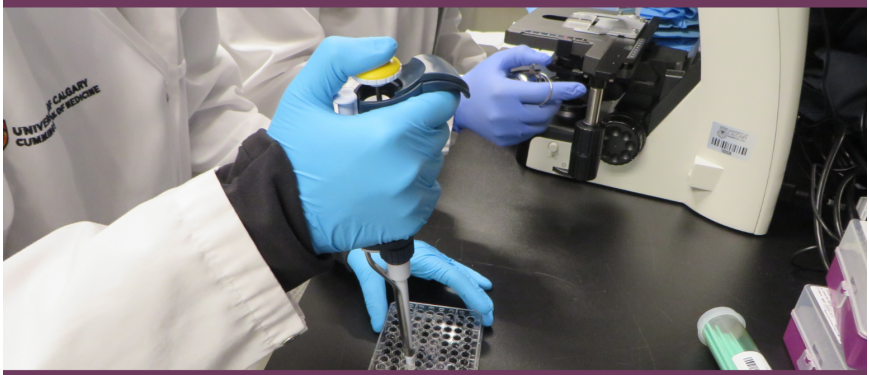
Department of
Critical Care Medicine
Calgary



May 10, 2023
Ground Floor, McCaig Tower | ICU Classroom

16TH ANNUAL
DCCM RESEARCH DAY

FEATURING THE MIRIAM AND ARNOLD WINSTON LECTURESHIP

UNIVERSITY OF CALGARY
CUMMING SCHOOL OF MEDICINE

Alberta Health Services

Research and innovation are the building blocks for advances in healthcare, aiming to improve quality of care and patient outcomes. Questions asked and answered in the laboratory and bedside have continuously informed the practice of medicine and health policy. The research conducted in our Department and beyond helps healthcare professionals provide the best care to patients, families, and society.

On behalf of the Department of Critical Care Medicine, I would like to acknowledge our trainees, staff, and faculty across all areas of research, who have worked on their ideas throughout the year and who have submitted their work to share at our Research Day.

I would like to thank our guest speaker, Dr. Sangeeta Mehta, an internationally recognized leader in Critical Care Medicine research for her participation in our Research Day.

I would also like to thank the Winston Family, Dr. Dan Zuege, Monica Cepoiu-Martin, Natalie Sun, Thelma Bartolome, and Karishma Sutar whose effort and support made this day possible.

Sincerely,

Kirsten Fiest

Kirsten Fiest, PhD
Director of Research and Innovation, Department of Critical Care Medicine
Associate Professor, Departments of Critical Care Medicine, Community Health Sciences, & Psychiatry, University of Calgary
Associate Scientific Director – Health Systems O'Brien Institute for Public Health

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Guest Speaker: Dr. Sangeeta Mehta, MD, FRCPC,
Intensive Care Physician, Clinician Scientist
Attending Physician, Mount Sinai Hospital
Professor of Medicine
Sinai Health System, University Health Network,
Princess Margaret Hospital

Topic: EDI in Research — From Research Teams to Trials

Dr. Mehta is a Critical Care Physician at Sinai Health System in Toronto, Canada. She completed medical school at McGill University in Montreal, Internal Medicine training at the University of Toronto, and Respirology and Critical Care training at Brown University in Providence, Rhode Island.

She is a Professor in the Department of Medicine, and a Clinician Scientist in the Division of Respirology and Interdepartmental Division of Critical Care, at the University of Toronto; and Clinician Scientist in the Lunenfeld Tanenbaum Research Institute. She has a strong record of research productivity and has published more than 300 peer-review publications.

Dr. Mehta's major research foci include 1) sedation, analgesia, and delirium management; and 2) EDI in academic medicine, particularly relating to gender. She is EDI Chair of the Canadian Critical Care Trials Group. She leads a program of research in EDI; and collaborates nationally and internationally. She has contributed to Round Tables and the development of equity policies and is invited to speak nationally and internationally on this topic.

Event Schedule

2023 Department of Critical Care Medicine Research Day May 10, 2023	
8:00am – 8:20am	**Registration / Coffee / Small Pastry Treats**
8:20am – 8:25am	Welcome / Opening Remarks – *Todd Anderson*
8:25am –8:30pm	Miriam and Arnold Winston Lectureship Introduction – *Brent Winston*
8:30am – 9:30am	Keynote Address – *Sangeeta Mehta [introduced by Kirsten, moderated by Natalia Jaworska]*
9:30am – 9:35am	Introduction to Presentations *[Kirsten Fiest]*
Session 1: Moderated by Dan Niven	
9:35am – 9:50am	*Stefan Edginton*[T] - Methods for determination of optimal positive end expiratory pressure: a scoping review
9:50am – 10:05am	*Braedon McDonald* - Test your Concept - Precision microbiome modification as immunotherapy to reduce infections in the ICU
10:05am – 10:20am	*Amanda Leong*[T] - Does pain optimisation impact delirium outcomes in critically ill patients? A systematic review and meta-analysis of randomised controlled trials
10:20am – 10:35am	*Jessica Jenkins* - Palliative care and advance care planning in adult congenital heart disease: PAL-ACHD
10:35am – 10:50am	*Diana Changirwa*[T] - Gastrointestinal colonization by *Candida albicans* modulates systemic host defence in sepsis
10:50am –11:10am	**Break**
Session 2: Moderated by Braedon McDonald	
11:10am – 11:25am	*Eric Pimentel*[T] - Metabolomics comparison between delta and omicron-infected COVID-19 individuals
11:25am – 11:40am	*Katherine Kissel & Emma Folz* - The impact of a 3-tiered model of nursing redeployment during the COVID-19 pandemic: A cross-sectional study
11:40am – 11:55pm	*Emma Schalm*[T] - Understanding patient and family perspectives of accelerated discharge planning in the critically ill: A qualitative interview study
11:55pm –12:10pm	*Dan Niven* - The impact of an intravenous sodium bicarbonate shortage on laboratory and clinical outcomes in a population-based sample of adult ICUs: An interrupted time-series analysis
12:10pm – 1:00pm	**Lunch**
Session 3: Moderated by Kirsten Fiest	
1:00pm -1:15pm	*Karla Krewulak* - An evaluation of the quality of delirium websites for patient and family education

1:15pm -1:30pm	*Rebecca Brundin-Mather* - Assessing the scope of public knowledge of sepsis in Canada: a cross-sectional national survey and national online focus groups to inform the development of sepsis public education communications
1:30pm – 1:45pm	*Ken Parhar* - Treatment of mechanically ventilated patients with hypoxemic respiratory failure and acute respiratory distress syndrome using a multidisciplinary care pathway: A pilot implementation study
1:45pm – 2:00pm	*Thérèse Poulin*[T] - Patient and family perceptions of research coordinator attire in the intensive care unit: A cross-sectional survey
2:00pm – 2:15pm	*Chel Hee Lee* - Daily SOFA Trajectory For Personalized Dynamic Prediction
2:15pm -2:30pm	*Breena Dobson*[T] - Sexual dimorphism of disease severity in sepsis is independent of the gut microbiota
2:30pm -2:45pm	**Break**
Session 4: Moderated by Ken Parhar	
2:45pm -3:00pm	*Laurie Lee* - Material deprivation and pediatric intensive care unit (PICU) admission and outcomes in Alberta
3:00pm -3:15pm	*Gwen Knight* - Designing a behaviour change wheel guided implementation strategy for a hypoxemic respiratory failure and ARDS care pathway that targets barriers
3:15pm -3:30pm	*Abigail Thomas*[T] - Healthcare resource use among critically ill urban and rural patients: a retrospective cohort study
3:30pm –3:45pm	*Sheena Morton* - Methods to monitor and evaluate safe neuromuscular blockade use in patients with hypoxemic respiratory failure and acute respiratory distress syndrome: A scoping review
3:45pm – 4:00pm	*Rachel Jeong*[T] - Follow-up care of critically ill patients with acute kidney injury
4:00pm – 4:15pm	*Ann A. Zalucky*[T] - Aptamer-Based Proteomics for Disease Pathway Analysis in Septic Patients with Differential Organ Dysfunction
4:15pm	Wrap up and thank you – *Dan Zuege*

Note: [T] = Trainee

We would like to express our thanks to Dr. Sangeeta Mehta for graciously agreeing to be a speaker at our 16th Annual DCCM Research Day

The event would not have been possible without generous donation from the Winston family in memory of Miriam and Arnold to establish an endowment with the Canadian Intensive Care Foundation.

