

Australian and New Zealand College of Perfusionists

37th ANNUAL SCIENTIFIC MEETING

Zoom Webinar

12th – 13th November 2020

Australian and New Zealand
College of Perfusionists



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Conference Information

Welcome....

On behalf of the organising committee, we would like to welcome you to the 37th Annual Scientific Meeting of the Australian and New Zealand College of Perfusionists.

2020 has been a year of unprecedented times and circumstances that has changed all of our lives forever. The unfortunate decision to postpone the physical Annual Scientific Meeting (ASM) in Sydney was made earlier this year after careful consideration and full discussion with the Executive Board. As we all have had to adapt and overcome obstacles that COVID-19 has imposed on us this year, so too has the scientific meeting.

Our very first online meeting will bring our members and guests 2 days of both domestic and international speakers, as well as a chance for the final year course students to present their final assessment. We are very grateful for all the presenters this year for their time and effort in contributing to such an important meeting.

The organising committee would like to thank the assistance from the Executive over the last few months in supporting the organising committee through this time. Their invaluable experience in hosting some insightful COVID webinars throughout the year has been a great help.

We would also like to thank the continued support and participation from our corporate partners, whom without their generous assistance, this ASM would not be possible.

We would like to thank you for your participation and look forward to catching up with everyone next year at the 2021 ASM, November 11-13th in Cairns.

The organising committee.

Faculty

Invited International Presenters:

Cory Alwardt
James Reagor
Kenneth Shann
Al Stammers

Invited Regional Presenters:

Arthur Prevolos
Timothy Willcox
Clarke Thuys

Committee

Organising & Scientific Committee:

Richard Newland
Andrea Hunt
Rob Baker
Killian O'Shaughnessy
Emerson Sgammotta

Faculty Information

Invited International Faculty

Cory Alwardt



Cory Alwardt, PhD, CCP has been the Chief Perfusionist and ECMO Coordinator at the Mayo Clinic Hospital in Phoenix, Arizona for the last 12 years, and has been a perfusionist for a total of 15 years. He is an Assistant Professor of Surgery in the Mayo School of Health Sciences and in the Mayo Clinic Alix School of Medicine. Cory is currently on the AmSECT Board of Directors and has also taken an active role in other societies such as ELSO, the STS and AATS, and the Arizona State Perfusion Society. His professional interests include the haemodynamics of ECMO and education, at both the basic science and clinical levels. He has also participated in medical mission trips to numerous developing countries throughout his career. Outside of his professional life, Cory enjoys traveling the world, enjoying food and wine, and spending time with his rescue doberman, Shiloh.

Al Stammers



Al Stammers has been a practicing perfusionist for over 35 years performing all aspects of cardiovascular perfusion. He has served as a Program Director for a graduate level perfusion education program; directed a multi-institution clinical perfusion program; and is currently the Vice President of Clinical Quality and Outcomes Research for SpecialtyCare. He works in the Medical Department to oversee the conduct of more than 45,000 annual CPB procedures at over 200 American hospitals performing cardiopulmonary bypass.

Kenneth Shann



I graduated from Villanova University in 1993 and Episcopal Hospital School of Perfusion in Philadelphia, PA in 1996. I am a Past-President (2016 – 2018) of the American Society of Extracorporeal Technology and an Executive Committee Member of AmSECT's International Consortium for Evidence-Based Perfusion since 2006. My professional interests include quality improvement, safety and teamwork and leadership. In approximately one month I will be transitioning from my role at InvoSurg and returning to full-time clinical practice as Director of Perfusion Services at Massachusetts General Hospital (MGH) in Boston, MA. MGH performs approximately 1700 cardiac cases annually including complex aortic, heart and lung transplantation, mechanical assist, and minimally invasive valve procedures. Our team is also responsible for liver transplantation, ECMO, hyperthermic chemotherapy and ex-vivo heart, lung and liver support.

James Reagor



Jim graduated from The University of Iowa in 1995 with a degree in Perfusion Technology and followed that up in 2014 with a Masters in perfusion science from the University of Nebraska. He is currently employed at Cincinnati Children's Hospital Medical Centre as the Director of Cardiovascular Perfusion and is an Assistant Professor at the University of Cincinnati. Jim serves on AmSECT's Board of Directors, the Government Relations Committee, the Paediatric and Congenital Committee, the Fellow of Paediatric Perfusion selection team, and Co-Chairs the MCS Committee. He is currently AmSECT's President and his past service includes two terms as Secretary for AmSECT's Board of Directors, one term as Zone Director, and Perfusion Without Borders Committee Chair, President and Treasurer of the

Oklahoma Association of Certified Perfusionists, and the Vice-President of the Maryland State Perfusion Society. Jim's areas of focus include the use of registry data and dedicated perfusion electronic medical records to improve perfusion practice and minimizing practice variation in the field of congenital perfusion.

Faculty Information

Invited Australian & New Zealand Faculty

Arthur Preovolos



Arthur has been a perfusionist since 1984. He trained and worked at the Alfred Hospital in Melbourne, he has a keen interest in all matters perfusion: Blood salvage, Mechanical Circulatory Support, IABP, ECMO, VAD, training, education, and simulation. He has held various roles in the ANZCP and its predecessor the ASCVP including President, Secretary, member of the Executive, and as a member of the simulation committee. He has also served as Chairman and Secretary of the ABCP and editor of the Journal. In 2012 he joined Medtronic as a technical specialist. He is involved in training and education where he has developed their simulation program, and is now part of the Mechanical Support Team. He still practices as a perfusionist.

Timothy Willcox



Tim Willcox is a perfusionist in the Green Lane Cardiothoracic unit at Auckland City Hospital. Tim became a perfusionist in 1972 and after 35 years as chief perfusionist stepped away from administration in 2016 to enjoy clinical, teaching mentoring and research interests. Tim has published widely in the perfusion literature on the areas of emboli and CPB, ECMO, perfusion practice and safety as well as contributing to book chapters. He is a Life Member of the ANZCP and an honorary senior lecturer at the Department of Anaesthesiology at the University of Auckland. In 2004, Tim founded an annual trans-Tasman multidisciplinary perfusion focused scientific meeting, the Perfusion Downunder (PDU) Winter Meeting, with Rob Baker and Michael McDonald. Tim is married to Brigid, a lawyer for the Manukau District Health Board in Auckland and has 2 daughters, 2 grandsons, 4 rabbits, 7 Vespas and 120,000 bees.

