THE AMERICAN ACADEMY
OF
CARDIOVASCULAR PERFUSION
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Winter 2020

The Academy Newsletter

Inside this issue

Greetings from Boston,

I currently sit in our pump room writing this, taking "advantage" of our recently-implemented reduced surgical caseload. Our team coloring book stockings have been hung (with care) on the door and festive cloth hats (under disposable bouffant caps) can be seen traversing the OR hallways displaying holiday spirit.

We are all waiting for what's next, in which order and to what extent – COVID vaccines, tidal wave of COVID patients, a loved one contracting COVID and if so, please don't let it be transmitted from me. {Clarification – I have no reason to believe I have had, or currently have COVID at this time}

As invasive as this pandemic has been, life on all of its facets goes on and one facet for me has been the role of Program Director for the upcoming (virtual) annual AACP seminar to be held during February 6-13, 2021. As the finishing touches are being applied to our stellar program, the sheer volume of emails, phone calls, texts and Facebook messages sent throughout the process is staggering. I realized I have used the term "virtual" no less than 1 million times in the past few months, so I did a little digging:

Merriam-Webster definition of virtual:

1: *being such in essence or effect though not formally recognized or admitted*

2: *being on or simulated on a computer or computer network, such as:*

a: *occurring or existing primarily online*

b: *of, relating to, or existing within a virtual reality*

3: *of, relating to, or using virtual memory*

Bill Riley
President, AACP

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4: *of, relating to, or being a hypothetical particle whose existence is inferred from indirect evidence.*

Of particular interest to me are #2a, which pertains to our upcoming seminar, and #4 which surely describes how many Perfusionists must have felt over the course of this year!

As a 1990s college student, it didn't take long for the Jamiroquai song "Virtual Insanity" to pop into my head. The song is found on the "Travelling without Moving" album and was written by band members Jay Kay and Toby Smith about how we would eventually be living in a dystopian, technology ridden culture. Reading the lyrics, it is eerily applicable to life as we know it in 2020 – the first verse is here:

"Virtual Insanity" by Jamiroquai 1996

Oh yeah, what we're living in (let me tell ya)
It's a wonder man can eat at all
When things are big that should be small
Who can tell what magic spells we'll be doing for us
And I'm giving all my love to this world
Only to be told
I can't see
I can't breathe
No more will we be
And nothing's going to change the way we live
Cos' we can always take but never give
And now that things are changing for the worse,
See, it's a crazy world we're living in
And I just can't see that half of us immersed in sin
Is all we have to give these -
Futures made of virtual insanity now
Always seem to, be govern'd by this love we have
For useless, twisting, our new technology
Oh, now there is no sound - for we all live underground…

I hope you all stay safe and in good spirits as this year comes to a close. Please stay tuned for registration information for the 2021 seminar and spread the word about our multi-disciplinary ECMO day to your ECMO colleagues!

Happy Holidays,
Bill

BLOOD PRODUCT SHORTAGES DEEPEN DURING PANDEMIC

Shortly after the coronavirus outbreak in the U.S. began, scores of Red Cross blood drives across the nation were canceled as locations that usually held these drives either closed or restricted public access. By July, more than 40,000 blood drives had been canceled, leading to a million fewer donations[1], which are typically around 470ml each. While some drives resumed over the summer and fall with safety measures in place, the uncontrolled pandemic, coupled with wildfires, hurricanes and other disasters, as well as the resumption of medical procedures, have continued to put pressure on blood, plasma and platelet supplies.

This shortage is particularly concerning, not only for emergency rooms, but also for cardiac surgeons and perfusionists who depend on these blood products for their patients. That's why Medtronic, makers of the HMS Plus Hemostasis Management System, sat down with Dr. Junaid Khan of Alta Bates Summit Medical Center recently to discuss his experience with HMS Plus. In this brief video, you'll see how incorporating the HMS Plus system into the OR during open-heart surgery has impacted the hospital's patients, costs, and blood product usage, especially during the pandemic.

Please hear Dr. Khan's experience at www.Medtronic.com/cardiacsurgery.

Reference

https://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-fda-provides-updated-guidance-address-urgent-need-blood-during-pandemic

Important safety information: for a listing of indications, contraindications, precautions, warnings, and potential adverse events, please refer to the Instructions for Use.

CAUTION: Federal law (USA) restricts this device by or on the order of a physician.

