

Critical Care SCN Alberta Society of Intensive Care Physicians Research Symposium Abstracts

January 20th, 2024



On behalf of the Alberta Society of Intensive Care Physicians, I extend a warm welcome to all participants attending this year's ASICP/CC SCN Research Symposium. We greatly appreciate your valuable contributions through your diligent efforts, which are integral to driving the progress of Intensive Care in our province. Your ideas and findings hold significant importance, forming a crucial part of our Winter Meeting's Educational program. I wholeheartedly express my gratitude for your unwavering dedication and continuous enthusiasm in enriching our academic program by presenting here in the picturesque Lake Louise. Wishing you the best of luck in all your endeavors.

Ken Parhar
President
Section of Intensive Care and Alberta Society of Intensive Care Physicians

Welcome to the Annual ASICP/CCSCN Research Symposium! On behalf of the AHS Critical Care Strategic Clinical Network (CC SCN), we would like to welcome a broad spectrum of presenters, including multi-level learners, early career, and multi-disciplinary clinicians, who have been selected to present their exciting work at this year's symposium. This ASICP/CCSCN Research Symposium has grown into one of the highlights of the Annual Mark Heule ASICP Meeting at the Post Hotel in beautiful Lake Louise. We would also like to acknowledge the time and dedication to all the mentors and supervisors of this year's presenters without whose continuing support to our annual Research Symposium would not be possible. We look forward to hearing about the innovative work being done across Alberta.

Sean Bagshaw
Scientific Director CC SCN

EXIT-ICU National Survey: Factors Leading Canadian ICU Healthcare Workers to Leave or Consider Leaving Their ICU Positions Since Onset of the COVID-19 Pandemic

Andersen SK, Kilcommons S, Deschenes S, Mudry T, Lau V

Background

ICU staff turnover has become increasingly common following the COVID-19 pandemic. Inadequate staffing is detrimental to patient care and a deeper understanding of factors leading staff to leave ICU positions is urgently needed to improve retention. The purpose of this study was to determine what factors have led Canadian healthcare workers to leave or consider leaving their ICU positions since onset of the COVID-19 pandemic and identify potential targets for intervention.

Methods

We distributed an electronic questionnaire to 2 provincial and 7 national healthcare professional organizations between August and December 2023. We used a combination of purposeful and snowball sampling to target healthcare workers who had been employed in a Canadian ICU at any point between January 2020 and December 2023. The questionnaire was developed by an interdisciplinary team of researchers and clinicians and piloted locally prior to distribution. Survey data was collected using RedCAP and preliminary results are reported below.

Results

Of the 444 eligible healthcare workers who consented to participate, 308 (69%) completed the questionnaire. Most respondents (84%) worked in adult ICUs, and the majority were from BC (48%), Alberta (30%), or Ontario (20%). Represented professions included registered nurses (63%), respiratory therapists (12%), physicians (7.5%), social workers (4.8%), and physiotherapists (1.3%). Half (49%) had left an ICU position since 2020. Among those still employed, 71% thought about leaving at least monthly and 18%, daily. For 59%, COVID-19 contributed to their decision or desire to leave. The most important factors contributing to intent to leave included: staffing, workload, decreased professional efficacy and inadequate work-life balance. Key organizational factors included dissatisfaction with leadership and culture. Most rated their current workplace experience and quality of care provided post-pandemic as unchanged or worse; only 16% felt their institution was responsive to concerns and only 34% reported that their institution was working to improve the quality of care. Unit-based (54%) and organizational (21%) interventions were rated as most important to improve staff retention.

Conclusion

Desire to leave and workplace dissatisfaction remain high among ICU staff. Future unit and organizational interventions should focus on improving staffing, workload, professional self-efficacy, institutional leadership and culture.

International Long-Haul Critical Care Transport - A Case Presentation

Cowan S

Background

The transport of critical care patients brings an expanded level of complexity beyond the considerations of a standard intensive care unit. Typical transports occur on a regional basis, however, on occasion, long-haul international repatriation of critical care patients is required. Significant logistical and medical considerations are required in planning for and determining the safety of these rare long-haul transports.