Clarke Thuys



Clarke started his perfusion career as a trainee in 1991 at the Royal Children's Hospital, Melbourne. After graduating from Swinburne, with a degree in Biophysics and Instrumental Science in 1983, he spent a short time doing clinical research in pulmonary function followed by research in neurocognitive function. He has had an interest in Perfusion Education since becoming a Board member in 2003 and has run the Board course since then, apart from when the course was at Swinburne University where he developed, and ran, the Paediatric perfusion subject. Away from work, when he was younger, he umpired Amateur Australian Rules football and recently retired from being a Scout Leader in his local Scout Group. He still snow skis

and surfs.

Meeting Program

Submitted abstract titles are in capital text.

Thursday 12^h November

12:00 **President's welcome**

Session 1

12:05 Lactate as a Predictor of Outcomes in Cardiopulmonary Bypass and ECMO
Cory Alwardt

12:30 CytoSorb Therapy for the Treatment of COVID-19
Kenneth Shann

12:55 Panel Discussion

13:05 **Intermission**

Session 2

13:15 Simulation; Virtual or Reality?
Arthur Preovolos, Jane Ottens & Darryl McMillan

13:40 Corporate Presentations
Spectrum Medical
Medtronic
Getinge
LivaNova

14:10 **Intermission**

Session 3 Submitted Abstracts

14:20 COVID-19: THE MANCHESTER ECMO EXPERIENCE
Elena Dosouto

14:32 APPLICATION OF A SCAVENING SYSTEM FOR THE MEMBRANE OXYGENATOR AND THE VENOUS RESERVOIR: AN EXPERIMENTAL STUDY
Angel Vilayil

14:44 A NEW ROLE FOR THE PERFUSIONIST IN TREATING PATIENTS WITH ARTIFICIAL STONE ASSOCIATED SILICOSIS
Charles McDonald

Student Abstracts

14:56 PULSATILITY: KNOW THE LIMITATIONS (PART 1)
Jonathan Pauli

15:06 PULSATILITY: KNOW THE LIMITATIONS (PART 2)
Juthawan Suthumporn

15:16 "IF YOU DO NOT MEASURE IT, YOU CANNOT IMPROVE IT" – PETER DRUCKER
Juthawan Suthumporn & Jonathan Pauli

15:26 Closing Remarks

Friday 13^h November

Session 1

- 12:00 Applied Analytics to Reduce Variation and Improve Care in Cardiovascular Perfusion
Al Stammers
- 12:25 Cardiopulmonary Bypass Management and Acute Kidney Injury in 118 Jehovah's Witness patients: a natural experiment
Tim Willcox
- 12:50 Panel Discussion
- 13:00 **Intermission**

Session 2

- 13:10 Higher Flow on Cardiopulmonary Bypass in Paediatrics is associated with a lower incidence of Acute Kidney Injury
James Reagor
- 13:23 Lessons Learned Using ECMO to Manage Severely Ill Covid-19 Patients: Results from our First 200 Patients
Al Stammers
- 13:38 Not a Case Report: An Admission Report
Clarke Thuys
- 13:50 Panel Discussion
- 14:00 **Intermission**

Session 3 Submitted Abstracts

- 14:20 Heater Coolers: The Good, The Bad, and The Unclean.
Steve Bottrell

Student Abstracts

- 14:32 A STUDY TO INVESTIGATE BUFFERING CONSISTENCY OF PERFADEX SOLUTION IN LUNG PROCUREMENT FOR TRANSPLANTATION
Jamie Hobson
- 14:42 ORGAN PROTECTION FOR OPEN THORACOABDOMINAL AORTIC SURGERIES
Annie Ng Kai
- 14:52 THE EFFECT OF CONVENTIONAL ULTRAFILTRATION ON RENAL OUTCOMES IN PATIENTS RECEIVING DEL NIDO CARDIOPLEGIA SOLUTION DURING CARDIAC SURGERY: A RETROSPECTIVE STUDY
Britney Westbrook
- 15:02 BUCKBERG ZERO SUGAR: AN AUDIT OF THE REMOVAL OF DEXTROSE FROM BUCKBERG CARDIOPLEGIA
Maddie Dobier
- 15:12 DEL NIDO CARDIOPLEGIA VERSUS 'STANDARD' MULTI-DOSE CARDIOPLEGIA IN ADULT CARDIAC SURGERY: AN OVERVIEW
Hugh Colman
- 15:22 **Closing Remarks**
-

Corporate Information

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ANZCP ASM 2020 Award



Terumo Award

The Terumo award is in recognition of the best scientific or clinical paper presented by an ANZCP member.



Medtronic
When Life Depends on Medical Technology

Encouragement Award – Medtronic Australasia

This award is made for an especially meritorious presentation by an ANZCP member.



Sid Yarrow Award - LivaNova

The Sid Yarrow award is in recognition of the best presentation by a student ANZCP member.

ANZCP Awards

ANZCP Meritorious Award

The purpose of the ANZCP sponsored meritorious award is to acknowledge presentations of excellence.

Abstracts – Thursday 12th November

LACTATE AS A PREDICTOR OF OUTCOMES IN CARDIOPULMONARY BYPASS AND ECMO

Cory Alwardt, Mayo Clinic Hospital.

Lactate is an important marker of hypoxia and/or hypoperfusion in both normal physiology and in extracorporeal support. Hyperlactatemia (HL) is seen in up to 38% of patients following cardiac surgery and is associated with complexity of surgery, low oxygen delivery during cardiopulmonary bypass (CPB), and other factors.