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11/2020

Identifying Speed-Bumps: Challenges of ECMO Transportation

Christana Psyhojos and Colleen Morrow

Rush University Medical Center
Chicago, Illinois

Within the field of cardiovascular perfusion, many practices are left up to the discretion of specific healthcare organizations rather than state, national, or international regulatory bodies. One facet of this is the transportation of patients while on extracorporeal membrane oxygenation (ECMO). The techniques used to safely stabilize and transport ECMO patients may be similar, but the differences in practice can bring variations in challenges each program may face.

There are a myriad of components that contribute to ECMO transport and characteristics of ECMO transport programs that vary from one another (Broman et al., 2020). Despite varying elements, a commonality among most ECMO transport programs is that several practices must be properly organized to ensure a successful transportation from the very moment the decision has been made to launch an ECMO transport team (Broman & Frenckner, 2016). Depending on the time of day and availability of personnel, the typical response time for activating an ECMO transport team is 30 to 90 minutes, including the organization of vehicle/aircraft transportation (Ehrentraut et al., 2019).

Ground (ambulance), rotary-wing (helicopter), and fixed-wing aircraft (plane) are three modes of commonly executed ECMO transport (Broman & Frenckner, 2016). There are several circumstances and contributing factors that influence the vehicle/aircraft used for ECMO transport. Choice of vehicle is a nuanced decision that relies on a multitude of factors regarding the trip. A few of these factors that contribute to which mode of transportation to use are the weight limitations, distance of transport, and patient condition, which dictates the speed at which a patient must be moved (Broman & Frenckner, 2016). Other circumstances such as toleration of noise, ease of mobility in the cabin, environmental conditions, and security of equipment should also be considered when choosing a mode of transit. Not all medical transportation is made equally, and each vehicle has its own advantages and disadvantages when regarding ECMO transport (Steenhoff & Zohn, 2020).

In a retrospective review, the University of Michigan ECMO program performed 221 ECMO transports between the years 1990 and 2012. The frequency and examples of complications experienced during the 221 ECMO transports were recorded. The complications were categorized into seven sections, including missing item, electrical complication, complication with overall aspects of patient care, complication causing substantial delay in travel, circuit issue, inadequate circuit flow, and patient death (Bryner et al., 2014). Of the 221 ECMO transports, electrical complications such as ambulance battery outage, portable laboratory device not working, battery loss requiring hand-cranking of pump, and water

heater failure occurred the most frequently at 39% of the time (Bryner et al., 2014). The patient death category of complications occurred the least frequently at 1% of the time (Bryner et al., 2014).

In a retrospective observational cohort study of 908 ECMO transports performed by the Karolinska University Hospital between the years 1996 and 2017, at least 1 complication occurred in 28% of all transports (Fletcher-Sandersjöö et al., 2019). This study categorized the complications into five categories; patient, environment, human error, transportation vehicle, and equipment. Of all modes of transportation, the study experienced a higher risk of transportation complications with a fixed-wing aircraft (Fletcher-Sandersjöö et al., 2019). The study explained that this complication likely reflected the fact that fixed-wing aircraft transportations involve an additional aspect of transportation requiring the reloading of the patient from the ambulance to the actual fixed-wing aircraft (Fletcher-Sandersjöö et al., 2019).

Just as no two perfusionists pump a case the exact same way, no two ECMO programs operate identically. Knowing that there are so many variables at play in the transportation of a single patient from one healthcare facility to another, it's no surprise that each team would have to work through their own specific challenges that arise during transportation. The challenges experienced by an ECMO transport team on the west coast may not be the same challenges experienced by an ECMO transport team on the east coast. The same goes for healthcare systems that work with fixed-wing airplanes versus ground transportation. Knowing what stands in opposition to efficient, safe, and evidence-based practice will aid in building a stronger system of ECMO transportation across the United States.

References

Broman, L. M., Dirnberger, D. R., Malfertheiner, M. V., et al. International survey on extracorporeal membrane oxygenation transport. ASAIO Journal. 2020;66(2), 214-225.

Broman, L. M., Frenckner, B. Transportation of critically ill patients on extracorporeal membrane oxygenation. Frontiers in Pediatrics. 2016;4, 63.

Bryner, B., Cooley, E., Copenhaver, W., et al. Two decades' experience with interfacility transport on extracorporeal membrane oxygenation. Annals of Thoracic Surgery. 2014;*98*(4), 1363–1370.

