UNIVERSITY OF TORONTO | Interdepartmental Division of Critical Care Medicine

ART SLUTSKY RESEARCH DAY

Interdepartmental Division of Critical Care Medicine
University of Toronto

Tuesday June 17, 2025
Campbell Conference Facility
Munk School of Global Affairs and Public Policy
Trinity Site, 1 Devonshire Place
University of Toronto

8:00 –8:55 am Registration and Light Breakfast

8:00 – 8:45 am Poster Set-Up

Posters should be on display until **3:00 pm** so they are available for viewing both at the designated time with the authors (see below), and informally (without authors) at coffee breaks and lunch.

Please set up posters before the start of the oral presentations to avoid interruptions.

We will supply VELCRO (we are not allowed to use pins on these rented boards)

8:55 – 9:00 am **Welcome and Introductory Remarks / Land Acknowledgement**

IDCCM Research Director: Margaret Herridge

9:00 – 9:45 am **Oral Presentations I**

Chairs: Haifa Mtaweh, Bruno Ferreyro

Each presentation is 10 min followed by 5 min discussion.

All speakers will be requested to strictly adhere to the time limit.

9:00 – 9:15 am **Mattia Docci**- PressUre-Muscle-index to avoid over-Assistance during pressure support ventilation. The PUMA study.

9:15 – 9:30 am **Rajiv Sanwal**- Investigating photoacoustic imaging as a novel method of monitoring edematous lung injury

9:30 – 9:45 am **Elliott Yee**- Primary Care Access is Associated with Improved Long-Term Survival After Severe Traumatic Injury

Featured Faculty Speakers

Session Chairs: Anne-Marie Guerguerian, Matteo Parotto

9:45 – 10:05 am **Ron Wald**

Renal Replacement Therapy in ICU after STARRT-AKI

10:05- 10:25 am **Alex Floh**

It's not the heart: kidney injury, congenital heart disease, and clinical outcomes in children

10:25- 10:35 am **Discussion**

10:35 - 11:00 am Morning Break

11:00 – 11:45 am **Oral Presentations II**

Chairs: Christie Lee, Martin Urner

Each presentation is 10 min followed by 5 min discussion.

11:00 – 11:15 am **Alice Grassi**- Increased Driving Pressure during Assisted Ventilation for hypoxemic respiratory failure is associated with lower ICU survival. The ICEBERG study.

11:15 – 11:30 am **Tim Weir**- Preparedness through education for the intensive care unit (PREP-ICU) pilot study

11:30 – 11:45 am **Thiago Bassi**- Diaphragm Neurostimulation to Optimize Hemodynamic Performance during Invasive Mechanical Ventilation for Acute Respiratory Failure

11:45 am – 1:30 pm **Poster Discussion/Viewing and Lunch**
Poster numbers with corresponding Abstract numbers are at the end of the agenda.

11:45 am – 12:45 pm Poster discussion
Presenting authors and poster discussants will be at their posters

12:45 pm – 1:30 pm Lunch and independent poster viewing

1:30 – 2:00 pm **Oral presentations III**

Chairs: Karen Burns, Damon Scales

Each presentation is 10 min followed by 5 min discussion.

1:30 – 1:45 pm **Vorakamol Phoophiboon**- Mechanical ventilation in neurosurgical patients: can we safely reduce assistance? The ENVISION study

1:45 – 2:00 pm **Shaurya Taran**- Life support limitation decisions in patients with acute brain injury and cardiac arrest: a secondary analysis of three prospective observational studies

2:00 – 2:20 pm **IDCCM Highlights - 2024-25**
Laurent Brochard

Session Chairs: Rob Fowler, Laveena Munshi

2:20 – 3:00 pm	**Featured Art Slutsky Day International Visiting Professor** **Dr. Marlies Ostermann** "RRT in ICU – is less more?".
3:00 – 3:10 pm	**Discussion**
3:10 – 3:30 pm	Afternoon Break

Featured Faculty Speakers

Session Chairs: Neill Adhikari, Martin Chapman

3:30-3:50 pm	**Professor Marci Shore** *The Fragility of Enlightenment, the Revolt against Reason: Understanding the American Catastrophe*
3:50-4:10 pm	**Dr. David Naylor** *An Assault on Science and Academe: Implications for the Health Realm*
4:10-4:20 pm	**Discussion**
4:20-5:20 pm	**Presentation of Certificates, Teaching Awards, Research Day Prizes and Closing Remarks** *IDCCM Faculty*
5:20- 5:30 pm Permitting	**End of Year Group Photo in Courtyard, Weather**
5:30- 6:30 pm	**IDCCM Community Wine and Cheese Reception**

Thank you!
Have another great year of research and education and see you next year!

Art Slutsky Research Day 2025
IDCCM Chair: Dr. Laurent Brochard
IDCCM Director of Research: Dr. Margaret Herridge
IDCCM Associate Director of Research: Dr. Neill Adhikari

GUEST SPEAKERS

Featured Art Slutsky Day International Guest Speaker:

Marlies Ostermann

Marlies Ostermann is Professor of Intensive Care and Nephrology at Guy's & St Thomas Hospital in London. After undergraduate training in Goettingen, Germany, she moved to the United Kingdom for postgraduate training in Nephrology and Acute Medicine. In 1996 – 1998, she completed a fellowship in Intensive Care in London, Ontario under the supervision by Professor W Sibbald.

Her academic and clinical interests relate to acute kidney injury, renal replacement therapy and extracorporeal organ support in critically ill patients. She is Director of Research of the Intensive Care Society UK, Chair of the AKI working group of the European Renal Association, and President-Elect of the European Society of Intensive Care Medicine.

Featured Faculty Speakers

Ron Wald

Ron Wald is a nephrologist at St. Michael's Hospital and Director of the hospital's Hemodialysis Program. He is also a member of the Department of Nephrology and Hypertension at Tel Aviv Medical Center. He is a Professor in the Department of Medicine and in the Institute of Health Policy Management and Evaluation at the University of Toronto. A native of Montreal, Ron completed undergraduate and medical degrees at McGill University and continued his clinical training in internal medicine and nephrology at the University of Toronto. This was followed by a Master of Public Health at Harvard University and a research fellowship at Tufts Medical Center in Boston.

Ron's research areas are in critical care nephrology and maintenance dialysis. He served as co-principal investigator of the STARRT-AKI trial, a CIHR-funded international trial on the timing of dialysis initiation in critically ill patients with acute kidney injury (AKI). He is co-leading other trials looking at fluid management in patients with AKI (Probe-Fluid), optimal dialysis dose in AKI (WISDOM) and the role of albumin in patients receiving dialysis in the ICU (ALTER-AKI). In the realm of maintenance dialysis, he is leading the multinational PHOSPHATE trial that is evaluating whether intensive lowering of serum phosphate reduces the risk of major adverse cardiovascular events.

Alex Floh

Dr. Floh is a staff physician in the Cardiac Intensive Care unit at The Hospital for Sick Children and an Associate Professor in Pediatrics at the University of Toronto. He is the Director of the Cardiac Critical Care subspecialty fellowship, and Associate Director of the Pediatric Critical Care Training Program. His research program focuses on inflammation and metabolism following cardiopulmonary bypass, nutrition delivery for critically ill children, and the complex relationship between kidney injury and congenital heart disease.

Marci Shore

Marci Shore is professor of history at Yale University and will begin teaching at the Munk School in fall 2025. She is also a regular visiting fellow at the Institut für die Wissenschaften vom Menschen in Vienna. This spring she guest curated, together with Oksana Forostyna, the Kyiv Book Arsenal with the theme "Everything is Translation." She is the translator of Michał Głowiński's The Black Seasons and the author of Caviar and Ashes: A Warsaw Generation's Life and Death in Marxism, 1918-1968, The Taste of Ashes: The Afterlife of Totalitarianism in Eastern Europe. A new edition of her third book, The Ukrainian Night: An Intimate History of Revolution, was published in 2024. Her articles and essays have appeared in The New Yorker, Foreign Policy, Eurozine, The Atlantic, The Yale Review, The New York Review of Books, The Times Literary Supplement, The New York Times, and The Wall Street Journal. She is the recipient of a Guggenheim Fellowship for her book project about phenomenology in East-Central Europe tentatively titled In Pursuit of Certainty Lost: Central European Encounters on the Way to Truth.

David Naylor

David Naylor is Professor of Medicine and President Emeritus at the University of Toronto. Previously the Dean of Medicine, director of clinical epidemiology at Toronto's Sunnybrook Health Science Centre and founding CEO of IC/ES, Naylor has co-authored over 300 scholarly publications spanning research methods, medical history, public policy and health economics, as well as clinical and health services research in most fields of medicine. He chaired national panels reviewing Canada's response to the SARS outbreak, options for innovative reform of Canada's healthcare systems, and federal support for extramural science and research across disciplines. During the recent pandemic, he served as co-chair of Canada's COVID-19 Immunity Task Force.