HL acquired during cardiac surgery is associated with increased risk of morbidity and mortality while HL acquired in the intensive care unit after surgery is more benign. HL during CPB is most often attributed to low oxygen delivery (type A HL), although there are a number of other potential causes (type B HL) such as microcirculatory changes, cardiac and/or circulatory arrest, various medications, and more obscure factors such as thiamine deficiency or decreased pyruvate dehydrogenase activity.

Oxygen delivery index and carbon dioxide-derived parameters can serve as continuous indirect estimates of lactate formation and can help to avoid HL in some patients placed on CPB. HL and lactate clearance are also predictors of mortality in both cardiac and respiratory extracorporeal membrane oxygenation (ECMO), even as early as 6 hours into ECMO support.

ECMO survivors tend to have lactate levels that decrease over time, while non-survivors tend to have HL that does not improve over time. It is also important that lactate levels remain low after weaning ECMO support. Serial lactate measurements are useful in understanding patient status during CPB and ECMO, and a full understanding of mechanisms contributing to HL are important to successful patient outcomes.

CYTOSORB THERAPY FOR THE TREATMENT OF COVID-19

Kenneth Shann, CCP

Director of Business Development and Education, InvoSurg, Inc.

Earlier this year CytoSorb was granted FDA Emergency Use Authorization for the treatment of patients 18 years of age or older, with confirmed COVID-19 admitted to the ICU with confirmed or imminent respiratory failure. The CytoSorb is a cytokine adsorber with massive surface area > 45,000 m² designed to remove inflammatory toxins from the blood stream. The CytoSorb can be easily adapted for use in CRRT, ECMO or hemoperfusion circuits.

The potential clinical benefits include a reduction in cytokines and inflammatory mediators, improved hemodynamic stabilization with reduced vasopressor requirements, improved perfusion and oxygenation, and improved weaning from ECMO and mechanical ventilation.

SIMULATION; VIRTUAL OR REALITY?

Jane Ottens,
Chief Perfusionist Ashford Hospital (ANZCP Chair of Simulation)
Arthur Preovolos,
Perfusionist, Technical Product Specialist, Medtronic
Darryl McMillan,
Perfusionist (Retired)

Since the first published reports of using simulation in perfusion training appeared in 1977, Simulation has evolved from the humble bucket to virtual reality.

We look at the evolution of the use of simulation as a training tool and contrast the benefits of immersive Hi Fidelity simulation over Virtual Reality.

Since 1998 the ANZCP and its perfusionists have been at the forefront of perfusion simulation education. In 2020 and beyond we ask how can these tools that we have be used to further benefit perfusion. Simulation is no longer a fad or a novelty it has become an essential tool now used world-wide for clinical education, perfusion safety and patient outcomes.

COVID-19: THE MANCHESTER ECMO EXPERIENCE

Elena Dosouto - Auckland City Hospital , New Zealand

Alexandra Sheardown - Wythenshawe Hospital , Manchester, United Kingdom

BACKGROUND

During the emergence of the COVID-19 pandemic, a national rise in the demand for Veno-Venous Extracorporeal Membrane Oxygenation (VV ECMO) was seen due to the severe acute respiratory syndrome caused by the virus. The surge in the demand for this therapy, drove the expansion in capacity for ECMO beds across the United Kingdom , where only five centres provide this service. In order to keep up with the high volume of COVID-19 admissions, the hospital underwent a significant change in service provision, and we also had to adapt by scaling up both human and technical resources.

AIMS/OBJECTIVES

The first wave of the Coronavirus pandemic escalated rapidly. As a result, hospitals had a very limited time to prepare for the increase in demand, and, also, due to the novelty of the virus, very limited previous experience.

Our main aim is to share our ECMO experience during the COVID-19 pandemic: the escalation plan of Wythenshawe Hospital, and the changes we made in order to cope with an unusually high number of patients on ECMO at one time.

METHODS

We retrospectively analysed the resources utilised during the first wave of COVID-19 and categorised them in four sections: national ECMO changes, escalation changes, staff changes and equipment changes.

FINDINGS AND CONCLUSIONS

Prior to the Coronavirus pandemic, our experience of dealing with a large number of ECMO patients at the same time was very limited. Also, there was no previous guidelines, evidence or recommendations on ECMO practice for COVID-19 patients.

Having to deal with a wave of cases in a relatively short period of time, gave us experience and confidence on how we would deal with a similar situation if we have to encounter it in the future.

APPLICATION OF A SCAVENGING SYSTEM FOR THE MEMBRANE OXYGENATOR AND THE VENOUS RESERVOIR: AN EXPERIMENTAL STUDY

A. J. Vilayil, J. Pauli (Clinical Trainee), J. Suthumporn (Clinical Trainee), J. McMillan
CCP (USA), CCP (AUS)

ABSTRACT

Background:

There have been multiple studies suggesting that a scavenging system should be applied on the oxygenator gas outlet and the venous hard-shell reservoir using two different vacuum sources separately. However, no clear guidelines have been recommended for this technique.

Aim:

Therefore, this study is an attempt to reduce the potential ill effects of scavenging gases and volatile anesthetics escaping into the operating room without compromising the integrity of the consumables, equipment and any augmentation to the venous return.

Methods:

This study was conducted in a laboratory setting to provide maximum control of all parameters to be measured. The circuitry was designed to scavenge the oxygenator gas outlet safely and to demonstrate the practicality and simplicity of the system utilized, as well as, to demonstrate the safety of scavenging the venous reservoir while eliminating the gases and condensate. All of the components used are freely available to all perfusionists in the operating room.

Findings:

It was demonstrated in the experiment with the custom-made metal connector attached to the scavenging port of the membrane oxygenator outlet did not allow volume or gaseous solution to cross the membrane and exit through the scavenging port. The integrity of the membrane oxygenator remained intact when high vacuum pressure (-700mmHg) was applied. CO₂ accumulation was captured by a soda lime canister and weight change was observed. In addition to venting of CO₂, the pCO₂ in the prime was tested, and both methods indicated that a vacuum pressure greater than -10mmHg is required to effectively eliminate high levels of CO₂.