This event is an Accredited Rounds activity (Section 1) as defined by the Maintenance of Certification program of the College of Physicians and Surgeons of Canada.

Abstract Presentations

Methods for Determination of Optimal Positive End Expiratory Pressure: a Scoping Review

Stefan Edginton[1], Natalia Kruger[1], Henry Tom Stelfox[1,2], Laurent Brochard[3,4], Danny J. Zuege[1], Jonathan Gaudet[1], Kevin Solverson[1], Helen Lee Robertson[1], Kirsten M. Fiest[1], Daniel J. Niven[1], Sean M. Bagshaw[5], Ken Kuljit S. Parhar[1,2,6]

1. Department of Critical Care Medicine, University of Calgary and Alberta Health Services, Calgary, Canada
2. O'Brien Institute for Public Health, University of Calgary, Calgary, Canada
3. Interdepartmental Division of Critical Care Medicine, University of Toronto, Toronto, Canada
4. Department of Health Research Methods, Evidence, and Impact, McMaster University, Hamilton, Ontario, Canada
5. Department of Critical Care Medicine, Faculty of Medicine and Dentistry, University of Alberta and Alberta Health Services, Edmonton, Canada
6. Libin Cardiovascular Institute, University of Calgary, Calgary, Canada

Background:
There is significant variability in the methods used to determine the optimal level of PEEP in invasively mechanically ventilated patients. Several high-quality studies in patients with acute respiratory distress syndrome have assessed certain methods of determining optimal PEEP; however, many methods and other populations have not been studied with randomized trials. We conducted a scoping review to systematically identify all methods of determining optimal PEEP, and to identify the patient populations, outcomes, and study designs utilized for each method.

Methods:
Using search terms developed with an expert librarian, we searched MEDLINE, EMBASE, Web of Science, CENTRAL, and Scopus for any papers that matched our inclusion and exclusion criteria as developed using the Population, Concept, Context framework. Data were abstracted from papers including method of PEEP determination, study setting, population, outcome, and study design with more detailed information abstracted from included randomized controlled trials (RCTs).

Results:
We included 216 articles from 9,596 unique citations. Twenty different methods of determining optimal PEEP were described. All studies were either set within an intensive care unit (ICU, n=180, 83%) or operating room (OR, n=36, 17%). Most included studies were observational (n=142, 66%). Eleven different methods were studied with RCTs (27% of total studies). Most RCTs in the ICU had a clinical outcome as the primary endpoint (n=21, 58%) and most RCTs in the OR had physiologic measures as the primary endpoint (n=17, 77%). Among ICU studies, the most common clinical outcomes were mortality or ventilator-free days. Among OR studies, the most common clinical outcomes were post-operative pulmonary complications. Safety outcomes such as were commonly reported among RCTs (n=43, 77%). Barotrauma was reported more frequently among ICU studies, and hemodynamic instability was more common among OR studies.

Conclusions:
Several methods of determining optimal PEEP amongst patients who are mechanically ventilated were identified from a variety of settings, populations, study designs, and outcomes. Many of these methods have not been adequately tested with certain study designs or outcomes in all patient populations. Testing these methods through RCTs in the future may be warranted.

Test your Concept - Precision microbiome modification as immunotherapy to reduce infections in the ICU

Braedon McDonald[1]

1. Department of Critical Care Medicine, Cumming School of Medicine, University of Calgary

Background:
The gut microbiota is a master regulator of the body's immune system. Pathological disruption of the gut microbiota (dysbiosis) can drive immune dysfunction and impaired host defense against infections. Recent research has found that critically ill patients who experience severe intestinal dysbiosis (marked by expansion of Enterobacteriaceae in the gut) develop impaired neutrophil function that is coupled with an increased risk of nosocomial infections. Rationalized, mechanism-guided correction of gut dysbiosis may reverse this immune dysfunction and reduce rates of nosocomial infections.

Objective/Hypothesis:
We hypothesize that a precision medicine approach to correcting gut Enterobacteriaceae dysbiosis in critically ill patients will improve neutrophil function and host defense against nosocomial pathogens.

Methods:
Pilot randomized controlled trial of an enterally-administered microbiota editing therapy (5-microbe consortia) versus placebo in adult multisystem ICU patients with severe gut dysbiosis. Microbiome dysbiosis at ICU admission will be determined using rapid nanopore sequencing to identify patients for study inclusion based on reduced microbiota Shannon diversity. Co-primary outcomes of gut microbiome dysbiosis score and neutrophil functional assessment on day 5 will be compared between groups. Secondary outcomes of nosocomial infections or death by 90 days, as well as multiple exploratory outcomes investigating additional clinical, microbiome, antimicrobial resistance, and immunological outcomes.

Results:
Preliminary data demonstrates feasibility of rapidly sequencing the fecal microbiome (3-4 hours) to screen patients for dysbiosis inclusion criteria. In vitro screening of therapeutic microbial consortia to achieve precision-editing of Enterobacteriaceae overgrowth has identified a 5-microbe consortia that blocks Enterobacteriaceae expansion, with regulatory approval and safety data in critically ill patients established. Potential barriers and facilitators of successful completion of the proposed pilot RCT will be discussed.

Conclusions:
Implementation of precision medicine in the ICU is an important priority for our Faculty, and the field of critical care. Feedback from DCCM members will be sought to optimize the proposed pilot precision medicine RCT.

Does pain optimization impact delirium outcomes in critically ill patients? A systematic review and meta-analysis of randomized controlled trials.

Leong, AY.[1], Burry, L. [2,3], Fiest, K.[1], Doig, C.[1], Niven, D. [1]

1. Department of Critical Care Medicine, Cumming School of Medicine, University of Calgary
2. Leslie Dan Faculty of Pharmacy, University of Toronto
3. Lunenfeld-Tanebaum Research Institute and Department of Pharmacy, Mount Sinai Hospital, Sinai Health

Background:
Delirium and pain are experienced in up to 45% and 80% of intensive care unit (ICU) patients, respectively. Delirium and uncontrolled pain have short- and long-term consequences, including: longer ICU and hospital lengths of stay, cognitive impairment, impaired wound healing and mental health problems.

Objective/Hypothesis:
We performed a systematic review with meta-analysis examining the relationship between pain or analgesics (two exposures) with delirium (outcome) incidence, duration, and severity among adults admitted to ICUs. In this study, we report the subgroup analysis of randomised controlled trials.