ABSTRACT JUDGES

Basic Science Category	Dr. Haibo Zhang
Clinical Research/Health Services Research Category	Dr. Chris Yarnell Dr. Luca Menga Dr. Rob Fowler Dr. Victoria McCredie Dr. Niall Ferguson Dr. Matteo Parotto Dr. Anne-Marie Guerguerian Dr. Neill Adhikari Dr. Margaret Herridge
Physiology Category	Dr. Irene Telias Dr. Mike Sklar Dr. Alice Grassi Dr. Laurent Brochard
Quality Category	Dr. Nava Maham Dr. Elaine Gilfoyle Dr. Alberto Goffi
Systematic Review/Case Report/Education Category	Dr. Dominique Piquette Dr. Luciana Rodrigues Dr. Briseida Mema

POSTER DISCUSSANTS FOR ART SLUTSKY DAY

(6) Basic/Translational Science Category I:	Dr. Haibo Zhang
(5) Clinical Research/Health Services Research Category I:	Dr. Brian Cuthbertson
(5) Clinical Research/Health Services Research Category II:	Dr. Gail Annich Dr. Laura Dragoi
(5) Clinical Research/Health Services Research Category III:	Dr. Victoria McCredie Dr. Chris Yarnell

(4) Clinical Research/Health Services Research Category IV: Dr. Niall Ferguson
Dr. Federico Angriman

(4) Physiology Category I: Dr. Annia Schreiber
Dr. Luca Menga

(3) Physiology Category II: Dr. Irene Telias
Dr. Mike Sklar

(3) Quality Category I: Dr. Elaine Gilfoyle

(3) Quality Category II: Dr. Alberto Goffi

(4) Education Category/ Systematic Review/Case Report I: Dr. Briseida Mema
Dr. Jenna Spring

(4) Education Category /Systematic Review/Case Report II: Dr. Luciana Rodrigues
Dr. Mika Hamilton

ORAL PRESENTATION JUDGES

Dr. Laurent Brochard
Dr. Margaret Herridge
Dr. Marlies Osterman
Dr. Neill Adhikari

ORAL PRESENTATION 1

PressUre-Muscle-index to avoid over-Assistance during pressure support ventilation. The PUMA study.

Submission ID

49

ABSTRACT CATEGORY

3. Physiology

AUTHORS

Docci, Mattia[1,2]; Phoophiboon, Vorakamol[1,2]; Ko, Matthew[1,2]; Rodrigues, Antenor[1,2]; Menga, Luca[1,2]; Raimondi Cominesi, Davide[1,2,3]; and Brochard, Laurent[1,2].

[1]Keenan Centre for Biomedical Research, Li Ka Shing Knowledge Institute, Unity Health Toronto, Toronto, Ontario, Canada
[2]Interdepartmental Division of Critical Care Medicine, University of Toronto, Toronto, Ontario, Canada
[3]School of Medicine and Surgery, University of Milano-Bicocca, Monza, Italy

INTRODUCTION:

When setting pressure support ventilation (PSV), the assumption that the patient needs to be partially assisted. Over-assistance should be avoided as it can result in a low respiratory drive and minimal inspiratory effort, facilitating the development of diaphragm atrophy, ineffective efforts, sleep apneas and increased duration of mechanical ventilation (1). The formal definition of over-assistance relies on esophageal pressure-derived indices of work of breathing, which is not routinely applicable at the bedside. Estimates of low inspiratory drive as a P0.1 below 1 cmH2O or a respiratory rate (RR) at 17 per minute or lower have been proposed to detect over-assistance at the bedside (2). We propose an alternative based on the association between over-assistance and patient's loss of control of tidal volume (Vt), which increases sharply when patients start to get over- assisted (3).
Pressure-muscle-index (PMI) – measured on airway pressure as the difference between end-inspiratory occlusion plateau pressure and peak airway pressure before the occlusion – reflects the volume actively inspired by the patient in addition to that delivered by the ventilator. PMI below 0 cmH2O may indicate that patient inspiratory effort is close to the sole trigger activity (the whole Vt is delivered by the mechanical ventilator) and may be used to detect over-assistance (4).

OBJECTIVES:

To investigate the association of PMI lower than 0 cmH2O and over-assistance in PSV.

HYPOTHESIS:

When PMI is lower than 0 cmH2O patients lose control on Vt while their inspiratory effort is nearly abolished.

METHODS:

We enrolled patients with acute hypoxemic respiratory failure (AHRF) invasively ventilated in PSV in a randomized cross-over physiological trial (NCT06494085).
For each patient enrolled, PMI was measured through an end-inspiratory occlusion at clinical PS, then the level of assistance was adjusted to get a PMI = 0 cmH2O ($PS_{PMI=0}$), i.e. plateau pressure was equal to peak pressure (PS+PEEP), and used as reference. Each patient was then randomized to 3 steps of PS above (+2, +4, +6 cmH2O) and 3 below (-2, -4, -6 cmH2O) $PS_{PMI=0}$. Steps lasted 5 minutes and were followed by 3 minutes at clinical PS to minimize changes in PaCO2.
At the end of each step 1 inspiratory occlusion and 3 expiratory occlusions were performed to measure PMI and the average occlusion pressure (∆Pocc) respectively (5). The inspiratory effort (Pmus) and the dynamic transpulmonary driving pressure (∆Plung,dyn) at each step were estimated using ∆Pocc (Pmus = 0.75*∆Pocc; ∆Plung,dyn = PS+0.66**∆Pocc) (5). Paw and flow continuous waveforms were acquired at 100 Hz from the ventilator (Servotracker, Maquet Critical Care, Sweden) allowing to quantify ineffective efforts and apneas at each study step. Distribution of ventilation in the lungs during breathing was recorded continuously through electrical impedance tomography (EIT) (PulmoVista500, Draeger, Germany).

RESULTS:

We enrolled 19 patients: 38% females; age 58±17 years; BMI 32±8 kg/m^2; PaO /FiO 217±68 mmHg; pH 7.43±0.04. Patients' ventilatory parameters at enrollment are shown as median [IQR]: PS 8 [5;10] cmH_2O; PEEP 8 [5;8] cmH_2O; Vt 0.44 [0.41;0.5] Liters; RR 22 [19;28] breaths/min; Pmus 6 [4;10] cmH2O; PMI 2 [0;5] cmH2O; maximal inspiratory pressure 25 [15;28] cmH2O.
Figure 1 shows the physiological variables of interest while increasing the PS at the different steps. When $PS_{PMI=0}$ was exceeded and PMI became lower than 0 cmH2O the slopes of physiological changes over PS increased abruptly for Vt by 290% [270;330] and ∆Plung,dyn by 180% [176;189] respectively (P<0.001 for both, paired t-test) and decreased for Pmus by 50% [25;80] (P<0.001, paired t-test). Moreover, distribution of ventilation was less even (more ventrally distributed) when PMI was lower than 0 cmH2O (ventro-dorsal distribution difference 40% [19;53] vs 30 [4;48] (P<0.001).
When PMI was lower than 0 cmH2O, 100% of patients developed ineffective efforts and 58% apneas versus 24% and 15% respectively when PMI was greater or equal to 0 cmH2O (P<0.001 for both, Fisher's exact test).

Figure 1. *Transpulmonary driving pressure (∆Plung,dyn), tidal volume (Vt), inspiratory effort (Pmus) and percentage of Ineffective Efforts across the study steps above and below the pressure support (PS) at which pressure-muscle-index (PMI) equals 0 cmH2O ($PS_{PMI=0}$). Data are shown as mean and CI95%.*

CONCLUSION:

In this cross-over physiological study in patients with AHRF ventilated in PSV, when PMI was lower than 0 cmH2O patients lost control over their tidal volume and driving pressure while their inspiratory effort was nearly abolished and ineffective efforts and apneas became frequent events. $PS_{PMI=0}$ appears a valuable threshold to avoid over-assistance.

REFERENCES:

1. Docci M, Rodrigues A, Dubo S, Ko M, Brochard L. Does patient-ventilator asynchrony really matter? Curr Opin Crit Care. 2025 Feb 1;31(1):21–9.
2. Pletsch-Assuncao R, Caleffi Pereira M, Ferreira JG, Cardenas LZ, De Albuquerque ALP, De Carvalho CRR, et al. Accuracy of Invasive and Noninvasive Parameters for Diagnosing Ventilatory Overassistance During Pressure Support Ventilation*. Crit Care Med. 2018 Mar;46(3):411–7.
3. Docci M, Foti G, Brochard L, Bellani G. Pressure support, patient effort and tidal volume: a conceptual model for a non linear interaction. Crit Care. 2024 Nov 6;28(1):358.
4. Docci M, Rezoagli E, Teggia-Droghi M, Coppadoro A, Pozzi M, Grassi A, et al. Individual response in patient's effort and driving pressure to variations in assistance during pressure support ventilation. Ann Intensive Care. 2023 Dec 20;13(1):132.
5. Bertoni M, Telias I, Urner M, Long M, Del Sorbo L, Fan E, et al. A novel non- invasive method to detect excessively high respiratory effort and dynamic transpulmonary driving pressure during mechanical ventilation. Crit Care. 2019 Dec;23(1):346.