A NEW ROLE FOR THE PERFUSIONIST IN TREATING PATIENTS WITH ARTIFICIAL STONE ASSOCIATED SILICOSIS.

Dan Chambers, Simon Apte, Ian Smith, Mark Kroll, Gary Walker, Charles McDonald and Ivan Rapchuk.

The Prince Charles Hospital, Chermside, Queensland.

Background

Artificial stone contains very high levels of silica bound by resin; much higher than found in natural stone products. Due to its high silica content, artificial stone is a source of hazardous dust exposure for workers that are employed in the manufacturing, finishing, and installation. Inhalation of respirable crystalline silica (RCS) can lead to silicosis (a progressive, irreversible and (probably incurable) fibrotic lung disease). The only life-saving therapeutic option in end-stage silicosis is transplant. Several small case series from Chin suggest a benefit to small volume, segmental lung lavage to remove RCS. This present study is investigating the safety and effectiveness of whole lung lavage (WLL) to remove RCS.

Methods

Twelve patients with artificial stone associated silicosis were enrolled to undergo bilateral WLL. After standard anaesthetic induction, patients were intubated with a dual lumen tube to allow for single lung ventilation concurrent with single WLL. Patients were rolled on their side (lung to be lavaged was uppermost). A lung lavage circuit, consisting a Terumo FX25 connected to a Heater cooler unit and primed with sodium bicarbonate buffered saline was connected to the dual lumen tube. A lavage volume estimate of 10ml/Kg was initially used and lung compliance pressures were measured. Total lung lavage volumes of 25 – 30 L over a 3 hour period were targeted for each single lung lavage and controlled by a perfusionist.

Results

To date six patients have received bilateral WLL. The study has been paused to review safety and effectiveness before completing the study target of 12 patients. WLL has been well tolerated and there has been a significant clearance of RCS as determined by comparing conventional BAL samples pre- and post-whole lung lavage.

Conclusion

Bilateral WLL to treat artificial stone associated silicosis is a safe procedure that removes significant RCS from the alveolar space. Improvements in lung function and lung volumes have been demonstrated. Further studies in several Australian hospitals are due to begin.

PULSATILITY: KNOW THE LIMITATIONS (part 1)

J. Pauli (Clinical Trainee), J. Suthumporn (Clinical Trainee), J. McMillan CCP (USA), CCP (AUS)

Background:

Organ dysfunction following cardiopulmonary bypass (CPB) has been shown to be associated with the presence of gaseous microemboli (GME) intraoperatively. A few in vitro models available concluded that pulsatile perfusion (PP) creates an environment for supplementary GME delivery. The objectives of the study were to determine if perfusate viscosity, temperature, gas flow, pulse rate and blood flow will have an effect on GME count and volume during pulsatile mode of perfusion in a controlled laboratory setting.

Aim:

First, to design a circuit whereby, temperature, gas flow, pulse rate and blood flow could be governed and measured while simultaneously quantifying GME count and volume. Second, to create a system of conducting the experiment efficiently.

Method:

The circuit components included a COBE roller pump, a COBE computerized perfusion controller, a Stöckert Heater-Cooler System 3T, a LivaNova Inspire 8F hollow-fibre membrane oxygenator with hard shell venous reservoir, integrated heat exchanger and arterial filter, 3/8" internal diameter (ID) tubing, 1/2" ID tubing, 3/8" x 1/2" connector, and an Affinity hard shell reservoir. Pressure transducers connected to a GE patient monitor were used to record pressure waveforms at both the pre-membrane and post-membrane sites. Spectrum M3 monitor with bubble sensors were used to detect GME at the pre-membrane and post-membrane sites. Temperature probes were used to monitor temperature at both the pre-oxygenator and post-oxygenator sites. An oxygen tank with flow meter was used to deliver gas to the membrane oxygenator. A Hoffman clamp was placed in the venous line to regulate venous reservoir level. Tests were conducted at 3 different pulse rates (40, 60, 80 beats per minute), under 3 flow rates (2, 4, 6 litres per minute), with or without gas flow (0 or 3 litres per minute), at 3 temperatures (20°C, 30°C, 37°C) using 2 fluids with different viscosities (Normal saline solution and whole milk), to yield a total of 324 experiments.

Findings:

Pulsatile perfusion using normal saline solution as perfusate yielded 162 data points. Due to the coagulation of whole milk at 30°C, pulsatile perfusion at 37°C had not been performed. Pulsatile perfusion using whole milk as perfusate yielded 105 data points. The whole experiment generated a total of 267 data points.

Conclusion:

The circuit and experimental design are both simple and reproducible. It enabled measurement of GME count and volume as well as control temperature, gas flow, pulse rate and blood flow precisely. A solution containing saline and glycerol, which can give a viscosity similar to that of blood, could be substituted for whole milk to avoid coagulation at 30°C and above.

PULSATILITY: KNOW THE LIMITATIONS (part 2)

J. Suthumporn (Clinical Trainee), J. Pauli (Clinical Trainee), J. McMillan CCP (USA), CCP (AUS)

Background:

Organ dysfunction following cardiopulmonary bypass (CPB) has been shown to be associated with the presence of gaseous microemboli (GME) intraoperatively. A few in vitro models available concluded that pulsatile perfusion (PP) creates an environment for supplementary GME delivery.

Aim:

The objective was to research and determined appropriate statistical testing to analysis the relationship between each of the variables and CME count and volume.

Method:

IBM SPSS Statistics program (New York, USA) was used to statistically analyse the data. The Shapiro-Wilk test of normality was used to firstly determine the type of distribution¹⁵. The data was determined to be not normally distributed and a non-parametric correlation test, Spearman's rank-order correlation coefficient test was determined to be best suited as the data met the test criteria¹⁶.

Findings:

The results show a statistically significant strong positive correlation between temperature and GME count and volume. It also showed a weak positive correlation that was statistically significant for pulse rate and GME count and volume. Viscosity was found to have a weak and moderate negative correlation to count and volume respectively, which are both statistically significant. Both gas flow and blood flow regarding GME count and volume had very weak negative correlations which are not statistically significant.