Methods:
The review protocol was registered on PROSPERO (ID: CRD42022367715). MEDLINE, EMBASE, CINAHL, the Cochrane Central Register of controlled trials, and a review of recent conference abstracts were searched without restriction from inception to 1 October 2022. Studies were included if they were: 1) randomised controlled design; 2) among adults admitted to ICU; and 3) reported a measure of pain, analgesics, and delirium. There was no language restriction. Data was extracted in duplicate using a data extraction tool on Microsoft Excel. Risk of bias was assessed with the Risk of Bias 2 tool. Dichotomous estimates were pooled using random effects meta-analysis.

Results:
Among a systematic review of ten studies, seven were conducted in a general medical/surgical ICU. There was little consistency in the reporting of pain or analgesics and its relation to delirium. The primary opioid analgesics analysed were fentanyl (n=5) and remifentanil (n=3), while only one study reported non-opioid analgesics (acetaminophen). Among the ten studies included in the systematic review, six were at high risk of bias. Among the four studies included in the meta-analysis, in patients exposed to analgesics, compared to those not exposed to analgesics, the risk of developing delirium was 0.49 RR (95% CI: 0.20 – 1.17, p = 0.08, I2 = 0%). Three studies controlled for known confounders and one study performed time-varying analysis.

Conclusion:
Our meta-analysis of RCTs suggest that among a small group of studies at high risk of bias, there was no statistically significant association between pain, analgesics, and delirium. While critical care guidelines suggest that pain optimisation is imperative for delirium management, our review suggests that the true effect of analgesics on delirium outcomes remains unclear. The results of our review should be interpreted as support for the need for additional, more rigorous studies to examine the true nature of the relationship between pain and analgesics as potential risk factors for delirium.

Palliative Care and Advance Care Planning in Adult Congenital Heart Disease: PAL-ACHD

Jessica Jenkins[1,2], Kayla Poku[3], Connor Hass[3], Michelle Keir[4]

1. Department of Critical Care Medicine, Alberta Health Services
2. Faculty of Nursing, University of Calgary
3. Undergraduate Student, University of Calgary
4. Libin Cardiovascular Institute

Background:
Congenital heart disease (CHD) impacts 8/1000 births with an estimated 250,000 people living with CHD in Canada. Prior to the 1980's, most infants and children with complex CHD died before reaching adulthood. Now, adults make up two thirds of patients with complex CHD. This substantial increase in survival has resulted in a novel group of patients not previously encountered in the healthcare system. The focus of interventions for those with moderate to severe CHD has been dedicated to improving survival. Despite this, many are at risk for early death (median age of death 48.8 years). Current guidelines have highlighted the importance of advanced care planning (ACP) and palliative care in this population, but the approach to ACP for young adults with CHD is widely variable amongst clinicians.

Primary Objective:
To develop meaningful interventions to support ACP and palliative care for those with CHD through a patient-led, multiphase research project.

Methods:
To address the absence of patient partnership in research, we used a participatory action framework to inform a multiphase program of research. In consultation with patient experts (those with CHD who are part of our research team), we identified strategic areas of study. Our patient experts developed a conceptual model and framework to guide interventions. We recently completed enrollment in a pilot RCT exploring the impact of patient expert derived interventions on adults with complex CHD's readiness to discuss ACP/EOL. We are currently enrolling families of patients with CHD who have died in a narrative study to understand the experience of EOL.

Results:
Within focus groups, the lack of ACP and palliative care was identified as a significant concern for people with CHD. In fact, many within the focus group physically recoiled when it was discussed because of their fear of the topic. When asked about their feelings about life-limiting illness a participant responded: 'It holds you back. What if I put time into a career and I'm going to drop dead? Maybe stable and mediocre is ok.' Another participant stated, 'I haven't brought it up and it hasn't been brought up with me. It's not imminent. I'll deal with it later'.

Conclusion:
A significant gap exists in the literature regarding how to best provide ACP and palliative care for adults with CHD. Through the development of meaningful partnerships with patient experts and a multiphase research approach we hope to incorporate meaningful, early ACP for those with CHD.

Gastrointestinal colonization by Candida albicans modulates systemic host defence in sepsis

Diana Changirwa[1,2,3], Amanda Zucoloto[1,2,3], Katrina Yu[1,2,3], Braedon McDonald[1,2,3]

1. Immunology Research Group, Snyder Institute for Chronic Diseases, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada
2. Calvin, Phoebe, and Joan Snyder Institute for Chronic Diseases, Cumming School of Medicine, University of Calgary, Calgary, AB T2N 4A1, Canada
3. Department of Critical Care Medicine, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada

Background:
Pathological dysbiosis of the intestinal microbiome can lead to defects in immune homeostasis and a breakdown in host defense that increases susceptibility to infection. This is particularly relevant in patients with sepsis, a disorder of infection-induced systemic immune dysregulation and multi-organ dysfunction, where dysbiosis of the bacterial microbiome in these patients has been associated with adverse clinical outcomes. However, the impact of the fungal microbiome on sepsis pathogenesis has not been characterized. Analysis of the gut fungal microbiome in critically ill patients with sepsis identified severe fungal dysbiosis driven by marked overgrowth of Candida.

Objective/Hypothesis:
Based on these clinical observation, we next sought to investigate the functional impact of intestinal Candida overgrowth on systemic inflammation and host defense using mouse models.

Methods:
We colonized the gastrointestinal tracts of antibiotic-conditioned specific pathogen free (SPF) C57BL/6 mice with different strains of Candida albicans (including both hyphal and yeast morphotypes) for 10 days prior to infection/sepsis with a well-characterized model of S. aureus bloodstream infection.

Results:
We observed that mice colonized with a yeast-locked strain of C. albicans displayed reduced illness severity, reduced systemic inflammation (lower concentrations of proinflammatory cytokines IL-12p70, IL-1β and IL-6), and enhanced protection against systemic pathogen dissemination compared to uncolonized controls. In contrast, mice colonized with hyphal/filamentous C. albicans displayed similar illness severity, systemic inflammation, and pathogen burden as uncolonized controls.

Conclusions:
Together, these data demonstrate that fungal dysbiosis with C. albicans overgrowth can modulate the systemic host response to sepsis, and that selective gut colonization by yeast-locked C. albicans may confer beneficial systemic immune modulation that is protective in sepsis.

Metabolomics comparison between delta and omicron-infected COVID19 individuals

Eric Pimentel[1], Brent Winston[2], Chel Hee Lee[3]

1. University of Calgary, Medical Sciences Graduate Program and the Department of Critical Care Medicine, University of Calgary
2. Departments of Critical Care Medicine, Medicine and Biochemistry and Molecular Biology, University of Calgary
3. Department of Critical Care Medicine, Alberta Health Services and University of Calgary and Department of Mathematics and Statistics, University of Calgary

Introduction:
Since the beginning of the COVID-19 pandemic in 2019, SARS-CoV-2, the type II coronavirus, has undergone several mutations responsible for different clinically important variants (variants of concern). These variants are responsible for the waves of infection throughout the COVID-19 pandemic around the world. The Delta and Omicron variants of SARS-CoV-2 in particular have distinct features that have led to major waves of infections and usage of considerable medical resources across Canada and the world.

Objective/hypothesis:
This study aims to compare the SARS-CoV-2 delta and omicron variants' effects on a patient's metabolomics profile. We will specifically examine the early plasma metabolomics effects of Delta and Omicron Covid-19 infection with respect to vaccination status and medications used to treat the infections during hospitalizations.