ORAL PRESENTATION 2

Investigating photoacoustic imaging as a novel method of monitoring edematous lung injury

Submission ID

34

ABSTRACT CATEGORY

1. Basic or Translational Science

AUTHORS

Sanwal, Rajiv[1,2]; Faeth, Chris[2, 3]; Leung, Katie[2]; Frazer, Callum [2]; Hysi, Eno [2,3,4], Lee, Warren L[1,2,5]

1 Department of Laboratory Medicine and Pathobiology, University of Toronto
2 Keenan Research Centre, St. Michael's Hospital U
3 Department of Medical Biophysics, University of Toronto
4 Department of Physics, Toronto Metropolitan University
5 Interdepartmental Division of Critical Care, University of Toronto

INTRODUCTION:

Acute respiratory distress syndrome (ARDS) is a major cause of morbidity and mortality in the intensive care unit. Excessive lung inflammation, often from pneumonia or sepsis, causes severe pulmonary edema and a reduction in gas exchange, leading to hypoxia and death.[1] Imaging of ARDS relies on chest X-rays/CT scans which possess several limitations: there is exposure to ionizing radiation, a lack of feasible real-time monitoring, lack of physiological information, and requires patient transport. Thus, there is a need for an improved patient monitoring modality.

To address this problem, we propose the use of photoacoustic imaging (PAI) as a novel lung imaging modality. Briefly, a laser is pulsed to illuminate the lungs and this light interacts with molecules in tissue (e.g. hemoglobin) to produce an acoustic response. This response is detected by a transducer. Notably, the wavelength of the excitatory laser can be changed to assess different qualities such as oxy- and deoxy-hemoglobin content, providing physiological readouts of lung function. The pulsed light is in the near-infrared spectrum, avoiding the use of radiation. Lung PAI has not been explored as air scatters the acoustic signal; however, the edematous lung is a favourable medium to transmit the acoustic signal, providing an opportunity for its use in ARDS.

OBJECTIVES:

In this study, we aim to assess the feasibility of PAI in imaging the injured lung using pre-clinical models of lung injury.

HYPOTHESIS:

We hypothesize that PAI can be used to acquire structural and functional information in the injured lung.

METHODS:

Using murine *E. coli* pneumonia models, we imaged lungs pre- and post-infection to assess the capacity of PAI to measure edematous lung injury. These images were compared to CT images, the current gold-standard. PAI images captured at different wavelengths were also analyzed to measure oxygen saturation. These were compared to systemic oxygenation measurements recorded by a pulse oximeter.

In pig experiments, *E. coli* was instilled into the right middle lobe to cause injury. The left upper lobe served as an internal control. Lungs were imaged using a handheld PA probe at 2 hours post-infection.

RESULTS:

Using PAI, we measured changes in acoustic response between healthy and fluid-filled lung tissue. Structural changes in murine lung injury were confirmed by CT imaging. Data from different wavelengths revealed increases in deoxyhemoglobin and decreases in oxyhemoglobin after lung infection which preceded changes in systemic oxygenation. Finally, preliminary data from a pig pneumonia model detected regional hypoxia, illustrating the feasibility of PAI when scaled up to larger animal models.

CONCLUSION:

Altogether, these data demonstrate that PAI has high potential to be a new clinically valuable tool in ARDS monitoring by providing both structural and functional information. Ultimately, we hope that this improved monitoring will provide clinical value, leading to earlier interventions and improved outcomes.

REFERENCES:

1. Ramji HF, Hafiz M, Altaq HH, Hussain ST, Chaudry F. Acute Respiratory Distress Syndrome; A Review of Recent Updates and a Glance into the Future. Diagnostics (Basel). 2023;13(9):1528. Published 2023 Apr 24. doi:10.3390/diagnostics13091528

ORAL PRESENTATION 3

Primary Care Access is Associated with Improved Long-Term Survival After Severe Traumatic Injury

Submission ID

17

ABSTRACT CATEGORY

2. Clinical/Health Services Research

AUTHORS

Yee, Elliott K.[1]; Mason, Stephanie A.[1]; Rosella, Laura C.[2]; Jaakkimainen, Liisa[3]; Zagorski, Brandon M.[4]; Little, Darby[5]; Postill, Gemma[6]; Nathens, Avery B.[1]; Tillmann, Bourke W.[7]; Haas, Barbara[1,7]

1. Division of General Surgery, Department of Surgery, University of Toronto, Toronto, Ontario, Canada

2. Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada

3. Department of Family and Community Medicine, University of Toronto, Toronto, Ontario, Canada

4. ICES, Ontario, Canada

5. Division of Plastic, Reconstructive & Aesthetic Surgery, Department of Surgery, University of Toronto, Toronto, Ontario, Canada

6. Temerty Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada

7. Interdepartmental Division of Critical Care, University of Toronto, Toronto, Ontario, Canada

INTRODUCTION:
Survivors of severe traumatic injury remain at elevated risk of death in the years after injury. Little is known about how long-term mortality among injury survivors can be reduced.

OBJECTIVES:
This retrospective, population-based cohort study aimed to examine the association between primary care access and long-term survival among community-dwelling adult (age ≥ 18 years) survivors of severe traumatic injury.

HYPOTHESIS:
We hypothesized that primary care access would be associated with improved long-term survival after severe traumatic injury.

METHODS:
Data were obtained from linked administrative databases held at ICES. Included patients were admitted to hospital in Ontario for severe traumatic injury and discharged alive between April 1, 2010 and March 31, 2022. Severe traumatic injury was defined using admission records containing ICD-10-CA codes in the range of S or T00–T149 and an

Injury Severity Score (ISS) > 15. ISS was calculated using a validated crosswalk algorithm.[1] The injury-related hospitalization was defined as the period starting with the initial injury-related emergency department encounter and ending with the final discharge home, whether from an acute care hospital or inpatient rehabilitation facility.

Patients were excluded if they were Ontario non-residents, lacked OHIP coverage, lacked age or sex data, died before discharge, were discharged to an institutional facility, lived in long-term care prior to injury, presented with concurrent burn injuries at the index hospitalization, had injuries related to environmental exposures, or were ≥ 65 years old presenting with an isolated hip fracture.[2,3] To avoid misclassifying patients seeking care for prior injuries, patients with a history of severe burn or severe traumatic injuries in the past five years, any burn or traumatic injuries in the past three months, and those presenting due to complications of a prior injury, were excluded.

The exposure of interest was baseline primary care access (dichotomous). Access was defined as the presence of core primary care physician fee codes or rostering to a primary care physician in the 2 years before the injury hospitalization.[4,5]

The primary outcome was the time from the index hospitalization discharge date to death from any cause. Patients were followed until the first of death, loss of OHIP eligibility, 5 years after discharge, or March 31, 2023.

Continuous variables were reported as mean with standard deviation (SD) and median with interquartile range (IQR). Categorical variables were reported as absolute number (n) and proportion (%). Baseline characteristics were compared between injury survivors with and without primary care access, with a standardized difference > 0.1 considered statistically significant. Unadjusted 5-year cumulative mortality was compared between primary care access categories by Kaplan-Meier curve and log-rank test.

Multivariable Cox proportional hazards models evaluated the association between primary care access and mortality, adjusted *a priori* for age, sex, marginalization (Ontario Marginalization Index), income quintile, immigration within 10 years, rurality, overall comorbidity burden (Johns Hopkins Adjusted Clinical Group® System's Aggregated Diagnosis Groups), frailty, mental health comorbidity, year, ISS, severe injuries by body region (chest, abdomen, head), mechanism of injury, hospitalization episode length of stay (LOS), treatment at a trauma centre, inpatient rehabilitation admission, and mechanical ventilation duration. The sandwich covariance matrix estimate accounted for hospital-level clustering. The proportionality assumption was confirmed graphically. Individuals with missing data were excluded from multivariable analyses. Results were reported as hazard ratio (HR) with 95% confidence interval (CI).

Sensitivity analyses tested model assumptions: 1) Primary care access was recoded with 3 categories (rostered, primary care visits without rostering, and no rostering or primary care visits); 2) Patients accepted to long-term care during the index hospitalization were excluded; 3) Patients with acute care hospital LOS < 7 days were excluded; 4) Age was redefined from a categorical to continuous variable; 5) An E-value was calculated to evaluate unmeasured confounding. Additional analyses assessed the association between primary care access and mortality across subgroups stratified by age, sex, marginalization, income, comorbidity, frailty, mechanism of injury, ISS, severe injuries of the chest, abdomen, and head, and treatment at a trauma centre.