Ehrentraut, S. F., Schroll, B., Lenkeit, S., et al. Interprofessional two-man team approach for interhospital transport of ARDS-patients under extracorporeal membrane oxygenation: A 10 years retrospective observational cohort study. BMC Anesthesiology. *2019;19*(1), 19.

Fletcher-Sandersjöö, A., Frenckner, B., Broman, M. A Single-Center Experience of 900 Interhospital Transports on Extracorporeal Membrane Oxygenation. Annals of Thoracic Surgery. 2019;*107*(1), 119–127.

Steenhoff, T. C., Zohn, S. F. EMS, air medical transport. StatPearls. Treasure Island: StatPearls Publishing LLC. 2020.

42nd Annual Seminar of The American Academy of Cardiovascular Perfusion : A Virtual Event

February 6-13, 2021

(All times are Eastern Standard Time.)

This year's virtual meeting will consist of six blocks. Each block will include presentations on a specific topic followed by discussion. Each block will also include some "Fireside Chats". Attendees will be able to register for each block individually or the entire meeting. Each block will be awarded Category I CEUs. Saturday, February 13th will be a multi-disciplinary day offering continuing education credits for nurses and respiratory therapists.
The entire meeting has been awarded 31.2 Category I CEUs by the American Board of Cardiovascular Perfusion.

Tentative Schedule

Part #1 - Saturday, February 6, 2021 (8:30 AM - 12:30 PM) - 4.8 CEUs

Non-Technical Aspects of Perfusion

8:30 - 8:50 AM	*American Board of Cardiovascular Board Report* Brad Kulat, CCP, Ann & Robert Lurie Children's Hospital of Chicago, Chicago, IL, President ABCP
8:50 – 9:10 AM *H*	*Heart Surgery, What Does it Really Cost?* Kainat Ayub, Rush University Perfusion Student, Chicago, IL
9:10 – 9:30 AM	*The Effect of COVID on Perfusion Students and New Graduates* Molly Bryant CCP, MHA, FPP, Mayo Clinic, Rochester, MN
9:30 - 9:55 AM	*How Can Team Communication Improve Patient Care? Using IT Solutions and Dashboards* James R. Beck, MPS, CCP, LP, Director, Clinical Perfusion & Anesthesia Support Services, New York Presbyterian Hospital, Columbia University Irving Medical Center, Morgan Stanley Children's Hospital of New York, MSCHONY
9:55 - 10:20 AM	*Validation of the Perfusionists' Intraoperative Non-Technical Skills (PINTS) Tool* Roger Daglius Dias, MD, MBA, PhD, Director of Research & Innovation, Director of the Medical Simulation Fellowship - Human Factors & Cognitive Engineering Lab STRATUS Center for Medical Simulation, Brigham Health, Boston. MA
10:20 - 10:45 AM	*The Just Culture of Shared Accountability* David Fitzgerald, CCP, MPH, DHA, Program Director, MUSC Perfusion School, Charleston, SC
10:45 - 11:10 AM	*Perfusionist Liability* John P. Puleo, Esq., Hamel Marcin Dunn Reardon & Shea, P.C., Boston, MA
11:10 - 11:30 AM	Panel Discussion
11:30AM - 12:30 PM	Fireside Chats Choice #1 – Clinical Instructor's Forum Choice #2 – Pediatrics

Part #2 - Saturday, February 6, 2021 (1:00 PM – 5:00 PM)- 4.8 CEUs

Blood

1:00 - 1:25 PM — *Cellular Response to CPB: Clinical Relevance*
Harvey Rinder, MD, Professor of Medicine (Hematology) and Laboratory Medicine, Yale School of Medicine, New Haven, CT

1:25 - 1:50 PM — *Can Automated Data Acquisition Assist Clinicians in Oxygen delivery on CPB? Help your patients!, DO2i & TDR*
James R. Beck, MPS, CCP, LP, Director, Clinical Perfusion & Anesthesia Support Services, New York Presbyterian Hospital, Columbia University Irving Medical Center, Morgan Stanley Children's Hospital of New York, MSCHONY

1:50 - 2:15 PM — *Cerebral Perfusion*
Edward DeLaney MS, MBA, LP, CCP, Director System Perfusion Services, Department of Cardiothoracic Surgery, Northwell Health, NY

