuous-infusion NMBAs in obese patients with ARDS.

METHODS: This retrospective evaluation compared use of IBW and ABW to calculate dose of fixed-rate atracurium (15 mcg/kg/min) for ARDS in adults (≥18 years) with a body mass index ≥30 kg/m2. The primary outcome was change in PaO2/FiO2 ratio (P/F) 48 hours after atracurium initiation. Analysis of covariance was used to compare change in P/F at 48 hours between IBW and ABW groups, adjusting for confounders of interest identified a priori. Secondary outcomes included total dose of atracurium, mortality, and intensive care unit- (ICU) and ventilator free-days.

RESULTS: There were 123 and 133 patients in the IBW and ABW groups, respectively. Those in the IBW group were younger (median [interquartile range]: 56 years [46, 63] vs. 64 [55, 71], p< 0.001), had a lower baseline P/F (85.0 [71.0, 118.3] vs. 93.3 [76.0, 128.3], p=0.025) and SOFA score (mean ± standard deviation: 9.7 ± 2.6 vs. 10.5 ± 2.6, p=0.015), and were more often prescribed steroids (96% vs. 89%, p=0.032) and prone positioning (72% vs. 58%, p=0.015). No significant difference in change in P/F at 48 hours was found between the cohorts (adjusted least squares mean (95% confidence interval): 55.8 (37.0-74.5) vs. 56.9 (39.6-74.1), p=0.90). Higher doses of atracurium were used in the ABW group (97.4 mg/hr [84.4, 110.3] vs. 55.4 [47.2, 65.7], p< 0.001). There was no difference in hospital or ICU mortality, ICU-free days, or ventilator-free days.

CONCLUSIONS: In obese patients with ARDS, the change in P/F at 48 hours was not different in patients who had continuous infusion atracurium dosed using IBW compared to ABW. Dosing atracurium according to IBW may allow lower infusion rates without compromising ability to improve oxygenation in obese patients with ARDS. Additional studies are warranted to determine optimal dosing of fixed-rate atracurium in obese patients.

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