All tests were 2-sided. P-values < 0.05 were considered statistically significant. All analyses were performed using SAS Enterprise Guide version 8.3.7 (SAS Institute Inc., Cary, North Carolina).

RESULTS:

We identified 25,713 survivors of severe traumatic injury (32.1% female, mean age 54 years, median ISS 20, 42.1% injured by a fall). 23,720 patients (92.2%) had pre-injury primary care access, whereas 1,993 (7.8%) did not. Patients without primary care access were more likely to be younger, male, less comorbid, and more marginalized. Cumulative 5-year mortality was 12.7% (3,265 deaths). Without multivariable adjustment, patients with primary care access appeared significantly more likely to die, with 3,120 deaths (13.2%) vs. 145 deaths (7.3%) among patients without access (log-rank p-value <0.0001).

Multivariable analyses included 24,871 survivors of severe traumatic injury with complete data. After adjusting for covariates, primary care access was significantly associated with a 20% lower hazard of death (HR 0.80, 95% CI 0.68–0.93). The direction of the association between primary care access and mortality was unchanged across sensitivity analyses. The E-value indicated that an unmeasured confounder would need an HR ≥ 1.82 to nullify the statistical significance of the model results. The relationship between primary care access and mortality was preserved across subgroups of age, sex, and comorbidity.

CONCLUSION:

Survivors of severe traumatic injury with primary care access were less likely to die in the five years after discharge, with primary care access associated with a 20% lower adjusted hazard of mortality. These findings identify that individuals without existing primary care access are a vulnerable subset of the injury survivor population. Primary care physicians may be key partners to trauma care providers in developing strategies that improve long-term outcomes in the years after injury. Future interventions and studies should consider programs that prioritize developing relationships between injury survivors and primary care physicians, as well as strategies to integrate primary care into post-discharge pathways within trauma systems.

REFERENCES:

1. Tillmann BW, Guttman MP, Thakore J, Evans DC, Nathens AB, McMillan J, Gezer R, Phillips A, Yanchar NL, Pequeno P, et al. Internal and external validation of an updated ICD-10-CA to AIS-2005 update 2008 algorithm. *J Trauma Acute Care Surg*. 2024;96(2):297-304. DOI: 10.1097/TA.0000000000004052.
2. Gomez D, Haas B, Hemmila M, Pasquale M, Goble S, Neal M, Mann NC, Meredith W, Cryer HG, Shafi S, et al. Hips Can Lie: Impact of Excluding Isolated Hip Fractures on External Benchmarking of Trauma Center Performance. *J Trauma Inj Infect Crit Care*. 2010;69(5):1037-1041. DOI: 10.1097/TA.0b013e3181f65387.
3. Tillmann BW, Yee EK, Guttman MP, Mason SA, Jaakkimainen L, Pequeno P, Nathens AB, Haas B. Early primary care follow-up is associated with improved long-term functional outcomes among injured older adults. *J Trauma Acute Care Surg*. 2025;98(5):734-741. DOI: 10.1097/TA.0000000000004528.
4. Glazier RH, Victor JC, Kopp A, Klein J, Sibley L. *Who Do Family Health Teams Serve and Who Do They Roster?* Institute for Clinical Evaluative Sciences; 2009.
5. Glazier RH, Klein-Geltink J, Kopp A, Sibley LM. Capitation and enhanced fee-for- service models for primary care reform: a population-based evaluation. *Can Med Assoc J*. 2009;180(11):E72-E81. DOI: 10.1503/cmaj.081316.

ORAL PRESENTATION 4

Increased Driving Pressure during Assisted Ventilation for hypoxemic respiratory failure is associated with lower ICU survival. The ICEBERG study.

Submission ID

31

ABSTRACT CATEGORY

3. Physiology

AUTHORS

Grassi, Alice; Bianchi Isabella; Teggia Droghi, Maddalena; Miori, Sara; Bruno, Ilaria; Balzani, Eleonora; Morris, Idunn; Schaedler, Dirk; Becher, Tobia; Valdivia Marchal, Marchal; Serrano, Jose M; Caritg, Oriol; Roca, Oriol; Costa, Eduardo; Amato, Marcelo; Barriga, Fernando; Roldan, Rollin; Boffi, Andrea; Piquilloud, Lise; Mitchon, Gregory J; Musch, Guido; Piva, Simone; Bertoni, Michele; Castagna, Luigi; Grasselli, Giacomo; Riccardo, Matteo; Spadaro, Savino; Nita, Ciprian; McNicholas, Bairbre; Sklar, Micheal C; Magliocca, Aurora; Rezoagli, Emanuele; Foti, Giuseppe; Laffey, John; Brochard, Laurent J; Goligher, Ewan C; Bellani Giacomo

AG Department of Anesthesiology and Pain Medicine, Toronto General Hospital and University of Toronto, Toronto, Canada
IB Department of Anesthesia and Intensive Care, ASST Papa Giovanni XXIII, Bergamo, Italy
MTD Department of Emergency and Intensive Care, Fondazione IRCCS San Gerardo dei Tintori, Monza, Italy
SM Department of Anesthesia and Intensive Care, Santa Chiara Hospital, APSS Trento, Trento, Italy
IB School of Medicine and Surgery, University of Milano-Bicocca, Monza, Italy
EB University of Turin, Department of Surgical Science, Anesthesia and Intensive Care Unit, Turin, Italy
ISM Nepean Clinical School, Sydney Medical School, Faculty of Medicine and Health, University of Sydney and Department of Intensive Care Medicine, Nepean Hospital, NSW, Australia. Department of Physiology and Interdepartmental Division of Critical Care Medicine, University of Toronto, Canada
DS and TB Department of Anesthesiology and Intensive Care Medicine, University Medical Center Schleswig-Holstein, Campus Kiel, Kiel, Germany
MVM Intensive Care Unit, Reina Sofia University Hospital, Cordoba, Spain
JMS Intensive Care Unit, Reina Sofia University Hospital, Cordoba, Spain
OC Grup de recerca de shock, disfunció orgànica i ressuscitació (SODIR), Institut de Recerca Vall d'Hebron (VHIR), Barcelona, Spain
OR Parc Taulí Hospital Universitari, Institut de Investigació i Innovació Parc Taulí(I3PT-CERCA), Sabadell; Departament de Medicina, Universitat Autònoma de Barcelona, Bellaterra; Ciber Enfermedades Respiratorias (CIBERES), Health Institute Carlos III, Madrid, Spain.
EC Laboratório de Pneumologia LIM-09, Faculdade de Medicina, Hospital das Clinicas HCFMUSP, Universidade de Sao Paulo, São Paulo, SP, Brazil
Research and Education Institute, Hospital Sírio-Libanes, Sao Paulo, Brazil
Divisao de Pneumologia, Faculdade de Medicina, Instituto do Coracao, Hospital das Clinicas HCFMUSP, Universidade de Sao Paulo, São Paulo, SP, Brasil
MA Laboratório de Pneumologia LIM-09, Faculdade de Medicina, Hospital das Clinicas HCFMUSP, Universidade de Sao Paulo, São Paulo, SP, Brazil
Divisao de Pneumologia, Faculdade de Medicina, Instituto do Coracao, Hospital das

Clinicas HCFMUSP, Universidade de Sao Paulo, São Paulo, SP, Brasil

FB Laboratorio de Fisiología Experimental, Facultad de Medicina Humana, Universidad de Piura, Lima, Peru. Intensive Care Unit, Hospital Rebagliati, Lima, Peru
RR Laboratorio de Fisiología Experimental, Facultad de Medicina Humana, Universidad de Piura, Lima, Peru. Intensive Care Unit, Hospital Rebagliati, Lima, Peru
AB Cardiac Anaesthesia and Intensive Care Unit, Istituto Cardiocentro Ticino, Lugano, Switzerland
LP Adult Intensive Care Unit, University Hospital and University of Lausanne, Lausanne, Switzerland
GJM and GM Department of Anesthesiology and Perioperative Medicine, UMass Chan Medical School, Worcester, Massachusetts, USA
SP and MB Department of Medical and Surgical Specialties, Radiological Sciences and Public Health, University of Brescia; Department of Emergency, ASST Spedali Civili University Hospital, Brescia, Italy.
LC Department of Emergency, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy
GG Department of Emergency, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy; Department of Pathophysiology and Transplantation, University of Milan, Milan, Italy
MR Department of translational medicine, University of Ferrara, Azienda Ospedaliera Universitaria, Ferrara, Italy
SS Department of translational medicine, University of Ferrara, Azienda Ospedaliera Universitaria, Ferrara, Italy
CN and BMN Department of Anaesthesia and Intensive Care Medicine, Galway University Hospital, Saolta University Healthcare Group, Galway Ireland. School of Medicine, College of Medicine, Nursing and Health Sciences, University of Galway, Ireland
MCS Department of Anesthesia and Interdepartmental Division of Critical Care Medicine, St. Michael Hospital and University of Toronto
AM Department of Pathophysiology and Transplants, University of Milan, Milan, Italy
ER School of Medicine and Surgery, University of Milano-Bicocca, Monza, Italy. Department of Emergency and Intensive Care, Fondazione IRCCS San Gerardo dei Tintori, Monza, Italy
GF School of Medicine and Surgery, University of Milano-Bicocca, Monza, Italy. Department of Emergency and Intensive Care, Fondazione IRCCS San Gerardo dei Tintori, Monza, Italy
LJB Keenan Research Centre, Li Ka Shing Knowledge Institute, St. Michael's Hospital, Unity Health. Interdepartmental Division of Critical Care Medicine, University of Toronto, Toronto, Canada.
JL Department of Anaesthesia and Intensive Care Medicine, Galway University Hospital, Saolta University Healthcare Group, Galway, Ireland. School of Medicine, College of Medicine, Nursing and Health Sciences, University of Galway, Ireland
ECG Department of Medicine, Division of Respirology, University Health Network, Toronto, Canada; Department of Physiology, University of Toronto, Toronto, Canada; Interdepartmental Division of Critical Care Medicine, University of Toronto, Toronto, Canada; Toronto General Hospital Research Institute, Toronto, Canada
GB Department of Anesthesia and Intensive Care, Santa Chiara Hospital, APSS Trento. Centre for Medical Sciences CISMed, University of Trento, Trento, Italy