Methods:
Patient plasma samples for this study are available from the BQC19 (Biobanque Quebecoise de la COVID-19) database and sample repository. Samples and data for this study have been collected from patients infected with SARS-CoV-2 in the province of Quebec. We will analyze the concentration of 143 metabolites developed by The Metabolomics Innovation Center (TMIC) at the University of Alberta. As we have previously done for Covid-19 patient plasma samples, reverse-phase liquid chromatography-tandem Mass Spectrometry (LC-MS/MS) will be applied to analyze amino acids, biogenic amines and organic acids and direct infusion tandem mass spectrometry (DI-MS/MS) to quantify glycerphospholipids.

Results:
We have previously used this methodology to show that ARDS from various infectious causes (Covid-19, H1N1 influenza, and bacterial pneumonia have unique plasma metabopatterns on admission to ICU. We expect to see differences in the metabolomics profile in patients infected with the Covid-19 Delta variant compared to the Covid-19 Omicron variant in patient plasma on Days 0, 2 and 7 post hospitalization (study entry). Multivariate analysis will be used to compare metabolites found to vaccine status and drugs used (with a focus on antiviral use and corticosteroids) to treat the viral infection.

Conclusion:
Metabolic dysregulation has been shown to change over the course of the pandemic, reflecting changes in variants, clinical presentation and treatment regimens. Higher vaccination rates among Omicron-infected patients resulted in reduced mortality compared to the Delta-infected patients who had an incomplete vaccination scheme. We anticipate that metabolomics studies will reflect immune-based differences in vaccination status and treatments utilized.

The Impact of a 3-Tiered Model of Nursing Redeployment During the COVID-19 Pandemic: A Cross-Sectional Study

Katherine Kissel[1], RN, MN, Christine Filipek[1,3], RN, MN, Emma Folz[1], RN, MA, Jessica Jenkins[1,2], MN, NP

1. Department of Critical Care Medicine, Calgary Zone, Alberta Health Services
2. Clinical Associate, Faculty of Nursing, University of Calgary
3. Christine Filipek is now affiliated with the Critical Care Strategic Clinical Network, Alberta Health Services

Background:
The extreme volume of critically ill patients during the COVID-19 pandemic resulted in unprecedented pressures on healthcare systems. Globally, nurses were redeployed to intensive care units (ICUs) to support overcapacity pandemic surges. Though various models of redeployment have been utilized to support rapid ICU capacity expansion, few studies have evaluated the impacts on nursing staff within the context of tiered models of care. Further, gaps remain in the identification of strategies to optimize rapid nursing redeployments, enaction of tiered models of care, and nursing support within these models.

Objective:
Our aim was to explore the local impacts of a 3-tiered nursing model of redeployment, and adjunctive supports, on nurses working in ICUs during the COVID-19 pandemic.

Methods:
This study utilized a cross-sectional survey design. The survey was disseminated to 931 nurses (both ICU and redeployed) who worked in 1 of 4 adult ICUs in one urban city in Alberta, during the 3rd and/or 4th pandemic wave(s). The survey explored the impacts of redeployment, rapid orientations, and the 3-tiered model of care during a time of extreme pandemic surge. The Copenhagen Burnout Inventory (CBI) was further integrated within the survey, in order to further contextualize nursing experiences after multiple pandemic waves.

Results:
We analyzed 191 surveys (from 59 ICU and 132 redeployed nurses). Several themes were explored in the survey examining impacts on both ICU, team leads, and redeployed nurses. Burnout in the CBI personal and workplace domains were present amongst all nursing tiers, and present only amongst ICU nurses and team leads in the personal domain. Overall, ICU nurses and team leads reported the highest prevalence of burnout. Facilitators of redeployment, including staff support, prior experience, and provision of education was reported. Recommendations included additional education/orientation, flexible scheduling with advanced notice of redeployment, enhanced on unit support, and strategies to optimize role clarity. Lastly, though the survey was not designed to evaluate psychological outcomes other than burnout, open-text comments signaled towards psychological harm.

Conclusions:
Future surge planning should integrate redeployment optimization strategies, with consideration for voluntary redeployment, the provision of targeted education (by tier, and ideally individualized), and ongoing support. Further, the implementation of strategies to mitigate harm, including burnout, should be explored, both during and after pandemic overcapacity surge.

Understanding Patient and Family Perspectives of Accelerated Discharge Planning in the Critically Ill: A Qualitative Interview Study

Emma Schalm[1]

1. Department of Critical Care Medicine, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada

Background:
Accelerated discharge, which involves initiation of discharge planning earlier in patients' intensive care unit (ICU) stay, has become more common to reduce discharge delays. Successful accelerated discharge planning relies on effective clinician communication and partnering with patients and family caregivers, who are the only constant throughout the care journey. To best enable family caregivers to feel self-efficacious in collaborating in the care of their critically ill loved one, their perspectives on the practice of accelerated discharge planning are needed to help facilitate successful transitions in care. This study sought to understand patient and family perspectives on accelerated discharge planning as well as their insights on supportive elements in accelerated discharge plans.

Methods:
We conducted ~45-minute virtual semi-structured interviews with former critically ill patients and family caregivers of former critically ill patients between October 2021 and January 2022. We used inductive, reflexive thematic analysis to identify relevant themes and subthemes.

Results:
Key themes identified following thematic analysis from seven participants (n=2 former critically ill patients, n=5 family caregivers) included: discharge planning process and stakeholder goal alignment (i.e., benefits of earlier planning, communication and continuity of care, and desire for stakeholder collaboration in care), patient and family support needs in accelerated discharge planning (i.e., informational support, psychological support, and logistical support), scope of support across care settings (i.e., form and timing of supports), individuality of dyads (i.e., condition, capacity, and environmental characteristics specific to each dyad), facilitators and barriers to accelerated discharge planning at the individual and structural level.

Conclusion:
The concept of accelerated discharge planning elicits positive regard from former critically ill patients and family caregivers through alignment of objectives between this transition in care model and patient and family goals of care. Individualized, realistic accelerated discharge plans that provide informational, psychological, and logistical supports may help facilitate successful transitions in care.

The impact of an intravenous sodium bicarbonate shortage on laboratory and clinical outcomes in a population-based sample of adult ICUs: An interrupted time-series analysis

Leong, AY.[1], Soo, A.[1], Bond, A.[2], Zuege, D.[1], Bagshaw, S.M.[3] Stelfox, T. [1], Niven, D.[1]

1. Department of Critical Care Medicine, Cumming School of Medicine, University of Calgary
2. Department of Cardiac Sciences, Cumming School of Medicine, University of Calgary
3. Department of Critical Care Medicine, Faculty of Medicine & Dentistry, University of Alberta

Background:
Limited research exists to guide the use of sodium bicarbonate among adults admitted to intensive care units(ICUs). From June to October 2017, there was a worldwide shortage of intravenous sodium bicarbonate. To manage the shortage, institutions enacted conservation measures.

Objective/Hypothesis:
To assess the effect of the 2017 shortage of intravenous sodium bicarbonate on the use of sodium bicarbonate, and important clinical outcomes: incidence of severe acidemia (pH ≤7.20), hyperkalemia(serum K ≥6 mmol/L), renal replacement therapy use, and ICU mortality.