The Case

A request for transport of a young adult male in Seoul Korea with a previously diagnosed COVID-19 induced cardiomyopathy sustained an acute hemodynamic collapse with severe AKI and SCAI class D cardiogenic shock while abroad. The patient was dependent on 2 inotropic agents and considered for temporary mechanical support before returning to Texas, USA, where he was to undergo workup for heart transplant given his decompensation. His condition improved to a status that allowed consideration for critical care transport to the US. In this presentation, the considerations in planning such a transport, including maximum ventilatory support for a 26-hour flight sequence, effects of altitude on respiratory function with severely reduced cardiac function, access and monitoring capabilities and travel logistics are explored. The selected transport team consisted of a transport physician, critical care transport paramedic and critical care RN in addition to the aviation team of 4 pilots and background logistics support team. Communication with the sending team was limited and clinical details were considered to be vague and unclear, resulting in the team planning for significant critical intervention for stabilization and safe transport.

Conclusion

Through presentation of this rare long-haul transport, lessons such as maximum ventilatory support possible over a 26-hour flight, medication supply and reserve, monitoring requirements and logistical challenges, the aim is to highlight the unique and uncommon considerations of long-distance transport medicine through case presentation.

Mortality and Morbidity Under the Microscope: A Protocol for a Think-Aloud Based Analysis of Intensivist Chart Review Practices

Goswami A, Hudson D, Zuege D, Au S

Background

Chart review is a gold standard for identifying hazards to patients in patient safety research and improvement endeavors. This is particularly true in the critically ill patient, which receives care in a unique environment with high – stakes decisions and significant diagnostic uncertainty. A new provincial computer information system (CIS) known as ConnectCare was implemented in the 4 adult ICUs in the Calgary Zone over the past year and frequently sought information pertaining to mortality chart review (e.g. cardiac arrest notes) is challenging to access as per physician feedback. We present a protocol for an observational “think–aloud” study of how Department of Critical Care Medicine (DCCM) clinicians undergo chart review.

Methods

We propose utilizing real patient charts, as simulated charts lack the complexity relatively. Enrollment will be open to all intensivists and fellows in the Calgary DCCM during the approved study period. We anticipate 15 clinicians to be sufficient – evidence from think - aloud analysis in user interface testing found 5 subjects allowed for identification of 77-85% of the perceived issues. DCCM clinicians will be assigned a patient chart to review. Study personnel will observe the order of operations in which clinicians undergo chart review. We will record a physicians' verbalized thought process during chart navigation. We will perform a follow-up interview with a standardized questionnaire to identify themes during chart review. The results from the talk – aloud analysis will be transcribed and coded using conventional talk – aloud coding practices. As this abstract describes a protocol, results are not available at present but will be present at the conclusion of this study.

Conclusion

Clinician chart review plays an integral role in the quality improvement infrastructure of the intensive care unit. Minimal training is devoted to this task in undergraduate or postgraduate medical training, despite this being a commonly accepted responsibility of attending physicians. Our study will elucidate common themes and hurdles in electronic chart navigation across the 4 adult Calgary ICUs and identify opportunities to improve the chart review process in the ICU.

Advance Care Planning for Adults with Moderate to Severe Congenital Heart Disease ACP-ACHD: Readiness Trial

Jenkins JD, Poku K, Hass C, Kotelko MAL, Campbell D, Keir M

Background

Adults with congenital heart disease (ACHD) are growing in number and living longer with complex lesions; however, many are at risk of death in mid-life. Conversations about advance care planning (ACP) in this population have been found to be infrequent and not part of regular outpatient care. The intent of this study was to explore ACHD patients' readiness to discuss ACP and assess the impact of interventions to support ACP conversations.

Methods

We used a participatory action framework to guide every phase of research, with ACHD members of our research team. Prior to this study, a focus group was conducted to outline research priorities for ACHD. Based on ACHD set priorities, we conducted a prospective, randomized, single-center trial of adults with moderate to severe CHD. Participants were included if they attended a CHD clinic in Calgary and were over 18 years. The control group was asked if they were ready to discuss their wishes if they were to become seriously ill. The intervention group was provided two additional resources with the readiness question, the modified Lyon Family-Centered ACP Survey (ML-ACP) to explore preferences and values when faced with serious illness and a patient-partner created ACHD-ACP video. Data was presented using descriptive statistics.