INTRODUCTION:

Over the last decade, the role of driving pressure (ΔP) both as a marker of severity (1,2) and a potential target for protective ventilation (3,4) has emerged. Driving pressure is computed as the difference between plateau pressure, measured by performing an end-inspiratory inclusion, and positive end-expiratory pressure (PEEP). From a physiological

standpoint, it represents the change in elastic pressure applied to the respiratory system during a breath. It corresponds to the ratio between tidal volume (V_T) and compliance.
Driving pressure is easily measured during controlled passive mechanical ventilation, when the entire work of breathing is generated by the ventilator (5). The measurement of ΔP in the presence of active spontaneous breathing is less straightforward, but possible and potentially just as relevant. Excessive lung strain may occur during spontaneous breathing, due to the combination of patient's muscular activity, generating negative intrathoracic pressures, and the positive pressure imposed by the ventilator (6). This interaction may be described by the analogy with an *Iceberg*, where a large component of the total distending pressure is hidden to standard bedside monitoring, unless an esophageal catheter is in place (7).
Performing inspiratory and expiratory holds during assisted ventilation can provide an estimate of static and transpulmonary dynamic driving pressures, respectively.
Thorugh inspiratory holds, a plateau pressure can measured, that, when reliable, allows to compute a quasi-static driving pressure (8). This was associated with outcome in a retrospective single center study (9).
Expiratory holds, and the measurement of occlusion pressure, provide an estimate of the inspiratory effort, useful to estimate the transpulmonary dynamic driving pressure (10). The latter has been shown to be associated with outcome in a retrospective study (11).

OBJECTIVES:

The primary objective of this study was to prospectively verify, in a multi-center setting, the association of static and transpulmonary dynamic driving pressures measured during the first three days of assisted ventilation and the outcomes of patients with hypoxemic respiratory failure.
Secondary objectives are to verify the association of other respiratory mechanics parameters (tidal volume, peak pressure, measures of inspiratory effort) and outcomes; and to assess the association between driving pressures and outcomes over time.

HYPOTHESIS:

We hypothesize that driving pressure is a reliable surrogate of lung strain also during assisted ventilation, as it is controlled modes, and therefore it is associated with ICU outcomes.

METHODS:

This is a multicenter prospective observational study. Patients with acute hypoxemic respiratory failure were enrolled within 48 hours of starting to trigger the ventilator. Respiratory mechanics were measured daily until day 7, then on day 10, 14 and every 7 days until extubation or death. This included performing inspiratory and expiratory holds and calculating the derived variables as follows:
Static driving pressure (ΔP_{stat}) = Pplat-PEEP
Transpulmonary dynamic driving pressure ($\Delta P_{L,dyn}$) = [(Ppeak – PEEP) – 2/3 * ΔPocc] (10)
Respiratory System Compliance (Crs) = $V_T/\Delta P_{stat}$
Crs normalized to Predicted Body Weight (Crs/PBW)=Crs/kg, as a way of normalizing compliance to an estimate of lung size. PBW was calculated using standard formulas (for males, 50 + 0.91*(height in cm – 152.4); for females 45.5 + 0.91*(height in cm – 152.4)
The variables of interest were averaged over the first three days of partial assistance. ICU outcomes were collected until day 90.
Differences between survivors and non-survivors were assessed by unpaired t-test, Mann-Whitney or chi-squared test, as appropriate. Variables known to be associated with

ICU mortality, were a priori entered into multivariable logistic regression models. Risk was reported as OR (95% CI).
The longitudinal trajectories of respiratory variables over time were assessed in a supplementary analysis, using outcome as a grouping variable.

RESULTS:

Two-hundred ninety-eight patients from 16 centers were enrolled.
Tidal volume, peak airway pressure, PEEP and inspiratory effort averaged over the first three days of assisted ventilation did not differ between survivors and non-survivors. Of note, all patients had a tidal volume within the protective range (<8ml/kg).
Quasi-static driving pressure and transpulmonary dynamic driving pressures were higher in non-survivors than in survivors (13 [11,14] vs 11 [9,13], p<0.001 and 19 [16,23] vs 16 [13,18], p<0.001, respectively) while compliance normalized to predicted body weight was lower (0.65 [0.54,0.84] vs 0.79 [0.64,0.97] ml/cmH_2O/kg, p<0.001). Multivariable analysis confirmed the association with outcome.
The mortality rate (Figure 1A) increased across the quartiles of both ΔP_{stat} and $\Delta P_{L,dyn}$ (p=0.011 and p<0.001, respectively), and decreased with Crs/PBW (p=0.019) but it did not have a significant association with Ppeak (p=0.129) or ΔPocc (p=0.314). The risk of death associated with increasing values of ΔP_{stat}, $\Delta P_{L,dyn}$ and Crs/PBW is shown in Figures 1B-D.
Over study days, static driving pressure significantly diverged between survivors and non-survivors (Figure 2).

CONCLUSION:

In conclusion, this is the first report of an association between respiratory mechanics (ΔP, its trend over time, normalized compliance) measured during assisted ventilation and ICU outcomes in acute hypoxemic respiratory failure patients, in a prospective, multicentric context. Tidal volume and respiratory effort alone did not show a correlation with survival. Despite not being able to ascertain a causal relationship, and a substantial overlap in diving pressure values between survivors and non survivors, these results support the value of monitoring respiratory mechanics during assisted ventilation. Static and dynamic ΔP might become targets for clinical trials aimed at assessing protective ventilatory strategies during assisted ventilation.

REFERENCES:

1. Amato MBP, Meade MO, Slutsky AS, Brochard L, Costa ELV, Schoenfeld DA, et al. Driving Pressure and Survival in the Acute Respiratory Distress Syndrome. N Engl J Med. 2015;372(8):747–55.
2. Goligher EC, Costa ELV, Yarnell CJ, Brochard LJ, Stewart TE, Tomlinson G, et al. Effect of lowering vt on mortality in acute respiratory distress syndrome varies with respiratory system elastance. Am J Respir Crit Care Med. 2021;203(11):1378–85.
3. Park M, Ahn HJ, Kim JA, Yang M, Heo BY, Choi JW, et al. Driving Pressure during Thoracic Surgery: A Randomized Clinical Trial. Anesthesiology. 2019 Mar;130(3):385–93.
4. Zhang C, Xu F, Li W, Tong X, Xia R, Wang W, et al. Driving Pressure-Guided Individualized Positive End-Expiratory Pressure in Abdominal Surgery: A Randomized Controlled Trial. Anesth Analg. 2021 Nov 1;133(5):1197–205.
5. Roca O, Goligher EC, Amato MBP. Driving pressure: applying the concept at the bedside. Intensive Care Med. 2023;49(8):991–5.
6. Brochard L, Slutsky A, Pesenti A. Mechanical ventilation to minimize progression of lung injury in acute respiratory failure. Am J Respir Crit Care Med. 2017;195(4):438–42.

7. Bertoni M, Spadaro S, Goligher EC. Monitoring Patient Respiratory Effort during Mechanical Ventilation: Lung and Diaphragm-Protective Ventilation. Crit Care. 2020;24(1)
8. Bellani G, Grassi A, Sosio S, Foti G. Plateau and driving pressure in the presence of spontaneous breathing. Intensive Care Med. 2019;45(1):97–8.
9. Bellani G, Grassi A, Sosio S, Gatti S, Kavanagh BP, Pesenti A, et al. Driving Pressure Is Associated with Outcome during Assisted Ventilation in Acute Respiratory Distress Syndrome. Anesthesiology. 2019;131(3):594–604.
10. Bertoni M, Telias I, Urner M, Long M, Del Sorbo L, Fan E, et al. A novel non-invasive method to detect excessively high respiratory effort and dynamic transpulmonary driving pressure during mechanical ventilation. Crit Care. 2019;23(1):1–10.
11. Urner M, Jüni P, Hansen B, Wettstein MS, Ferguson ND, Fan E. Time-varying intensity of mechanical ventilation and mortality in patients with acute respiratory failure: a registry-based, prospective cohort study. Lancet Respir Med. 2020;8(9):905–13.