Methods:
This was an interrupted time series analysis among adults(≥18 years old) admitted to ICUs in Alberta, Canada between June 1, 2015 and December 31, 2019. The primary data source was eCritical, a population-based electronic health record and data registry for all ICUs in Alberta. Patients were included if at any time during ICU admission, blood gas analysis revealed a pH <7.3. Intravenous sodium bicarbonate exposure was defined as bolus and/or infusion-based prescriptions. The parent healthcare organisation, Alberta Health Services enacted sodium bicarbonate conservation measures during the shortage (June to October 2017). The primary outcome was the proportion of the study population treated with intravenous sodium bicarbonate. Individual patient data were aggregated and examined at the ICU-level per month. All analyses were conducted using R statistical software.

Results:
There were 19,293 admissions meeting inclusion criteria among 19 ICUs in 15 sites. Among these admissions, the median age was 63 years (interquartile range, IQR 52 – 72 years), 35.9% were female, and median APACHE II was 23 (IQR 18 – 30). Among all admissions, 30.53% received sodium bicarbonate during the pre-shortage period. This dropped to 22.21% during the shortage and increased to 29.34% post-shortage. Among patients with severe acidemia, 50.51% received sodium bicarbonate pre-shortage, which fell to 41.48% during the shortage and was maintained at 40.91% post-shortage. Among patients with hyperkalemia, 45.09% received sodium bicarbonate pre-shortage, which fell to 33.62% during the shortage, and rose to 44.82% post-shortage. The proportion of patients with severe acidemia was 42.01% pre-shortage, 42.09% during shortage, and 40.10% post-shortage. The proportion of patients with hyperkalemia was 15.41% pre-shortage, 16.47% during shortage, and 16.59% post-shortage. The proportion of patients requiring renal replacement therapy was 16.46% pre-shortage, 17.46% during shortage, and 16.48% post-shortage. There was no difference in ICU mortality.

Conclusion:
The intravenous sodium bicarbonate shortage was associated with reduced sodium bicarbonate administration, including among patients with severe acidemia and hyperkalemia, two conditions where sodium bicarbonate administration is a common practice.

An Evaluation of the Quality of Delirium Websites for Patient and Family Education

Karla D. Krewulak[1], Kathryn Strayer[1], Natalia Jaworska[1], Krista Spence[1], Nadine Foster[1], Scotty Kupsch[1], Khara M. Sauro[1,2], Kirsten M. Fiest[1]

1. Department of Critical Care Medicine, Alberta Health Services & University of Calgary, Calgary, AB, Canada
2. Department of Community Health Sciences, University of Calgary, Calgary, AB, Canada
3. O'Brien Institute for Public Health, Department of Psychiatry & Hotchkiss Brain Institute, University of Calgary, Calgary, AB, Canada

Background:
Delirium information is widely available on the internet, but the quality of the information shared may be inconsistent across multiple sources. It is unknown if the websites patients, families, and the public access for delirium information contain reliable, accurate, and up to date information.

Objective:
We aimed to identify and evaluate websites on delirium that could be used for patient and family education.

Methods:
We searched Bing, Google, and Yahoo using the key words "delirium" and "delerium," which patients and families might use to identify websites that contain delirium information. The quality of included websites were evaluated by two authors using the presence of the Health on the Net (HON) accreditation, the validated DISCERN tool, the Journal of the American Medical Association (JAMA) benchmark criteria, and readability (Simple Measure of Gobbledygook and the Flesch Reading Ease score and Flesch Kincaid grade level). Each website was evaluated for delirium content using a checklist of items co-developed with patients, families, researchers, and clinicians. The top 10 websites were identified as the websites with the highest weighted combined quality scores (HON criteria, DISCERN, and JAMA benchmark scores), delirium-related content scores, and grade reading level.

Results:
We identified 71 websites that were targeted towards patients and families, most which were commercial websites (21/71;30%) or from a foundation or advocacy group (17/71;24%). The median time since last website update was 3 years (interquartile range [IQR], 1.7-6.1). Only 28% (20/71) of the websites had received HON accreditation. However, the absence of HON Accreditation is not significantly associated with lower quality or delirium content scores. Most websites (67/71;94.4%) are written at a reading level higher than the recommendation of grade six. The median DISCERN total score and JAMA benchmark score were 41 (IQR 34.42-46.67) and 1 (IQR 1-2), respectively, indicating the quality of websites was fair, with poor transparency. Many websites that families may encounter when looking for information about delirium may include incomplete information about delirium, with few providing outdated and inaccurate information (e.g., antipsychotics used to treat delirium, use of the word "confusion" instead of delirium).

Conclusions:
Delirium websites for patients, families, and public are of fair quality. Inadequacies in evaluated websites such as lack of transparency, incomplete delirium information, and poor readability should be addressed when updating current or creating new delirium websites aimed at patients, families, or public.

Assessing the scope of public s knowledge of sepsis in Canada: a cross-sectional national survey and national online focus groups to inform the development of sepsis public education communications

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Background:
Sepsis is a life-threatening complication of the body's response to fighting an infection. The global burden of sepsis is high with a reported mortality rate of 20%, high costs due to hospitalization, and long-term multifaceted sequelae. As most sepsis starts in the community, public knowledge of sepsis is essential to support rapid medical intervention. Yet, sepsis awareness is generally low globally.

Objective/Hypothesis:
As part of the collaborative work of a multidisciplinary national research network (Sepsis Canada), we conducted a Canada-wide survey to measure public awareness and knowledge of sepsis. We subsequently conducted online focus groups to explore the lived experiences and perspectives of sepsis survivors and family members with the goal to inform sepsis public education communications.

Methods:
We developed and disseminated a survey to a representative sample of adults in Canada to assess three sepsis-focused domains: awareness, knowledge, and information access. Descriptive statistics summarized responses and multivariate analyses tested for demographic differences and associations. Focus groups explored four topics: circumstances leading to sepsis, impacts on life, interactions with healthcare providers, and raising sepsis awareness. We adopted a hybrid deductive-inductive approach to code transcripts and generate themes.

Results:
Sixty-one percent of 3,200 adults sampled across Canada had heard of sepsis. Awareness differed by respondent's residential region, sex, education, and ethnicity ($p<.001$, all). Knowledge of sepsis definitions, symptoms, risk factors, and prevention measures were generally low (53.0%, 31.5%, 16.5%, 36.3% respectively). Significant predictors of knowledge were previous exposure to sepsis, healthcare employment, female sex, and a college/university education ($p < 0.001$, all). Post survey, we conducted 11 focus groups with 32 participants. We synthesized three key campaign foci—seriousness of sepsis, signs of sepsis, and health advocacy—from participants accounts of profound physical and mental impacts of sepsis and perceived failures in the health system vis à vis diagnosis and information access. Participants discussed potential barriers to campaign uptake amongst the public (complexity of sepsis, lack of personal relevance, fatigue with health messaging) as well as potential facilitators (embed personal stories, partner with other health campaigns).

Conclusions:
Sepsis requires rapid medical intervention to reduce severity of outcomes, yet few adults in our survey knew important signs, risk factors, and strategies to lower risk of sepsis. Our preliminary qualitative results suggest focusing education on symptom recognition and health advocacy, but there are several potential barriers to overcome to effectively communicate the relevance of sepsis to Canadians.