Results

A total of 111 responses (control (n=59) and intervention (n=52)) were collected, with a mean age of 39.6 years (SD=14.8). No significant difference was found between the group's readiness. Most participants (92.8%) responded positively towards initiating conversations about ACP. Participants rated the following as very important: knowing what their chances of survival were (90.4%) and understanding treatment choices (82.7%). Participants cited being very afraid or somewhat afraid of being a burden (either physically or financially, 88.5% and 86.5% respectively) on their families.

Conclusions

We found that adults with CHD, despite their young age, are ready to have ACP conversations as part of their outpatient care. The ML-ACP survey and ACHD-ACP video are helpful adjuncts to provide ACHD specific ACP and assess values and concerns around ACP and serious illness. Further inclusive research is needed to involve family in ACP and evaluate ACP integration in outpatient care.

Geometrical Understanding of Uncertainty in Clinical Reasoning Process

Lee CH, Waechter J, Doig C

Background

Clinical reasoning is a cognitive process of assessing patient information, formulating differential diagnoses, and developing treatment strategies. Uncertainty is associated with every step in this process, arising from various sources, such as the lack of information, conflict, incompleteness, and fuzziness. Clinicians have used probability to describe aleatory uncertainty about outcomes; however, epidemic uncertainty in this reasoning has not been well explored.

Methods

We adopted the theory of imprecise probabilities proposed by Walley's (1991) study for conceptualizing and quantifying uncertainty and implemented a so-called imprecise inferential model as an R package, iDDX. A random online training module was taken from www.teachingmedicine.com, and the history of assessment skills over four stages (case introduction, taking a history, physical examination, and investigation) for final clinical decision-making was used for illustration purposes.

Results

The imprecise model implemented provides a convenient and intuitive approach to eliciting a prior in a mathematical form using upper and lower probabilities, which is known to be the biggest flaw of Bayesian studies. This characterization strategy allows us to describe the cognitive state of complete or near-prior ignorance when information is little or unavailable. The difference between these probability bounds plays a role as a measure of imprecision. We use a graphical approach to illustrate that informational imprecision decreases over decision-making steps, and intrinsic uncertainty remains at the final diagnosis. Moreover, the imprecision measure helps us understand that any prior is informative in either direction regardless of correctness, and observation may differ from prior information or expectations. This graphical approach also benefits computation since two inference and prediction estimation problems can be solved graphically by translating model parameters.

Conclusions

This imprecise model provides an inferential framework supporting the indeterminate decision, a more realistic conclusion during clinical reasoning in practice, by adopting the measure of imprecision. We expect the model to be helpful when a sample is small. However, this imprecise inference is limited by a learning parameter explaining how quickly the amount of imprecision is shrinking. Further study is needed to develop a strategy for choosing the optimal learning parameter.

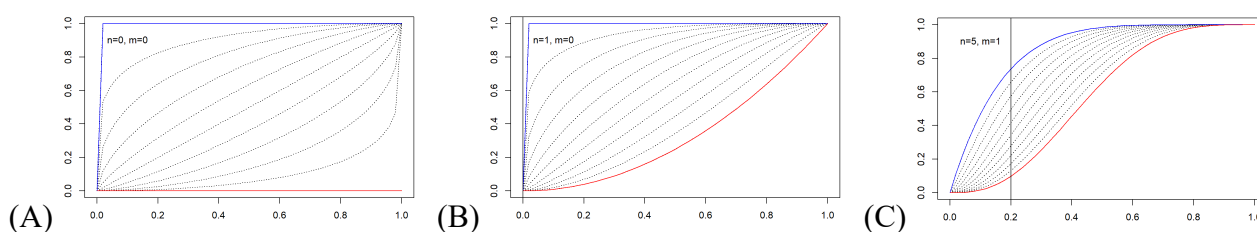


Figure 1. The area enclosed by lower and upper probabilities is the degree of imprecision. (A) State of complete ignorance, (B) Contribution direction of a prior to decreasing imprecision, and (C) Parameter estimation as shrinkage of imprecision.