Conclusion:

In conclusion, through the statistical analysis, it is evident that both temperature and pulse rate had a positive correlation on embolic load, with higher counts and volumes observed as both factors are increased.

“IF YOU DO NOT MEASURE IT, YOU CANNOT IMPROVE IT” – PETER DRUCKER

J. Suthumporn (Clinical Trainee), J. Pauli (Clinical Trainee), J. McMillan CCP (USA), CCP (AUS)

Background:

Technologies developed to measure blood flow in coronary artery bypass grafts such as the Doppler flowmeter have been around since 1988. Measurements of blood flow intraoperatively permit early detection of technical errors and therefore their correction without subjecting patients to further invasive investigative procedures.

Aims:

This paper retrospectively studies the use of transit time flow measurement (TTFM) within one cardiac unit through understanding the technology of the device used and its benefits and limitations.

Methods:

A cohort of 151 patients from September 2019 to June 2020 were reviewed which included a total of 399 grafts.

Findings:

Measurements obtained showed a mean pulsatility index (PI) of 2.4 ± 1.5 , mean graft flow (MGF) of 45 ± 30 ml/min and diastolic filling percentage (DF%) of $66\% \pm 9\%$. It was observed that 80.87% of the collected PI values were below 3, 94.59% of the acoustic coupling index (ACI) data were above 30% and 94.39% of DF% were above 50% of all data collected.

Conclusion:

TTFM is a promising quality control adjunct to the surgeon's judgement with the potential to aid decision making when considering to re-anastomose a graft. Furthermore, its utilization may result in a reduction or avoidance of reinvestigation of coronary artery grafts at the catheterization laboratory.

Abstracts – Friday 13th November

APPLIED ANALYTICS TO REDUCE VARIATION AND IMPROVE CARE IN CARDIOVASCULAR PERFUSION

Alfred H. Stammers, MSA, PBMS, CCP Emeritus, Linda B. Mongero, BS, CCP Emeritus, Eric A. Tesdahl, PhD, Kirti Patel, MPS, MPH, CCP, LP, CPBMT

Background:

Reducing unwanted variation for conducting cardiopulmonary bypass (CPB) has long been sought for perfusion practice with the hope of optimising care and improving outcomes. While regulatory authorities have mandated that techniques to identify and reduce clinical variability be employed, this charge has yet to be accomplished, and is especially elusive for perfusionists. This report describes the development of a systematic analytic process utilized by a national (American) outsource provider for perfusion services.

Methods:

To standardise operational performance across multiple facilities a multifactorial process was undertaken that involved multiple departments including medical, information technology, regulatory and operations. This involved the integration of clinical practice guidelines, current and evolving best available evidence and standards that regulate health care organisations. An analytic infrastructure was developed that included the incorporation of applications for collecting patient health informatics and an analytic structure for backend processing. Training and education on the use of these systems was conducted in new hire orientation and then with mandatory ongoing yearly refresher courses. Data obtained from clinical procedures is then used to assess performance, generate reports and populate a national registry (SpecialtyCare Operative Procedural rEgistry, SCOPE).

Results:

Beginning in 2011 a proprietary application (Case Documentation System) was utilised to collect all clinical performance data for SpecialtyCare perfusionists (approximately 500 in 200 hospitals). Of the 1.8 million procedures, 365,036 are open-heart involving CPB and an additional 250,278 autotransfusion cases. There are 130 variables assessed for each case which can be compared across 21 distinct cardiac procedure types. Performance is monitored across multiple levels including the entire organisation, by geographical region, hospital, perfusionist and by cardiac team. Key performance indicators are used to compare individual performance standardised for a specific procedure (first time coronary artery bypass graft). There are two tiers of assessment: individual and cardiac team. Multiple dashboards for data viewing are accessible by associates and managers to enhance transparency. Hospital specific performance reports using key metrics are automatically generated and emailed on the 11th day of each succeeding month. Equipment maintenance and inventory management is tracked on a monthly basis assuring all preventative maintenance is performed. In addition, SCOPE provides a vehicle whereby research has been conducted and overseen by a non-affiliated regulatory board.

Conclusion:

The use of an integrated systematic process incorporating analytical tools of assessment has resulted in a national standardisation of clinical performance amongst perfusionists.

CARDIOPULMONARY BYPASS MANAGEMENT AND ACUTE KIDNEY INJURY IN 118 JEHOVAH'S WITNESS PATIENTS: A NATURAL EXPERIMENT

Tim Willcox, Richard Newland, Rob Baker

Previously presented at the PDU Winter meeting 2019 and published 2020 Perfusion

Introduction:

Blood product transfusion is associated with significant adverse outcomes in surgical patients with low predicted morbidity and mortality. There has been recent attention given to modifying factors of cardiopulmonary bypass (CPB) to reduce the incidence of acute kidney injury (AKI). A relatively small cohort of patients presenting for cardiac surgery refuse blood products primarily on religious grounds. Accurate detail of the modifiable factors of CPB relating to AKI is previously unreported in this patient population.

Methods:

118 adult Jehovah's Witness patients refusing transfusion were propensity matched to 118 adult patients accepting transfusion from the 30,942 patients in the Australian and New Zealand Collaborative Perfusion Registry. The primary endpoint was AKI. Intraoperative and bypass management characteristics were also compared between early (2007-2012) and late (2013-2018) cohorts along with the acceptance or refusal of transfusion.

Results:

In patients accepting transfusion, 49% received a blood product. In patients refusing transfusion, AKI was lower (8% vs 22%; $P = 0.003$). Cell salvage use was higher (70% vs 22%; $P < 0.001$); as was use of hemofiltration (8% vs 4%; $P = 0.03$) and tranexamic acid in the early period (87% vs 62%, $P = 0.004$) but not late (100% vs 97%; $P = 0.15$). There was no difference in modifiable CPB factors (mean arterial pressure, minimum oxygen delivery (DO_{2i}), retrograde autologous prime, circuit prime volume) between the two groups, however prime volume decreased and DO_{2i} increased over time for both. Patients refusing transfusion had lower postoperative blood loss ($P = 0.02$) and shorter postoperative length of stay ($P = <0.001$) with no difference in morbidity ($P = 0.46$) or mortality ($P = 0.68$).