Treatment of mechanically ventilated patients with hypoxemic respiratory failure and acute respiratory distress syndrome using a multidisciplinary care pathway: A pilot implementation study

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Background:
A significant gap exists between ideal evidence-based practice and real-world application of evidence-informed therapies for patients with hypoxemic respiratory failure (HRF) and Acute Respiratory Distress Syndrome (ARDS). Pathways can help integrate and organize the use of evidence-based care and help overcome potential barriers.

Objectives:
To assess the feasibility and acceptability of a multidisciplinary, stakeholder derived, evidence informed care pathway for the management of HRF and ARDS.

Methods:
One medical-surgical ICU was used to prospectively pilot this pathway using a quasi-experimental before and after study design. All mechanically ventilated patients admitted to the ICU were included in the study and received the pathway intervention. A pre-implementation period of 52 weeks (September 2018 to August 2019) was defined as the baseline period. Pilot implementation occurred over a four-week (August 2019 to September 2019) implementation period. A 52-week post-implementation period (September 2019 to August 2020) was used to assess feasibility and acceptability. The primary feasibility outcome was a composite fidelity score that measured adherence to 5 key steps of the pathway. Results were analyzed using segmented linear regression model based on patient level data and adjusted for age and median PF ratio within first 24 hours of ventilation start. The primary acceptability outcome is defined as a median score of 5 or above from a 7-point Likert scale indicating agreement.

Results:
A total of 429 patients were included in the preintervention period and 491 patients in the post-intervention period. The median age and SOFA (interquartile range [IQR]) in the pre and post intervention periods were 60(45-70) and 57(45-67), and 8(5-11) and 8(5-11), respectively. The frequency and proportion of patients with HRF in the pre and post intervention group was 294 (68.5%) and 309 (62.9%) respectively. The frequency and proportion of patients with ARDS in the pre and post intervention group was 136 (31.7%) and 142 (28.9%), respectively. The median composite fidelity score increased in all mechanically ventilated patients (pre: 80[57-100] vs post: 100[67-100], p<0.001), as well as in patients with HRF (pre: 67[43-92] vs post: 80[60-100], p<0.001) and ARDS (pre: 67[53-82] vs post: 76[60-94], p<0.002). Driving pressure, as well as the mechanical power, were lower in the post intervention period.

Conclusion:
A comprehensive care pathway for patients with HRF and ARDS is feasible and acceptable to clinicians. Adherence to the pathway may be associated with improved physiological and clinical outcomes. This study will inform a future cluster randomized stepped wedge implementation study to test the clinical effectiveness of this pathway.

Patient and family perceptions of research coordinator attire in the intensive care unit: A cross-sectional survey

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Background:
Recruitment of Intensive Care Unit (ICU) patients and their family members into research studies is essential to conduct studies that may improve patient- and family-centered care. However, ICU patients are often too ill to consent to participation in a research study and families make these decisions on their behalf. Unlike members of the ICU care team, research coordinators do not have a pre-existing relationship with the patient or family and must build their trust before they feel comfortable to participate in a study. Previous studies have shown that a person's attire may influence trust; for example, physicians in professional dress are rated "more trustworthy" by family members of ICU patients. Research coordinator attire may be an important, modifiable factor to improve research engagement.

Objective/Hypothesis:
This study aims to (1) evaluate the importance of research coordinator attire to ICU patients and families when being asked to participate in research; (2) describe ICU patient and family perceptions of research coordinators (e.g., competency, knowledge) based on research coordinator attire; and (3) examine associations between perceptions of research coordinator attire and ICU patient or family characteristics.

Methods:
A cross-sectional survey administered to 400 critically ill adults and their family members admitted to a participating ICU in four Calgary area hospitals. Participants are included in the study if they are 18 years of age or older, can provide informed consent, and can communicate in English. Exclusion criteria include moribund patients or patients excluded at physician or registered nurse discretion. Consenting, eligible patients and their family members will be approached to complete a survey. The survey includes multiple choice, Likert-type questions, Yes/No questions, comparison questions (i.e., which picture best represents a concept) and free-text questions. Collected data includes demographics, factors that influence perceptions of research coordinators, and comparisons of research coordinators in different gender inclusive attire: casual, smart casual, business casual, and traditional business attire.

Results:
We have approached 270 participants and collected data for 222 participants. We will determine demographic characteristics and response preferences using descriptive statistics (e.g., mean, median) and differences in proportions of categorical data using student's t-test (means) or Mann-Whitney U test (medians). Textual data from written sections will be analysed using Braun and Clarke's inductive thematic analysis approach.

Conclusions:
Our unique patient-oriented approach will integrate patient and family perspectives on research coordinator attire, which may provide valuable information to optimize study engagement and improve future health research participation.

Daily SOFA trajectory for personalized dynamic prediction

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Background:
Sequential organ failure assessment (SOFA) is a scoring system to assess multiple organ dysfunction syndrome. The difference in SOFA profile between survivors and non-survivors was extensively discussed in the study of Doig (2004) and Soo (2019) using a generalized estimating equation. However, the association between this longitudinal profile and the terminal event was not discussed since traditional analytical approaches analyze longitudinal and time-to-event data separately.

Objective/Hypothesis:
This study aims to discuss whether the SOFA routinely monitored is related to a terminal event of clinical interest, such as death. Furthermore, we challenge to develop a real-time prediction model for the terminal event based on the dynamics of the daily SOFA score.

Methods:
We integrated two models, Cox proportional hazard model accounting for a terminal event and the linear mixed-effects model accounting for a longitudinal pattern. This integrated model is restricted to ventilated patients (N=410) diagnosed with a diagnosis at ICU admission within a respiratory classification during 2012 and 2013.

Results:
We created an animated figure illustrating patient-specific dynamic prediction of terminal events.

Conclusions:
This novel model of data visualization and analysis permits an integrated approach to investigate the relationship between time-varying longitudinal measures and a clinical endpoint. However, the computational cost is time consuming, processing intensive, and therefore very expensive. Having demonstrated the feasibility of these analyses, we are planning to to compare the performance of this integrated model to the Cox regression model, with daily SOFA as a time-varying predictor.

Sexual dimorphism of disease severity in sepsis is independent of the gut microbiota

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Background:
Sepsis is a life-threatening disease characterized by an exaggerated host response to infection leading to collateral damage to tissues and organ dysfunction. Despite many promising pre-clinical discoveries of sepsis in animal models, translation to humans has universally failed, and there remains no disease-modifying treatments. A key reason for the failed animal-to-human pipeline in sepsis research is that pre-clinical sepsis models have largely failed to consider the impact of heterogeneity (genetic, environmental, phenotypic, and other) that is paramount in human disease, including the fundamental contributions of biological sex on disease pathogenesis and treatment response. Clinical studies in humans have established that the epidemiology and outcomes of sepsis differ between males and females, highlighted by a significantly higher incidence of disease and mortality in males than females. Despite this, the mechanisms underlying this sex bias have not yet been defined. The gut microbiome and its influence on immune development and function has emerged as an important diver of sexual dimorphism in several immune-mediated disease.

Hypothesis:
We tested the hypothesis that sexual dimorphism of systemic inflammation, organ damage, and disease severity in sepsis is mediated through sex-based differences in the gut microbiota.

Methods:
Using a well-established model of abdominal sepsis (fecal-induced peritonitis, in which a defined amount of donor SPF feces is injected into the peritoneal cavity), we determined the role of the microbiota in sepsis pathogenesis and outcomes by comparing systemic inflammatory response, pathogen dissemination, organ dysfunction, and disease severity in SPF (specific pathogen-free, ie. conventional laboratory mice) versus germ-free (GF) mice.