Evaluating Bone and Muscle Changes Among Critical Care Patients with CT Imaging

Smith ACJ, Bott KN, Hisey BM, Lee CH, Solverson KJ, Grant C, Boyd SK, Doig CJ, Manske SL

Background

Critical care patients are susceptible to muscle degradation and bone loss. This can lead to fractures and long-term physical impairment. However, it is unclear which critical care patients are at the greatest risk of muscle degeneration. Moreover, bone loss among critical care patients has been scarcely investigated. CT images acquired in the intensive care unit (ICU) can be repurposed to evaluate muscle cross-sectional area (CSA) and bone mineral density (BMD). The objectives of this study were to: 1) measure changes in muscle CSA and BMD over the course of critical illness; 2) determine risk factors associated with muscle loss.

Methods

We retrospectively acquired abdominal CT scans of ICU trauma and sepsis patients. Patients were included if they had a CT scan within 48 hours of ICU admission (baseline) and a second CT scan taken >3 days later, prior to discharge (follow-up). We assessed mean psoas muscle CSA (cm²) by segmenting the psoas muscle at L3 using an automated algorithm with manual correction. We assessed femur BMD for a subsample of patients with >14 days between their baseline and follow-up scans using a machine learning algorithm and internal calibration approach. We acquired patient demographics using electronic medical records.

Results

Critical care patients (n = 164) had a mean time between scans of 12 ± 9 days. Patients had a mean psoas CSA of 14.60 ± 6.45 cm² at baseline and 12.80 ± 5.55 cm² at follow-up ($p < 0.001$). Absolute muscle CSA loss was greater in trauma than sepsis patients ($p < 0.001$), in younger patients ($p < 0.05$), and in males ($p < 0.01$). Patients with greater illness severity (SOFA, Apache-IV scores) experienced greater relative muscle CSA loss ($p < 0.05$). Critical care patients in the bone analysis subsample (n = 12) had no difference between baseline and follow-up femur BMD ($p = 0.46$).

Conclusions

Patients with more muscle at admission, typically young males with traumatic injuries, experience greater absolute muscle loss. Patients with more severe illness experience greater relative muscle loss. Next, it must be determined whether relative or absolute muscle loss better predicts post-ICU function.

A-line(ing) with Best Practice: A Quality Improvement Initiative to Optimize Arterial Line Insertion and Securing Practices

Spence S, Thomas R, Brandt K, Mundell A

Background

Over 50% of respiratory therapists (RTs) surveyed within our ICU indicated they had never been formally trained in radial arterial line insertion techniques. Baseline tracking demonstrated a first-time success rate of only 54%, with ultrasound (US) use occurring in 45% of insertions. As using US has been shown to increase first-attempt success rates and decrease frequency of complications and time to cannulation, this was identified as an important quality gap to address.

Methods

Employing the PDSA framework for quality improvement (QI), a baseline survey was administered and insertion tracking sheets were developed to track baseline success rates, US use, catheter type, and relevant patient factors. A two-part curriculum was developed and administered by way of a recorded screencast and in-person sessions. Equipment was standardized to a single arterial catheter, and suturing instruction was provided. The ICU RT lead and project lead MD were available thereafter for ad-hoc refreshers on US use and suturing technique. Process, outcome, and balancing measures of interest were tracked for intervention efficacy and trends amenable to future improvement cycles.

Results

110 insertions were tracked at baseline, of which 54% were successful on the first attempt and 72% successful overall. US was employed for 45% of insertions, and arrow catheters used 68% of the time. 110 post-intervention insertions tracked revealed a 72.7% first-attempt success rate, and an 86.5% overall success rate. US was used for 100% of post-intervention insertions, and arrow catheters used in 100% of cases. 94% of post-intervention arterial lines were sutured in place. No reported patient complications occurred in either group, and survey results demonstrated that the education intervention was well tolerated by RTs and that US use and suturing did not adversely affect RT workload or job satisfaction.

Conclusions

Our novel QI intervention was both well-tolerated and demonstrably effective among RTs at Chinook Regional Hospital (CRH) ICU. Given a lack of drawbacks and improvements in RT job satisfaction and insertion success rates, efforts to begin scaling this intervention provincewide are underway. Later follow-up data will likely be collected to ensure persistence of benefits, and detailed costing data may also be sought to evaluate project economic impact.