ORAL PRESENTATION 5

Preparedness through education for the intensive care unit (PREP-ICU) pilot study

Submission ID

3

ABSTRACT CATEGORY

4. Quality

AUTHORS

Weir, Timothy[1,2]; Spring, Jenna[1,2]; Detsky, Michael[1,2]; Ferreyro, Bruno[1,2]; Lee, Christie[1,2]; Munshi, Laveena[1,2]
1 Interdepartmental Division of Critical Care Medicine, University of Toronto, Toronto, Canada
2 Interdepartmental Center for Critical Care, University Health Network / Sinai Health, Toronto, Canada

INTRODUCTION:

Patients with hematologic malignancy (HM) are at particular risk of developing critical illness[1] with high risks of disability and death in a subset of patients.[2] In many cases, critical illness occurs suddenly and unexpectedly, leaving patients unable to communicate their wishes and preferences for their care. Advance care planning (ACP) attempts to identify patient values and preferences, helping to ensure that treatments are consistent with these.[3] Unfortunately, ACP conversations are not routinely undertaken in patients with HM, and when they are performed, it is often late in the disease course or at the time of a critical event.[4] Our study objectives were to evaluate the feasibility, effectiveness and acceptability of an ICU orientation pilot initiative to improve ACP in inpatients with HM at high risk of developing critical illness.

OBJECTIVES:

Our specific aims included: (1) To evaluate whether the ICU orientation intervention is feasible, (2) to evaluate the effectiveness of the ICU orientation intervention on knowledge acquisition of ICU escalation and strategies to reflect upon personal values and preferences, and (3) to evaluate the emotional impact (adverse events) of the ICU orientation intervention.

HYPOTHESIS:

We hypothesized that the intervention bundle would be feasible, effective at improving knowledge pertaining to ICU procedures, and associated with minimal emotional distress.

METHODS:

We conducted a pilot study of an ICU orientation intervention from March-May 2025 in which we enrolled inpatients with HM at high risk for developing critical illness. The inclusion criteria were (1) any adult inpatient with a “full code” designation during this hospitalization and (2) relapsed or refractory acute leukemia who remained eligible for systemic treatment, or who had undergone hematopoietic stem cell transplant, and were (i) over 60 years with two or more comorbidities or (ii) confirmed or suspected infection. Exclusion criteria were prior admission to ICU or expected survival of less than seven days.

Intervention: The ICU orientation intervention consisted of three parts: first, a 10-minute educational video, the themes of which are outlined in Figure 1; second, a workbook exploring personal values and preferences, and finally, a follow-up meeting 24-48 hours later with a critical care doctor to discuss the patient's values and preferences and re-explore the patient's goals of care (GOC).

Outcomes and Outcome Measures: The study outcomes included (1) feasibility, (2) effectiveness of the video, and (3) acceptability. To evaluate **feasibility**, we looked at recruitment rates, time to first and second meetings, and the completion of the 3 parts of the study and outcome measures. To evaluate **effectiveness**, we conducted pre- and post-video surveys focused on the patient's understanding of ICU interventions and outcomes. We also noted if GOC were modified following the intervention. To evaluate **acceptability**, we administered an emotional impact survey to elicit whether the intervention led to significant distress. The study intervention flow and outcome measures are outlined in Figure 2.

Study recruitment and data collection was undertaken by a trained research coordinator. The ICU orientation provider communicated with patients' MRPs to confirm eligibility, gain approval prior to approaching patients to participate, and to follow up on the outcome of the discussion. Our sample size goal was 15 patients.

RESULTS:

Feasibility: From March-May 2025, 49 patients were eligible and 15 consented to participate (recruitment rate of 31%). Median age was 65 +/- 5, 53% were male, and 80% were admitted to hospital for initiation of systemic chemotherapy or allogeneic stem cell transplant. Median time from hospital admission to the first meeting was 20 days (IQR 17-21 days). Median time from enrolment to the first meeting was 1 day (IQR 0-2 days) and from enrolment to the follow-up meeting was 2 days (IQR 2-7 days). 15/15 of the baseline educational surveys were completed, 12/15 of the follow up education survey were completed, 12/15 of the emotional impact surveys were completed. All patients completed the video intervention, and 13/15 patients completed the follow up meeting (one was discharged from hospital prior to completion and one did not wish to participate in the follow up meeting).

Effectiveness: To evaluate knowledge acquisition following the video, 12 patients completed both the pre and post educational survey. The mean score on the Knowledge Survey pre-intervention was 6.2/10 (SD 1.7), and 8.3 /10 (SD 1.9) following the intervention (p = 0.0003). Only 8% (1/12) patients scored 90-100% on the knowledge survey pre-interventions whereas 58% (7/12) scored 90-100% post intervention.

Following the intervention, there were modifications to GOC in half of those who completed the intervention (6/12 patients, 50%). Four patients (27%) modified their GOC "full code" to "admit to ICU but do not perform CPR" and 2/12 patients (17%) died while in hospital without escalating to ICU measures. During the time in hospital, 6/12 patients (50%) experienced critical illness: four were admitted to ICU and survived, and two died in hospital without being admitted to ICU.

Acceptability: Twelve participants (80%) completed the Emotional Impact Survey with 3/12 (25%) stating they agreed or strongly agreed that they felt sad and anxious hearing about or discussing ACP. Most participants agreed or strongly agreed that the video was informative: 11/12 (92%) were glad they had the opportunity to hear about and discuss ACP, 11/12 (92%) found the information in the video helpful, 10/12 (83%) would recommend the video to others, and 10/12 (83%) would recommend this type of conversation to other patients.

CONCLUSION:

This pilot study provides insights on the feasibility, effectiveness and acceptability of a video-based decision aid for ACP in HM inpatients at risk of developing critical illness. The intervention was associated with an increase in knowledge pertaining to ICU therapies. Most participants felt that the intervention was important and not associated with emotional distress. These findings will inform a larger scale study implementing this intervention with a view to assessing whether patients who develop critical illness receive goal-concordant care. Finally, there are opportunities to expand the scope of this intervention to include other patient groups outside of HM.

REFERENCES:

1. Ferreyro BL, Scales DC, Wunsch H, Cheung MC, Gupta V, Saskin R, et al. Critical illness in patients with hematologic malignancy: a population-based cohort study. Intensive Care Med. 2021;47(10):1104-14.
2. Munshi L, Dumas G, Rochwerg B, Shoukat F, Detsky M, Fergusson DA, et al. Long-term survival and functional outcomes of critically ill patients with hematologic malignancies: a Canadian multicenter prospective study. Intensive Care Med. 2024;50(4):561-72.
3. Sudore RL, Lum HD, You JJ, Hanson LC, Meier DE, Pantilat SZ, et al. Defining Advance Care Planning for Adults: a consensus definition from a multidisciplinary Delphi panel. J Pain Symptom Manage. 2017;53(5):821-832.e1.
4. Spring J, McKinlay J, Puxty K, Metaxa V, Detsky M, Mehta S, et al. Perspectives on Advance Care Planning for patients with hematologic malignancy. Ann Am Thorac Soc. 2021;18(9):1533-9.

ORAL PRESENTATION 6

Diaphragm Neurostimulation to Optimize Hemodynamic Performance during Invasive Mechanical Ventilation for Acute Respiratory Failure

Submission ID

30

ABSTRACT CATEGORY

2. Clinical/Health Services Research

AUTHORS

Thiago Bassi1, Idunn Morris1, Ewan C Goligher1.
1 University of Toronto

INTRODUCTION:

Positive pressure ventilation may impair cardiovascular performance by decreasing preload and increasing pulmonary vascular resistance. This can exacerbate shock states and contribute to organ dysfunction.1

OBJECTIVES:

Diaphragm neurostimulation facilitates controlled levels of diaphragm activity, but its effects on hemodynamics in mechanically ventilated patients has not been systematically described.

HYPOTHESIS:

Diaphragm neurostimulation optimize cardiac function in mechancially ventilated patients.

METHODS:

STIMULUS was a phase 1 clinical trial (NCT05465083) of diaphragm neurostimulation-assisted ventilation in passively ventilated patients with acute hypoxemic respiratory failure or respiratory failure post thoracic surgery. A specialized electrode-embedded central venous catheter was placed in the left subclavian or internal jugular vein to enable transvenous stimulation of bilateral phrenic nerves in synchrony with ventilator-initiated breaths (Lungpacer AeroPace Protect System; Lungpacer Medical). Hemodynamic measurements were obtained during passive ventilation and three levels of stimulation (titrated to expiratory occlusion pressure) at two randomly ordered levels of positive end expiratory pressure (PEEP), at least 5 cm H_2O apart. Pulmonary artery pressures and cardiac output were measured in those with an established clinical indication for monitoring.