Conclusion:

Refusal of transfusion in patients undergoing CPB was associated with reduced AKI, hospital stay and postoperative blood loss, whilst not impacting mortality. Management of CPB for patients refusing blood products arguably constitutes a standard of care for low risk cardiac surgery.

HIGHER FLOW ON CARDIOPULMONARY BYPASS IN PEDIATRICS IS ASSOCIATED WITH A LOWER INCIDENCE OF ACUTE KIDNEY INJURY

James A. Reagor MPS, CCP, FPP^{1,6}, Sean Clingan MS, CCP¹, Zhiqian Gao PhD, MSPH², David L. S. Morales, MD^{3,6}, James S. Tweddell, MD^{3,6}, Roosevelt Bryant, MD^{3,6}, William Young⁴, Jesse Cavanaugh⁴, and David S. Cooper, MD, MPH^{5,6}

1 Department of Cardiovascular Perfusion, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio, USA

2 Heart Institute Research Core, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio, USA

3 Division of Cardiothoracic Surgery, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio, USA

4 Information Services, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio, USA

5 Cardiac Intensive Care Unit, Heart Institute, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio, USA

6 Department of Pediatrics, University of Cincinnati College of Medicine, Cincinnati, Ohio, USA

Objective:

Adequate perfusion is of paramount concern during cardiopulmonary bypass (CPB) and different methodologies are employed to optimize oxygen delivery. Temperature, hematocrit, and cardiac index are all modulated during CPB to ensure appropriate support. This study examines two different perfusion strategies and their impact on various outcome measures including acute kidney injury (AKI), urine output on CPB, ICU length of stay, time to extubation, and mortality.

Methods:

Predicated upon surgeon preference, the study institution employs two different perfusion strategies (PS) during congenital cardiac surgery requiring CPB. One method utilizes a targeted 2.4 L/min/m² CI and nadir hematocrit of 28% (PS1), the other a 3.0 L/min/m² CI with a nadir hematocrit of 25% (PS2). This study retrospectively examines CPB cases during which the two perfusion strategies were applied to determine potential differences in packed red blood cell administration, urine output during cardiopulmonary bypass, AKI post CPB as defined by the KDIGO criteria and operative survival as defined by the Society of Thoracic Surgeons.

Results:

Significant differences were found in urine output while on CPB ($p < 0.01$) and all combined stages of postoperative AKI ($p = 0.01$) with the PS2 group faring better in both measures. No significant difference was found between the two groups for packed red blood cell administration, mortality, time to extubation, or ICU length of stay.

Conclusion:

Avoiding a nadir hematocrit less than 25% has been well established but maintaining anything greater than that may not be necessary to achieve adequate oxygen delivery on CPB. Our results indicate higher cardiac index and oxygen delivery on CPB is associated with a lower rate of AKI and this may be achieved with increased flow rather than increasing the hematocrit thus avoiding unnecessary transfusion.

LESSONS LEARNED USING ECMO TO MANAGE SEVERELY ILL COVID-19 PATIENTS: RESULTS FROM OUR FIRST 210 PATIENTS

Alfred H. Stammers, MSA, PBMS, CCP Emeritus, Jeffrey P. Jacobs, MD, Linda B. Mongero, BS, CCP Emeritus, Eric A. Tesdahl, PhD, Kirti Patel, MPS, MPH, CCP, LP, CPBMT, Michael S Firstenberg, MD FAIM FACC

Background:

ECMO has been used as a tool to manage severe respiratory collapse in patients suffering from coronavirus disease (COVID-19). While the role of ECMO in managing adult patients with ARDS is well accepted its utility as a modality for COVID-19 remains to be seen. The goal of this report is to analyse registry data on the use of ECMO across American hospitals.

Methods:

Beginning in March 2020 an adjunct database for COVID-19 patients managed on ECMO was created as a supplement to a national registry of medical procedures (SpecialtyCare Operative Procedural rEgistry, SCOPE). Data was obtained from hospitals across America where perfusion and ECMO services were provided. The data metrics included demographic profiles of patients, medication and treatment regimens applied before and while on ECMO, and outcomes of these interventions. Patients were further separated into two groups dependent on survivability.

Results:

There were 210 COVID-19 ECMO patients from 29 distinct hospitals from March 17, 2020 to October 20, 2020. The median yearly age of patients was 51.5 and 71.4% were male, and 92.9% were placed on veno-venous ECMO. 44.2% of patients were Latino, 17.1% African American, and 23.3% Caucasian. While 27 patients are still on ECMO, 183 are off support with 94 (51.4%) unable to be weaned or succumbing while hospitalized. Of the 89 survivors 70% have been discharged from the hospital. Median time on ECMO was 12.1 days (IQR=7.3-16.0 days) for survivors and 14.7 days (IQR=7.3-27.7 days) for non-survivors. Survivors were generally younger (47 v. 53 years) more likely to be Caucasian (29.2% v. 17.6%), have lower composite pre-ECMO comorbidity (26.1% v 29.2%) and had higher usage of commercial ECMO systems and lower use of dual lumen cannulae. While the use of adjunctive therapies changed over the seven month period, the use of intravenous steroids, anti-interleukin-6 receptor blockers, convalescent plasma, Remdesivir, hydroxychloroquine, and prostaglandins were similar across groups.

Conclusion:

The use of ECMO resulted in approximately a 50% survival rate of select critically ill patients with COVID-19. Substantial variation exists in pharmacotherapeutic management of these challenging patients, but ECMO offers a reasonable rescue strategy.

NOT JUST A CASE REPORT: AN ADMISSION REPORT

Clarke Thuys

The Royal Children's Hospital, Melbourne

We all have cases that stick in our memories. Management of this patient fell to me twice during the seven procedures carried out during the admission. These two procedures were the ones that had the potential for disastrous consequences.