Results:
In SPF mice, we observed that males demonstrated a significantly higher illness severity than females. In GF mice, the same sex-bias in sepsis pathogenesis was observed, with increased illness severity in GF males compared to GF females, indicating that sexual dimorphism of sepsis severity is independent of the gut microbiota. Interestingly, increased disease severity in males was not linked to an exaggerated systemic inflammatory response, nor differences in host defense or dissemination of the underlying infection.

Conclusion:
Together, these findings demonstrate that sexual dimorphism of illness severity in sepsis is independent of the gut microbiota.

Material Deprivation and Pediatric Intensive Care Unit (PICU) admission and outcomes in Alberta

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Background:
Socioeconomic deprivation (SED) is associated with worse health outcomes. Data in pediatric critical care shows increased rates of pediatric intensive care unit (PICU) admission for those with greater SED, but no relationship between SED and PICU outcomes. The primary objective of this study is to describe the distribution of SED for children admitted to a PICU in Alberta.

Methods:
This is a retrospective study using administrative data. PICU records were extracted from the Discharge Abstract Database (DAD) and SED information from the Pampalon database on children admitted to a PICU in Alberta between January 1, 2011 and December 31, 2021. Hospital mortality (%), PICU LOS (hours) and hospital LOS (days) as extracted from the DAD. Sex, age, rural status, type of admission and source of admission as extracted from the DAD. Proportions of deprivation within PICUs were compared to the general Alberta population with a two-sample test of proportions. Logistic (mortality) and negative binomial (LOS) regression models were fit to examine the association between SED and each outcome while assessing for modification and confounding by covariates.

Results:
In total, 18,449 records were extracted, 7,995 were excluded. A total of 10, 454 children were included with a median age of 2 years (IQR, 0-9 years). The overall proportion of mortality was 3.0%, the median ICU LOS was 41.3 hours (IQR, 23.8-81.3), and median hospital LOS was 3 days (IQR, 3-11). In contrast to the Alberta population (20.0% per quintile), 26.7% of children admitted to a PICU reside in the most deprived quintile ($p<0.001$), while 15.8% reside in the least deprived quintile ($p<0.001$). Proportion of mortality was the lowest for Q1 (2.3%) and highest for Q4 and Q5 (3.6% and 3.3%). Median ICU LOS ($p=0.71$) and hospital LOS ($p=0.23$) were similar across quintiles. Children from Q4 and Q5 had 1.59 (95%CI: 1.15-2.18) and 1.47 (95%CI: 1.09-1.98) times higher odds of mortality than those in the combined first and second quintiles, respectively. No difference in PICU length of stay between quintiles was observed ($p=0.20$). Children residing in Q5 had an estimated 19.5% (95%CI: 9.8%-30%) longer hospital stay ($p<0.001$) than those residing in Q1. This effect decreased with increasing age.

Conclusion:
Children who reside in the most deprived neighborhoods are overrepresented in Alberta PICUs, have increased odds of mortality, and an increased duration of hospital stay when compared to children residing in the least deprived neighborhoods. Further research aimed at minimizing the negative impacts of these social determinants of health is essential.

Designing a Behaviour Change Wheel guided implementation strategy for a Hypoxemic Respiratory Failure and ARDS care pathway that targets barriers

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Background:
A significant gap exists between ideal evidence-based practice and real-world application of evidence-informed therapies for patients with hypoxemic respiratory failure (HRF) and acute respiratory distress syndrome (ARDS). Pathways can help integrate and organize the use of evidence-based care, but barriers exist that can influence their adoption and successful implementation.

Objective/Hypothesis:
To identify behaviour change theory-based barriers to the implementation of a best practice care pathway for HRF and ARDS and design an implementation science-based strategy targeting these barriers that is tailored to the Critical Care setting.

Methods:
A survey questionnaire (12 open text questions) was administered to ICU clinicians (physicians, nurses, respiratory therapists) in 17 medical-surgical intensive care units (ICUs) across Alberta, Canada. The Behavior Change Wheel (BCW), Capability, Opportunity Motivation – Behaviour (COM-B) and Theoretical Domains Framework (TDF) were used to perform qualitative analysis on open text responses. Barriers to a multidisciplinary, evidence-based, stakeholder-informed, integrated care pathway for HRF and ARDS were identified. Behaviour Change Technique (BCT) Taxonomy, and Affordability, Practicality, Effectiveness and cost effectiveness, Acceptability, Side-effects and safety, and Equity (APEASE) criteria were used to design an implementation science-based strategy specific to the Critical Care context.

Results:
A thematic analysis was conducted and belief statements and themes were generated using the COM-B and TDF. Survey responses (692) resulted in 16 belief statements and nine themes with nine relevant TDF domains. Differences in responses between clinician professional group and hospital setting were common. Based on intervention functions linked to each theme and its relevant TDF domain, 26 candidate BCTs were identified and evaluated using APEASE criteria. 23 BCTs were selected and grouped to form eight key components of a final strategy: Audit and feedback, education, training, clinical decision support, site champions, reminders, implementation support, and empowerment. The final strategy was described using the Template for Intervention Description and Replication (TIDieR) framework.

Conclusions:
Barriers to a best practice care pathway were identified and were amenable to the design of an implementation science-based mitigation strategy. Future work will evaluate the performance of this strategy in effecting clinician behavior change and a sustained increase in the adherence to evidence-based care.

Healthcare resource use among critically ill urban and rural patients: a retrospective cohort study.

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Background:
Individuals in rural areas tend to have worse health outcomes than their urban counterparts, suggesting that health disparities exist based on location of residence. Disparities may be magnified in critically ill patients in the intensive care unit (ICU); some of the sickest patients in the healthcare system.

Objective/Hypothesis:
We aimed to describe differences in healthcare resource use among ICU patients based on their location of residence. Differences in healthcare resource use between urban and rural ICU patients were expected, as rurality may contribute to differences in the use of resource intensive ICU treatments independently of factors such as age, socioeconomic status, and severity of illness.

Methods:
A retrospective cohort study of patients aged 18+ who survived their ICU stay, remained in ICU for at least 24 hours, and had 1-year of follow-up post-index ICU admission was performed. Population based administrative and clinical data from eCritical TRACER, the Discharge Abstract Database (DAD), National Ambulatory Care Reporting System (NACRS), and Physician Claims from Jan 2014 – Apr 2018 were deterministically linked to obtain the study cohort. Outcomes centered on healthcare resource use. The exposure was location of residence, dichotomized as urban or rural. Descriptive statistics and univariate tests of significance (two-sided student's t-test, chi-square test) were performed to examine differences in demographic characteristics and outcome variables between urban and rural ICU patients.

Results:
There were significant differences in age and comorbidities between rural and urban patients. Analysis of healthcare resource revealed no differences in ICU length of stay, or number of emergency room visits, but rural patients had higher rates of 30-day hospital and ICU readmission and shorter hospital stays than their urban counterparts. Once discharged from the hospital, rural patients used less healthcare resources with a lower cumulative number of specialist and general practitioner visits than urban patients. Significant differences in the most common provider type seen after hospital discharge and first provider seen after hospital discharge were found between urban and rural ICU patients.

Conclusions:
Differences exist in healthcare resource use between critically ill urban and rural patients. Inadequate community care may explain ~~some of t~~he differences seen between critically ill urban and rural patients, as lower rates of community healthcare use may be associated with higher rates of hospital healthcare use.