ICU Specific Resources for Indigenous Patients and Families: An Environmental Scan of ICUs in Alberta

Turner A, Deschenes S, Ames L, Bagshaw SM

Background

Indigenous Peoples are disproportionately burdened with a spectrum of health problems and consistently report lower satisfaction with their healthcare experience compared with non-Indigenous Canadians, yet little is known about their experiences in the context of critical care medicine. It is vital to understand the current scope of information available for Indigenous Peoples in the ICU to work towards a two-eyed seeing understanding about culturally competent ICU care and establishing ethical and culturally safe ICU spaces. Our aim was to synthesize information on ICU specific resources for Indigenous patients so that we may identify gaps and build a forward-looking foundation for organizational learning to lead culturally safe change for Indigenous Peoples in critical care medicine.

Methods

We conducted an environmental scan, following Charlton's approach. In the first phase, we searched >20 websites and selected social media platforms for information targeted towards Indigenous patients, their families, and for health care professionals. In the second phase, we conducted interviews with ICU stakeholders to elicit information on site specific resources, services, tools, or initiatives dedicated to Indigenous patients. Interviews were conducted online, ~30 minutes, audio recorded, and transcribed for later analysis. We aimed to sample 1-2 stakeholders in each ICU across Alberta to ensure proper representation.

Results

Preliminary results of the internet search have failed to yield any resources, services, policies, or tools that promote an Indigenous-cultural informed and safe space. For the second phase, 5 interviews have been completed so far, including 3 medical directors, 1 clinical nurse educator, and 1 social worker. Though interviews are still being conducted, preliminary results have revealed some general themes: 1) ICU sites sampled have limited critical care supports dedicated to Indigenous patients. Resources are generally limited to supports that all patients, regardless of identity, can access, or are hospital wide resources and not ICU specific; and 2) All sites perceive that their ICU "needs improvement" in terms of supporting Indigenous patients with appropriate resources.

Conclusions

At the level of critical care, there are limited ICU-specific resources, policies, and procedures dedicated to supporting Indigenous patients and their families, along with the unique challenges confronted by critical care healthcare professionals.

CT Perfusion for Assessment of Poor Neurological Outcome in Comatose Cardiac Arrest Patients

Wiens EJ, Alcock S, Singh S, Singh N, Ande SR, Lampron K, Huang B, Kirkpatrick I, Trivedi A, Schaffer SA, Shankar JS

Background

Out-of-hospital cardiac arrest (OHCA) occurs in ~40,000 Canadians per year, with an estimated overall 10% survival. Neurologic prognostication following OHCA remains imprecise, and generally involves clinical assessment after at least 72 hours of ICU care. This delay and imprecision may result in unnecessary healthcare resource expenditure for patients in whom treatment will be ultimately futile, as well as uncertainty for a patient's family. Currently, there is no reliable method for determining neurologic outcome immediately after OHCA. CT Perfusion (CTP) is an imaging modality capable of quantifying cerebral blood flow, and has shown high sensitivity and specificity in assessment of brain death. However, it has not been assessed for prognostication in the immediate post-OHCA period. Our study aims to validate CTP for predicting poor neurologic outcome in OHCA patients.

Methods

We enrolled 90 consecutive adult OHCA patients who were comatose at the time of admission and in whom standard therapy was planned, including targeted temperature management to 36.6°C. All patients underwent CTP prior to admission except for patients diagnosed with STEMI, in whom CTP occurred after emergent cardiac catheterization. Exclusion criteria included known pregnancy, contraindication to CT contrast agent, or eGFR <30 ml/min/1.73m². Interpretation was by 2 independent neuroradiologists, and patients were classified as "dead" or "not dead" based on cerebral blood flow quantification. Clinicians were blinded to the results. Clinical data was collected including in-hospital mortality and neurologic status at discharge, with poor neurologic status being defined as modified Rankin scale ≥4.

Results

A previous pilot study of 10 patients in the same center showed that CTP correctly classified brain death in 3/10 patients, and that there were no false positives (ie. 100% positive predictive value), suggesting that CTP may be useful for early identification of patients destined for poor clinical or neurologic outcome. Final results for this larger cohort will be available by the end of 2023.

Conclusions

CTP may be a useful imaging modality for identifying patients destined for poor neurologic outcome immediately post-OHCA. This may allow more accurate communication with a patient's family regarding prognosis and expectations, and also potentially reduce healthcare resource expenditure.