2:15 - 2:40 PM — *Nitric Oxide on Cardiopulmonary Bypass*
Lorenzo Berra, MD, Anesthesiologist & Critical Care Physician, Massachusetts General Hospital, Medical Director, Respiratory Care, Massachusetts General Hospital, Reginald Jenney Associate Professor of Anaesthesia, Harvard Medical School, Boston, MA

2:40 – 3:00 PM — Panel Discussion

3:00 – 4:00 PM — Fireside Chats
Choice #1 – Blood Conservation
Choice #2 – Perfusion Accidents

4:00 – 4:20 PM — *Comparison of Del Nido to Blood Cardioplegia in Adults and Pediatrics*
Brian Lester, RN – Quinnipiac University Perfusion Student, Hamden, CT

4:20 – 4:40 PM — *The Assessment of Patients Undergoing Cardiac Surgery for COVID-19*
Al Stammers - MSA, PBMS, CCP Emeritus Vice President, Clinical Quality and Outcomes Research, SpecialtyCare INC, Brentwood, TN

4:40 – 5:00 PM — *Meta-Analysis on ANH & RAP on Reducing Allogeneic Blood Transfusions*
Maria Plomondon – Quinnipiac University Perfusion Student, Hamden, CT

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Part #3 - Tuesday, February 9, 2021 (5:30 PM – 10:30 PM) - 6.0 CEUs

Conduct of Research

5:30 PM - 5:50 PM	*Faculty: ECMO Education in a Perfusion Program (Program Perspective)* Edward M. Darling, MS, LP, CCP, Associate Professor, Department of Cardiovascular Perfusion, SUNY Upstate Medical University, Syracuse, NY
5:50 – 6:10 PM	*Student Perspective of ECMO Capstone Experience* Michael Wynn, SUNY Perfusion Student, Syracuse, NY
6:10 – 6:30 PM	*Myocardial Protection Comparing Warm and Cold Cardioplegia Delivery Methods* Nathan Minie, Quinnipiac University Graduate Student, Hamden, CT
6:30 - 6:55 PM	*Isolated Heart Perfusion* Tony Calhoun, CCP, Massachusetts General Hospital, Boston, MA
6:55 - 7:20 PM	*Trials and Tribulations of Research: The Good, the Bad and the Terrible* Al Stammers – MSA, PBMS, CCP Emeritus Vice President, Clinical Quality and Outcomes Research, SpecialtyCare INC, Brentwood, TN
7:20 - 7:45 PM	Research Collaborations Nitin A. Das, MD, Instructor/Research with UTHealth San Antonio Long School of Medicine, San Antonio, TX
7:45 - 8:10 PM	*The Processes and Pitfalls of Peer-Review and Publication* Mark Kurusz, CCP Emeritus and John Toomasian, MS, CCP, *Perfusion Journal* Associate Editors
8:10 - 8:30 PM	Panel Discussion
8:30 - 9:30 PM	Fireside Chats Choice #1 – Myocardial Protection Choice #2 – Pump On: First Five Years Choice #3 – Scope of Practice
9:30 -9:50 PM	*Prophylactic Steroids and SIRS on CPB* Stephanie Johnson, Quinnipiac University Perfusion Student, Hamden, CT
9:50 – 10:10 PM	*The Development Of A National Quality Program For Extracorporeal Membrane Oxygenation* Linda Mongero, CCP Emeritus, SpecialtyCare, INC, Brentwood, TN
10:10 – 10:30 PM	*Historical Presentation* Steven Sutton, CCP, Wichita Falls, TX