This presentation lays out the history and the path of the patient through the admission and shows how the disastrous consequences were averted. There were no equipment failures and no demonstrable human error. Was it the odds just trying to catch up? What were the lessons learned?

HEATER COOLERS: The Good The Bad and The Unclean.

Stephen Bottrell, Stephen Horton, Clarke Thuys, Brad Schultz, Simon Augustin, Martin Bennett and Alison Horton.

The Royal Children's Hospital. Melbourne. Australia.

The purpose of this talk is to discuss the addition of two new Heater Cooler technologies recently trialled at the Royal Children's Hospital. We would also present alternate cleaning mechanisms when dealing with a high CFU by the use of UV light and CO₂ added to the HCU water and its ability to reduce bacterial load.

A STUDY TO INVESTIGATE BUFFERING CONSISTENCY OF PERFADEx SOLUTION IN LUNG PROCUREMENT FOR TRANSPLANTATION

Jamie Hobson BA (Hons), B Nursing (Hons), CCRN, CCP
Institution: Alfred Hospital

Background

Alfred Hospital has a large lung transplant program. Donor lungs are procured and flushed with buffered Perfadex to reduce reperfusion injury and primary graft dysfunction, Perfadex is a solution created by XVIVO.

Aims/objectives

THAM is added to Perfadex at the donor hospital several minutes before flushing the donor lungs. THAM acts as a proton acceptor and corrects acidosis by binding with hydrogen ions. This quality study will describe any variability in the pH of the flushing solution after it has been buffered.

Methods

A sample of buffered Perfadex was taken at the donor hospital by the procuring anaesthetist after THAM was added and mixed. The sample was stored in ice and pH tested at the Alfred with twenty-four hours. A proof of concept was performed to establish the efficacy of the protocol and consistency of testing before starting.

Results

Eight donors are included in the study, and each lung donation was flush with three 2800mls bags of Perfadex.

SPSS version 25 was used to generate descriptive statistics.

A paired t-test was used to compare the three samples of Perfadex for each donation, and no significance was noted.

	n	Mean \pm	SD	Range
Sample_A	8	7.46 \pm	0.36	(7.85- 6.79)
Sample_B	8	7.59 \pm	0.28	(8.01- 7.28)
Sample_C	8	7.55 \pm	0.21	(7.90- 7.25)

A paired-samples t-test showed no significant differences in pH levels between Samples A and B ($p>0.05$), Samples A and C ($p>0.05$) and Samples B and C ($p>0.05$).

Conclusion

This study demonstrated some variability in the pH of Perfadex that is used for flushing the donor lungs as a result of the addition of THAM. When the results were analysed this was not demonstrated to be statistically significant.

ORGAN PROTECTION FOR OPEN THORACOABDOMINAL AORTIC SURGERIES

Ng Kai Annie (Senior Perfusionist / Advanced Practice Nurse)

The Prince of Wales Hospital

July, 2020

Objective:

Open surgical repair for the descending thoracoabdominal aorta aneurysm (TAAA) is nowadays the dominant treatment of choice at many institutions worldwide. The objective of this study was to analyse and compare among various organ protection techniques for open thoracoabdominal aortic surgeries and to facilitate the development of evidence based best practice.

Methods:

Twenty studies published from 2015 to 2020 related to the topic of open TAAA repair were selected for this literature review. All of these cases were operated under cardiopulmonary bypass (CPB).

Results:

The choice of management approach varied according to the extent of the disease and the choice made by the surgeons and the perfusionists. This literature review discussed on the different types of bypass and the protection strategies most frequently used for brain, spine, and visceral organs.

Conclusion:

Operative techniques for open TAAA repairs have been refined over the past decades in an effort to prevent early death and life-altering complications. Prerequisites for better patient outcomes are appropriate organ protection with a multimodal strategy of surgical adjuncts and a multidisciplinary approach, according to the aneurysm extension and urgency of each operation.

THE EFFECT OF CONVENTIONAL ULTRAFILTRATION ON RENAL OUTCOMES IN PATIENTS RECEIVING DEL NIDO CARDIOPLEGIA SOLUTION DURING CARDIAC SURGERY: A RETROSPECTIVE STUDY

Britney Westbrook, CCP, Waikato District Health Board

Background and objectives:

Conventional ultrafiltration (CUF) in the intra-operative setting assists in reducing post-operative volume overload and haemodilution during cardiopulmonary bypass (CPB). In our institution the hot topic remains around determining whether the addition of the ultrafiltration device to the circuit, combined with one litre of del Nido cardioplegia is beneficial? The correlation between ultrafiltration and post-operative renal outcomes is controversial. This study aims to examine the effect of intra-operative ultrafiltration vs. non-ultrafiltration on post-operative renal outcomes, specifically acute kidney injury (AKI).

Methodology:

Retrospective data was collected from a single institution, over a two-year period (2019-2020). Patients who underwent coronary artery bypass grafting (CABG) or single valve replacements with del Nido cardioplegia were the focus. Scrutinising the data generated a population set, which was able to be matched according to variables appropriate for each of the two groups, one with CUF (n=58) and the other without CUF (n=103), with a total of 161 patients.

Results:

The plasma haemoglobin (Hb) in both groups comparably depleted from baseline to post-operative on average measurement (CUF 3.23g/L and without CUF 5.67g/L, $p=0.73$) without reaching any statistical significance. The average Hb from baseline to post-operative Hb with CUF showed only a slight 6% reduction, however was not statistically significant when compared the 16% reduction without CUF. The two groups had no statistical difference in average elevation of serum creatinine, from baseline to peak 48 hour post-operative (CUF 15.4 $\mu\text{mol/L}$ and without CUF 17.9 $\mu\text{mol/L}$, $p=0.68$). The three stages of AKI were varied throughout both groups and defined according to the AKIN classification. Stage one was illustrated more often without CUF (17% and 10%) with no statistical significance and both stages two and three, were very similar in their findings $p=0.81$ (stage two with CUF 2.1% and without CUF 2.7%, stage three with CUF 0.2% and without CUF 1.15%).