RESULTS:

Sixteen of 19 enrolled patients underwent the stimulation titration procedure. Most had pre-existing cardiac dysfunction (12/16; 75%); 9 had documented right ventricular dysfunction and/or pulmonary hypertension (56%). Increasing diaphragm neurostimulation was associated with increases in cardiac index (Figure 1A, n=8, p=0.003), stroke volume index (Figure 1B, n=8, p=0.016), and mean arterial pressure

(Figure 1C, n=16, p=0.002). Mean pulmonary artery pressure decreased with increasing stimulation (Figure 1D, n=11, p<0.001). Given coincident increases in cardiac index, decreases in pulmonary artery pressure likely reflect decreases in pulmonary vascular resistance.

CONCLUSION:

Diaphragm neurostimulation increases cardiac output and reduces pulmonary artery pressure in a dose-response fashion across the range of physiological levels of inspiratory effort, mitigating the adverse hemodynamic effects of positive pressure ventilation.

REFERENCES:

1-Parfait M, Rohrs E, Joussellin V, Mayaux J, Decavèle M, Reynolds S, Similowski T, Demoule A, Dres M. An Initial Investigation of Diaphragm Neurostimulation in Patients with Acute Respiratory Distress Syndrome. Anesthesiology. 2024 Mar 1;140(3):483-494. doi: 10.1097/ALN.0000000000004873. PMID: 38088791

ORAL PRESENTATION 7

Mechanical ventilation in neurosurgical patients: can we safely reduce assistance? The ENVISION study

Submission ID

23

ABSTRACT CATEGORY

3. Physiology

AUTHORS

Phoophiboon, Vorakamol[1,2,3,4]; Rodrigues[1,2], Antenor; Ko, Matthew[1,2]; Docci, Mattia[1,2,3,5]; Schreiber, Annia[1,2]; Butterworth, Rosie; [1,2] Menga, Luca Salvatore[1,2], Gerardy, Bethany[6]; Bizios, Adam[1,2]; Sousa, Mayson L.A. [1,2,7]; Vieira, Fernando[1,2]; Sklar, Michael C[1,2,3]; Rigamonti, Andrea[1,2,3]; Brochard, Laurent[1,2,3]

[1]Keenan Centre for Biomedical Research, Li Ka Shing Knowledge Institute, Unity Health Toronto, Toronto, Ontario, Canada

[2]Interdepartmental Division of Critical Care Medicine, University of Toronto, Toronto, Ontario, Canada

[3]Department of Critical Care, St Michael's Hospital, Unity Health Toronto, Toronto, Ontario, Canada

[4]Division of Critical Care Medicine, Department of Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

[5]School of Medicine and Surgery, University of Milano-Bicocca, Monza, Italy

[6]YRT Limited, Winnipeg, Canada

[7]Department of Medicine, University of Manitoba, Winnipeg, MB, Canada.

INTRODUCTION:

Many neurosurgical patients with acute brain injury (ABI) such as subarachnoid hemorrhage, subdural hematoma, intracerebral hemorrhage, isolated traumatic brain injury are kept on mechanical ventilation (MV) only waiting for their neurological recovery. Over assistance may occur and lead to negative effects on diaphragm(1), cerebral circulation and duration of stay. Recognizing that MV is not needed may lead to shorter decisions for extubation.

OBJECTIVES:

The aim of this physiological study in neurosurgical patients under MV, eligible for spontaneous breathing trial (SBT) was to assess the effects of different MV settings on regional ventilation distribution, respiratory variables, respiratory muscle activity (diaphragm and intercostal), brain circulation (oximetry).

HYPOTHESIS:

Over-assistance from MV may occur in neurosurgical patients, and reducing assistance may be often possible.

METHODS:
The study was conducted under the following settings: clinical pressure support (CPSV, PS [8-10] & PEEP [5-8] cmH_2O), low ventilation setting (LPSV, PS 5 & PEEP $5cmH_2O$) and during SBT for 30 min (PS 0 & PEEP $0cmH_2O$), respectively. EIT images were divided into ventral (V) & dorsal (D) regions, a smaller VD difference indicating a more homogeneous ventilation.(2) Over-assistance was defined by muscle pressure Pmus < 5 cmH_2O and / or a pressure muscle index PMI < 0 cmH_2O(3, 4), under assistance was Pmus ≥ 15 cmH_2O.(4, 5) Diaphragm and PI thickening fraction (TFdi and TFic), regional cerebral oximetry (StO_2) and electroencephalogram's pattern (EEG) were also monitored.

RESULTS:
Twenty-seven patients passed SBT and were entered into the study. Distribution of ventilation showed high VD difference at baseline and decreased slightly from 24.5% [15.6-29.4] to 18.8 [9.9-23.6] in SBT, p=0.002. Over-assistance (PMI < 0 cmH_2O) was frequent and decreased from CPSV (n=12, 44%) to LPSV and SBT (n=0), p=0.0001. (Figure) During SBT, respiratory system compliance decreased (p<0.0001), TFdi (p<0.0001) and TFic (p=0.009), P0.1 (p=0.001) and Pmus (p<0.0001) all increased. StO_2, EEG patterns and vital signs did not change across the different settings. Seven patients were found to be underassisted at SBT (Figure) and P0.1 ≥ 4 cmH_2O had 80% sensitivity and 91% specificity to detect this under-assistance.

Figure. Sankey diagram demonstrated the number of patients in over (blue), adequate (pink) and under (green) assistance from mechanical ventilation during clinical pressure support ventilation (CPSV), low pressure support ventilation (LPSV) and spontaneous breathing trial (SBT). Over-assistance defined by PMI < 0 cmH_2O, adequate-assistance defined by PMI ≥ 0 and Pmus < 15 cmH_2O and under-assistance defined by Pmus ≥ 15 cmH_2O.

CONCLUSION:
Neurosurgical patients with ABI are over-assisted at clinical MV setting in more than 40% of cases. Reducing MV support could be safely performed in many patients. Pmus and P0.1 can detect the few patients who may become under-assisted.

REFERENCES:

1. Dres M, Dubé BP, Goligher E, Vorona S, Demiri S, Morawiec E, et al. Usefulness of Parasternal Intercostal Muscle Ultrasound during Weaning from Mechanical Ventilation. Anesthesiology. 2020;132(5):1114-25.
2. Phoophiboon V, Rodrigues A, Vieira F, Ko M, Madotto F, Schreiber A, et al. Ventilation distribution during spontaneous breathing trials predicts liberation from mechanical ventilation: the VISION study. Critical Care. 2025;29(1):11.
3. Docci M, Rezoagli E, Teggia-Droghi M, Coppadoro A, Pozzi M, Grassi A, et al. Individual response in patient's effort and driving pressure to variations in assistance during pressure support ventilation. Annals of Intensive Care. 2023;13(1):132.
4. Goligher EC, Dres M, Patel BK, Sahetya SK, Beitler JR, Telias I, et al. Lung- and Diaphragm-Protective Ventilation. Am J Respir Crit Care Med. 2020;202(7):950-61.

Bertoni M, Telias I, Urner M, Long M, Del Sorbo L, Fan E, et al. A novel non-invasive method to detect excessively high respiratory effort and dynamic transpulmonary driving pressure during mechanical ventilation. Critical Care. 2019;23(1):346.

ORAL PRESENTATION 8

Life support limitation decisions in patients with acute brain injury and cardiac arrest: a secondary analysis of three prospective observational studies

Submission ID

16

ABSTRACT CATEGORY

2. Clinical/Health Services Research

AUTHORS

Taran, Shaurya[1,2,3] Liu, Kuan[3]
Penuelas, Oscar[4,5]
Burns, Karen E.A.[1,6,7] Frutos-Vivar,
Fernando[4,5] Scales, Damon C.[2,3,8]
Ferguson, Niall D.[1,2,3,9] McCredie,
Victoria A.[1,2,3] Singh, Jeffrey M.[1,2]
Adhikari, Neill K.J.[2,3,8]

[1] Department of Medicine, University Health Network, Toronto, Ontario, Canada
[2] Interdepartmental Division of Critical Care Medicine, University of Toronto, Toronto, Ontario, Canada
[3] Institute of Health Policy, Management, and Evaluation, University of Toronto, Toronto, Ontario, Canada
[4] Intensive care Unit, Hospital Universitario de Getafe, Madrid, Spain
[5] Centro de Investigación en Red de Enfermedades Respiratorias, CIBERES, Madrid, Spain
[6] Division of Critical Care Medicine, Department of Medicine, Unity Health Toronto, St Michael's Hospital, Toronto, Ontario, Canada
[7] Li Ka Shing Knowledge Institute, St Michael's Hospital, Toronto, Ontario, Canada
[8] Department of Critical Care Medicine, Sunnybrook Health Sciences Centre, Toronto, Canada
[9] Toronto General Hospital Research Institute, Toronto, Ontario, Canada

INTRODUCTION:

Decisions to withdraw or withhold life-sustaining therapies (WLST) are responsible for a large proportion of deaths in the intensive care unit (ICU). Among critically ill patients, especially those with acute brain injury (ABI) or cardiac arrest, WLST decisions are often

driven by clinicians' prediction of poor neurologic prognosis.[1,2] Premature WLST, particularly in the neurologically injured, may contribute to self-fulfilling prophecies and truncate recovery potential. Although recent international neuroprognostication guidelines

caution against early WLST decisions,[3,4] it remains unclear whether practices have changed over time, whether approaches differ by diagnosis, and how neurologic versus systemic organ failures influence decision-making.