Methods to monitor and evaluate safe Neuromuscular Blockade use in patients with Hypoxemic Respiratory Failure and Acute Respiratory Distress Syndrome: A scoping review

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Background:
Neuromuscular blocking agents (NMBAs) are an important therapy in managing moderate to severe acute respiratory distress syndrome (ARDS); however, the current evidence does not support a clear consensus on the most effective way to monitor NMBA administration in this patient population. Variations in NMBA monitoring practices may affect provider, patient, or resource outcomes. The aim of the scoping review was to describe the methods used to monitor the effectiveness of NMBAs, the outcomes associated with these monitoring strategies, and the different study designs used to assess these strategies.

Methods:
The population of interest was adults undergoing invasive mechanical ventilation in a critical care setting who received NMBAs and had ARDS or hypoxemic respiratory failure. The primary concept was to describe the strategies used to monitor the effectiveness of NMBA. Based on the inclusion and exclusion criteria, a comprehensive literature search was conducted in three bibliographic databases – MEDLINE (Ovid), Embase (Ovid), and CINAHL (EBSCO). The full text of 387 publications were independently reviewed by two team members to determine if inclusion criteria was met. Disagreement was resolved by discussion with two other team members. The full-text assessment identified eight relevant studies. Data were extracted and an analysis was completed to synthesize the results.

Results:
Of the eight studies, only one was an RCT. NMBA dosing and monitoring strategies varied significantly, which makes comparison difficult. Peripheral nerve stimulation with a train-of-four (TOF) monitor was the most commonly reported monitoring strategy. Location and goals for TOF monitoring varied amongst the studies. Clinical assessment was also reported as an adjunct or comparator to TOF and as an independent monitoring strategy. Out of the six studies that assessed clinical variables, ventilator desynchrony was most commonly described. End-tidal CO2 was not reported as a monitoring strategy used to guide NMBA administration or monitoring. Patient, provider and resource outcomes varied. No significant differences were observed between administration and/or monitoring strategies and mortality, length of stay, or duration of mechanical ventilation. A guided dosing strategy was used in seven studies. A decrease in the amount of NMBA administered was associated with this strategy.

Conclusions:
Evidence in support of a method to monitor the effectiveness of NMBA in patients with ARDS is sparse and represents a gap in the literature. This work has implications for future research and the development of guidance for critical care clinicians in administering and monitoring NMBAs.

Follow-up Care of Critically Ill Patients with Acute Kidney Injury

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Background: Acute kidney injury (AKI) occurs in more than half of critically ill patients and is associated with long-term adverse outcomes. Guidelines recommend evaluating patients 3 months after AKI for assessment of CKD. Currently, the proportion of survivors of critical illness with AKI who receive follow-up care in line with guideline recommendations is unknown.

Objective/Hypothesis: To determine the proportion of patients receiving guideline-concordant evaluation for CKD in survivors of critical illness and AKI.

Methods: We conducted a retrospective cohort study of patients admitted to the intensive care unit with AKI (defined as ≥50% or ≥26.5 µmol/L serum creatinine increase) from 2005-2018 in Alberta, Canada. The primary outcome was the cumulative incidence of an outpatient creatinine and urine protein measurement at 3 months post-discharge. Secondary outcomes included an outpatient creatinine or urine protein measurement, or an outpatient family physician or nephrologist visit at 3 months of discharge. We used non-parametric methods (Aalen-Johansen) to estimate the cumulative incidence functions of outcomes accounting for competing events of death and kidney replacement therapy (maintenance dialysis or kidney transplantation).

Results: There were 29,732 critically ill adult patients with AKI. The median age was 68 years (interquartile range [IQR] 57-77), 39% were female, and the median baseline estimated glomerular filtration rate was 72 mL/min/1.73 m2 (IQR 53-90). The median length of ICU stay was 13 days (IQR 7-24) and 50% received invasive mechanical ventilation. Overall, 70%, 18%, and 13% of patients experienced KDIGO stage 1, stage 2, and stage 3 AKI, respectively, and 5% received acute dialysis. Nephrology consultation occurred in 20% of the cohort. The cumulative incidence of having an outpatient creatinine and urine protein measurement at 3 months post-discharge was 25% (95% confidence interval [CI] 25-26). At 3 months of discharge, 64% (95% CI 64-65) and 28% (95% CI 27-28) of patients had an outpatient creatinine or urine protein measurement, respectively. The cumulative incidence of an outpatient visit to a family physician or nephrologist were 89% (95% CI 89-90) and 5% (95% CI 4-5), respectively.

Conclusions: Only 1 in 4 survivors of critical illness and AKI receive the recommended laboratory testing at 3 months of hospital discharge. Our findings illustrate a gap in the transition of care for survivors of critical illness and AKI.

Aptamer-Based Proteomics for Disease Pathway Analysis in Septic Patients with Differential Organ Dysfunction

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Introduction:

Septic shock is a heterogenous syndrome defined by a dysregulated host immune response to infection resulting in organ dysfunction. Acute kidney injury (AKI) and acute respiratory failure (ARF) are among the most common end-organ manifestations that occur in patients with sepsis, contributing to increased risk of morbidity and mortality. Despite being a well-recognized major clinical problem among critically ill patients, there is a limited understanding of the pathogenesis of sepsis-associated AKI and ARF, resulting in the complete absence of effective disease-modifying therapeutics apart from supportive therapies including dialysis and mechanical ventilation.

Objective:

To identify protein biomarker signatures associated with the pathogenesis of sepsis-associated AKI and ARF.

Methods:

We conducted a retrospective cohort study using previously collected serum samples from septic patients enrolled in the Critical Care Epidemiologic and biologic Tissue bank Resource (CCEPTR). Patients were categorized into 4 distinct groups based on evidence of end organ dysfunction: sepsis-associated AKI (n=18), defined by a urine output of <0.5ml/kg for at least 2 hours despite adequate fluid resuscitation; sepsis-associated ARF (n=22), defined by arterial oxygen partial pressure to fractional inspired oxygen (P/F) of <250; sepsis-associated AKI with ARF (n=23); and septic controls, defined by patients without AKI or ARF (n=22). A total of 85 patients were selected based on age, sex, Charleston Comorbidity index, and severity of illness, defined by sequential organ failure assessment (SOFA) score matching. Quantitative SOMAscan proteomics was applied to serum samples drawn from day 1 of ICU admission. Between group differences were made using standard bivariate analytic approaches (t-test, Wilcoxon ranksum) corrected for multiple comparisons.

Preliminary Results:

A total of 370 proteins were identified that distinguished sepsis-associated ARF from septic controls ($p<0.01$) with 33 proteins showing differentiation with high statistical significance ($p<0.001$). In sepsis-associated AKI and sepsis-associated AKI with ARF, 18 and 26 proteins, respectively, showed discrimination compared with septic controls ($p<0.01$). Next, we will use a systems biology approach to identifying novel pathogenesis pathways associated with organ dysfunction phenotypes through differential expression and protein network analyses.

Significance:

Aptamer-based proteomics represents a novel approach to systems biology analysis of sepsis-associated organ dysfunction. Understanding the protein pathways mediating differential organ dysfunction in sepsis may uncover novel mechanisms of pathogenesis and inform therapeutic innovations in sepsis.

— Notes —

Thank you for attending. Your support and participation is what made this day a success!

Let us know what you thought about the event:

https://survey.ucalgary.ca/jfe/form/SV_3kpycVWQEaGA97M