Conclusion:

The addition of CUF during CPB did not correlate to a reduction in renal dysfunction post-operatively. CUF did reduce the hb depletion post-operatively and serum creatinine, but neither of which reached statistical significance. This suggests additional data analysis of the variables and increased cohort size, would reduce the limitations and may result in more conclusive outcomes. Further investigation surrounding oxygen delivery index (DO_{2i}), will be required to provide further insight and claim any correlative outcomes.

BUCKBERG ZERO SUGAR

AN AUDIT OF THE REMOVAL OF DEXTROSE IN BUCKBERG CARDIOPLEGIA

Maddie Dobier, Auckland City Hospital

Background:

Intraoperative hyperglycaemia as defined as a blood glucose $>10\text{mmol/L}$ has been associated with increased morbidity and mortality after cardiac surgery (Lessen et al., 2012). Cardiopulmonary bypass (CPB) exacerbates the disturbance to glucose homeostasis thus calling for a review of any glucose-containing medications used during CPB (Mongero et al., 2018). A greater frequency of hyperglycaemia during CPB at Auckland City Hospital compared to other centres in the Australia and New Zealand Collaborative Perfusion Registry was previously demonstrated resulting in a reduction of glucose to the modified Buckberg cardioplegia. Therefore, I raised the question on whether the complete elimination of dextrose to modified Buckberg cardioplegia could be made safely without detriment to the patient in terms of serum glucose levels, myocardial protection and post-operative outcomes.

Hypothesis:

Removal of 3mL 50% Dextrose from modified Buckberg cardioplegia does not impact myocardial protection and reduces the rate of CPB hyperglycaemia

Method:

There were two groups: Group 1 - Modified Buckberg Cardioplegia with 3ml 50% dextrose addition and Group 2 - Modified Buckberg Cardioplegia with no dextrose addition. 50 consecutive cases for each group were audited with Institutional Board ethics approval. Exclusions for this audit were insulin-dependent diabetics and/or patients receiving a Hotshot reperfusion cardioplegia. Serum glucose levels on standard ABGs were recorded along with: intraoperative use of insulin, maximum troponin levels <12 hours post-op and postoperative outcomes; ventilation time, stay in ICU, hospital stay, sepsis, stroke deep sternal wound infection, death and >30 day mortality. An analysis of the results assessed: changes in blood glucose from pre-CPB to: maximum blood glucose during CPB, post-CPB in the OR and the maximum blood glucose <6 hours in ICU; the frequency of hyperglycaemia and hypoglycaemia and group difference between post-op troponins.

Results: There was no statistical significant difference between the two groups for group mean blood glucose: pre-CPB ($p = 0.75$), min CPB ($p = 0.29$), max CPB ($p = 0.55$), post-CPB in OR ($p = 0.90$) or max <6 hours in ICU ($p = 0.50$). There was no statistical significant difference between the two groups, for frequency of hyperglycaemia: pre-CPB ($p = 0.64$) during CPB ($p = 0.36$), Post CPB ($p = 0.81$) or <6 hours in ICU ($p = 0.83$). There was no statistical significant difference between the two groups for change in blood glucose from pre-CPB to: Max during CPB ($p = 0.69$), post-CPB in OR ($p = 0.65$) and <6 hours in ICU ($p = 0.65$). There was also no statistical significant difference between the two groups for max troponin levels <12 hours post-op ($p = 0.97$).

Conclusion:

The complete removal of 50% dextrose addition to modified Buckberg cardioplegia resulted in no statistical significant difference to any outcome variable, and therefore was safely removed. Following this audit elimination of dextrose to modified Buckberg cardioplegia has been implemented as standard practice at Auckland City Hospital. As

this change is now standard practice it provides the opportunity to further investigate this question with a larger matched sample size, which was a limitation to the study.

References:

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DEL NIDO CARDIOPLEGIA VERSUS 'STANDARD' MULTI-DOSE CARDIOPLEGIA IN ADULT CARDIAC SURGERY: AN OVERVIEW

Hugh Colman

Objective

The use of the Del Nido cardioplegia solution in adult cardiac surgery has been growing in popularity as a routine replacement for 'standard' multi-dose cardioplegia. This warrants an analysis on the safety and efficacy of this solution when compared to 'standard' multi-dose alternatives. The goal of this study is to analyse current literature in order to validate the use of Del Nido cardioplegia as a routine replacement for 'standard' cardioplegia. This study compares the delivery methods for both 'standard' cardioplegia and Del Nido, the safety profiles for both solutions in adult cardiac surgery and other potential benefits of the Del Nido solution.

Method

PubMed was used to source articles.

Results

Use of Del Nido cardioplegia resulted in a reduction in cardioplegia volume, lower cross-clamp and bypass times, improved LVEF, lower postoperative glucose levels, lower postoperative troponin and creatinine kinase levels and increased return to spontaneous rhythm when compared to 'standard' cardioplegia in CABG, isolated valve procedures and valve + CABG procedures.

Conclusion

Del Nido cardioplegia appears to be comparable or potentially superior to 'standard' multidose cardioplegia in low to medium risk adult cardiac surgery. Its use as a routine alternative should be considered.

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1. Long, et al., Perfusionist Techniques of Reducing Acute Kidney Injury Following Cardiopulmonary Bypass; An Evidence-Based Review. Perfusion, 2014;1-8

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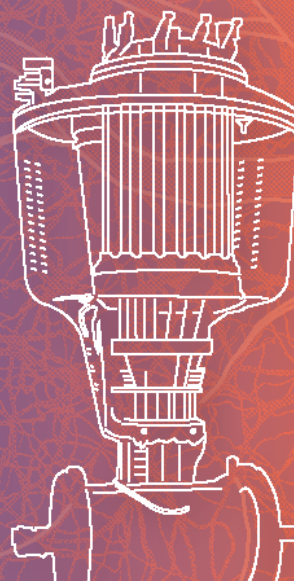
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