OBJECTIVES:

1. To determine whether patients with ABI and cardiac arrest experience WLST more frequently and earlier than other ICU patients.

2. To assess whether WLST practices for these patients have evolved over time.

3. To evaluate the contribution of neurologic versus non-neurologic organ failures to WLST decisions across different diagnostic groups.

HYPOTHESIS:

We hypothesized that:

- WLST would be more frequent and occur earlier in patients with ABI and cardiac arrest than in comparator ICU patients.

- This pattern would persist over time, including after the publication of major international neuroprognostication guidelines.

- Non-neurologic organ failures would drive fewer WLST decisions in patients with ABI or cardiac arrest, compared to those with comparator conditions.

METHODS:

We performed a secondary analysis of three large prospective ICU cohorts: the International Study of Mechanical Ventilation (ISMV),[5] the International Observational Study (IOS),[6] and the Global Epidemiology of Mechanical Ventilation in the ICU (GEMINI)[presently unpublished]. Adult patients receiving mechanical ventilation between 2010 and 2022 were included and stratified into three mutually exclusive groups: ABI (defined as any of traumatic brain injury, ischemic stroke, or intracerebral hemorrhage), post-cardiac arrest brain injury, and a comparator group with other ICU diagnoses.

The primary outcome was a composite of WLST decisions (either withdrawal or withholding of life-sustaining therapies), assessed up to 28 days after ICU admission. WLST was treated as a time-to-event variable with death as a competing risk. We used cause-specific Cox proportional hazards models with time-varying effects to account for violations of the proportional hazards assumption and adjusted for baseline confounders including age, sex, illness severity, and organ failure scores. Models accounted for ICU site clustering and year of cohort enrollment.

Secondary outcomes included individual analysis of withdrawal and withholding events, ICU mortality, and the association between time-varying clinical complications and WLST. Sensitivity analyses included multiple imputation for missing data and additional adjustment for comorbidities and time-varying organ dysfunction.

RESULTS:

The harmonized cohort included 24,842 ICU patients (3,039 with ABI, 1,567 with cardiac arrest, and 20,236 comparators). WLST occurred in 15.6% of patients with ABI and 22.3% with cardiac arrest, compared to 9.9% in the comparator group. WLST occurred earlier in ABI (median: 4 days) and cardiac arrest (median: 3 days) patients compared to comparators (median: 6 days), with no difference across cohort years.

Time-varying Cox models revealed a strong early association between ABI (HR at ICU admission: 3.61; 95% CI: 2.74–4.74) and cardiac arrest (HR: 4.65; 95% CI: 3.49–6.19) with WLST, which attenuated over time and became non-significant by day 14. These findings persisted across sensitivity analyses and in analyses of withdrawal and withholding events as separate outcomes.

Stratified analysis showed no significant change in baseline WLST hazard across cohort years, suggesting persistent early WLST. Among patients with WLST within 3 days of ICU admission, sedation was common and rarely interrupted, particularly in ABI and cardiac arrest groups.

Neurologic dysfunction, measured by the Glasgow Coma Scale (GCS), was more strongly associated with WLST in ABI and cardiac arrest than in comparator conditions. Conversely, the impact of additional non-neurologic organ failures on WLST was significantly attenuated in ABI (interaction p = 0.04) compared to comparator patients.

Mortality analyses confirmed higher ICU mortality in patients with cardiac arrest (46.8%) and ABI (38.1%) versus comparators (25.0%). WLST was the most common cause of death in cardiac arrest patients and the second most common in ABI after brain death.

CONCLUSION:

This international, multicenter study reveals that patients with ABI and cardiac arrest are significantly more likely to undergo WLST—and to do so earlier—than other ICU patients. There was no apparent change in WLST practices over the twelve-year study period, including after the publication of neuroprognostication guidelines. The strength of association between early WLST and these diagnoses suggests a potential bias toward early decisions in groups where prognosis is inherently uncertain. Importantly, neurologic impairment appears to drive these decisions more than systemic organ failure, particularly in ABI patients.

These findings raise questions about the appropriateness of early WLST, especially in populations vulnerable to premature pessimism in prognostication. Future research should investigate the implementation of structured, delayed prognostic protocols and decision aids to mitigate self-fulfilling prophecies.

REFERENCES:

1. Elmer J, Torres C, Aufderheide TP, et al. Association of early withdrawal of life- sustaining therapy for perceived neurological prognosis with mortality after cardiac arrest. Resuscitation 2016; 102: 127-35.

2. Mark NM, Rayner SG, Lee NJ, Curtis JR. Global variability in withholding and withdrawal of life-sustaining treatment in the intensive care unit: a systematic review. *Intensive Care Med* 2015; **41**(9): 1572-85.

3. Muehlschlegel S, Rajajee V, Wartenberg KE, et al. Guidelines for Neuroprognostication in Critically Ill Adults with Moderate–Severe Traumatic Brain Injury. Neurocritical Care 2024; 40(2): 448-76.

4. Greenberg SM, Ziai WC, Cordonnier C, et al. 2022 Guideline for the Management of Patients With Spontaneous Intracerebral Hemorrhage: A Guideline From the American Heart Association/American Stroke Association. Stroke 2022; 53(7): e282-e361.

5. Peñuelas O, Muriel A, Abraira V, et al. Inter-country variability over time in the mortality of mechanically ventilated patients. *Intensive Care Med* 2020; **46**(3): 444-53.

6. Burns KEA, Rizvi L, Cook DJ, et al. Ventilator Weaning and Discontinuation Practices for Critically Ill Patients. Jama 2021; 325(12): 1173-84.

POSTER PRESENTATION LIST

Basic/Translational Science Category I
Poster Discussion Facilitators: Haibo Zhang

P1 Abstract # 12
P2 Abstract # 33
P3 Abstract # 36
P4 Abstract # 48
P5 Abstract # 50
P6 Abstract # 54

Physiology Category I
Poster Discussion Facilitators: Annia Schreiber, Luca Menga

P7 Abstract # 7
P8 Abstract # 24
P9 Abstract # 25
P10 Abstract # 38

Physiology Category II
Poster Discussion Facilitators: Irene Telias, Mike Sklar

P11 Abstract # 44
P12 Abstract # 45
P13 Abstract # 55

Education /Systematic Review/Case Report I
Poster Discussion Facilitators: : Briseida Mema, Jenna Spring

P14 Abstract # 8
P15 Abstract # 9
P16 Abstract # 10
P17 Abstract # 11

Education /Systematic Review/Case Report II
Poster Discussion Facilitators: Luciana Rodrigues, Mika Hamilton

P18 Abstract # 13
P19 Abstract # 14
P20 Abstract # 37
P21 Abstract # 43

Clinical Research/Health Services Research I
Poster Discussion Facilitators: Brian Cuthbertson

P22 Abstract # 4

P23 Abstract # 15
P24 Abstract # 19
P25 Abstract # 20
P26 Abstract # 21

Clinical Research/Health Services Research II
Poster Discussion Facilitators: Gail Annich, Laura Dragoi

P27 Abstract # 26
P28 Abstract # 27
P29 Abstract # 28
P30 Abstract # 29
P31 Abstract # 32

Clinical Research/Health Services Research III
Poster Discussion Facilitators: Vicki McCredie, Chris Yarnell

P32 Abstract # 35
P33 Abstract # 39
P34 Abstract # 40
P35 Abstract # 47
P36 Abstract # 51

Clinical Research/Health Services Research IV
Poster Discussion Facilitators: Niall Ferguson, Federico Angriman

P37 Abstract # 52
P38 Abstract # 56
P39 Abstract # 57
P40 Abstract # 58

Quality Research I
Poster Discussion Facilitators: Elaine Gilfoyle

P41 Abstract # 2
P42 Abstract # 5
P43 Abstract # 6

Quality Research II
Poster Discussion Facilitators: Alberto Goffi

P44 Abstract # 18
P45 Abstract # 22
P46 Abstract # 41