Part #4 - Thursday, February 11, 2021 (5:30 PM – 10:30 PM) - 6.0 CEUs

Outside the Box

5:30 - 5:50 PM	*Preliminary Report of the 2020 Organ Care System Workforce Survey* Blaine Johnson, MBA, CCP, LP, University of Chicago, Chicago, IL
5:50 – 6:10 PM	*Surgical Awareness in LVAD Procedures* Craig Haug, CVP Student, Rush University, Chicago, IL
6:10 – 6:30 PM	*Conventional Ultrafiltration Versus Diuretic Use with Cardiopulmonary Bypass and Postoperative Outcomes: A Meta-Analysis of Literature Reviews* Jennifer L. Pierce BSN, RN, Quinnipiac University Perfusion Student, Hamden, CT
6:30 - 6:55 PM	*Managing ECMO Catastrophes on the Road and in the Air* Rachel Gambino, RN, BSN, CCP, Duke University Medical Center, Durham, NC
6:55 - 7:20 PM	*NYC Covid-19 Experience* Nicholas Mellas, CCP, Montefiore Medical Center, New York, NY
7:20 - 7:45 PM	*Pediatric ICU Resuscitation* Tia Tortoriello Raymond, MD, FAAP, FAHA, Pediatric Cardiac Intensivists of North Texas, PLLC, Medical City Children's Hospital, Dallas, TX
7:45 - 8:10 PM	*CPB to ECMO Simulation: A Multi-Disciplinary Handoff* Greg MacLean, CCP, David Sturmer, CCP Gretchen Lawson, CCP, Killian Patton-Rivera, CCP, University of Michigan, Ann Arbor, MI
8:10 - 8:30 PM	Panel Discussion
8:30 - 9:30 PM	Fireside Chats Choice #1 – Pediatrics Choice #2 – Simulation Choice #3 – Student Forum
9:30 - 9:50 PM	*Meta-Analysis on the Clinical Benefits of Miniaturized Extracorporeal Circuits Compared to Conventional Cardiopulmonary Bypass and Off- Pump Coronary Artery Bypass* Herson Hernandez, Quinnipiac University Perfusion Student, Hamden, CT
9:50 - 10:10 PM	*Comparing Hydroxocobalamin and Methylene Blue in the Treatment of Vasoplegic Syndrome in Cardiac Surgery: A Meta-Analysis* Kathryn Cirillo, RN, BSN, Quinnipiac University Perfusion Student, Hamden, CT
10:10 - 10:30 PM	*Historical Presentations* Steven Sutton, CCP, Wichita Falls, TX

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Part #5 - Saturday, February 13, 2021 (8:30 AM – 12:30 PM) *Multi-Disciplinary Day - 4.8 CEUs*

ECMO

8:30 - 8:50 AM — *Extracorporeal Cardiopulmonary Resuscitation: From Cannulation to Home*
Nicholas Mesisca BSN, RN, CCRN, Thomas Jefferson University, Perfusion & Extracorporeal Technology Program, Philadelphia, PA

8:50 – 9:30 PM — *Debate: COVID-19 Respiratory Failure: Just Treat it like ARDS*
Craig Rackley, MD and Anne Mathews, MD, Duke University Medical Center, Durham, NC

9:30 - 9:55 AM — *ECMO Lessons Learned During COVID-19 Experience*
Dr. Gary Schwartz, MD, Director, Extracorporeal Membrane Oxygenation Program, Department of Thoracic Surgery & Lung Transplantation, Baylor University Medical Center, Dallas, TX

9:55 - 10:20 AM — *ELSO Supplies Platform: ECMO Equipment Sharing Made Easy*
Justin Sleasman CCP, MS, FPP, Lucile Packard Children's Hospital, Stanford, CA, Perfusion Liaison to ELSO

10:20 - 10:45 AM — *Nitric Oxide for COVID-19*
Lorenzo Berra, MD, Anesthesiologist & Critical Care Physician, Massachusetts General Hospital, Medical Director, Respiratory Care, Massachusetts General Hospital, Reginald Jenney Associate Professor of Anaesthesia, Harvard Medical School, Boston, MA

10:45 - 11:10 AM — *Quality in Perfusion: Hard to Define But I Know It When I See It*
Al Stammers – MSA, PBMS, CCP Emeritus, Vice President, Clinical Quality and Outcomes Research, SpecialtyCare INC, Brentwood, TN

11:10 - 11:30 AM — Panel Discussion

11:30 AM - 12:30 PM — Fireside Chats
Choice #1 – ECMO Scenarios
Choice #2 – EMR
Choice #3 – Pediatric ECMO

Part #6 - Saturday, February 13, 2021 (1:00 PM – 5:00 PM) *Multi-Disciplinary Day - 4.8 CEUs*

ECMO

1:00 - 1:25 PM — *European ECMO Experience With COVID-19*
Luc Puis, ECCP, Leuven, Belgium.

1:25 - 1:50 PM — *Future of Pediatric ECMO*
Timothy Crombleholme, MD , Medical City Children's Hospital, Dallas, TX

1:50 - 2:15 PM	*Massachusetts General Hospital ECMO Cannulation Simulation* Sarah Lojovich, MS, CCP, LP, ECMO Liaison, MGH Perfusion Service, Boston, MA
2:15 - 2:40 PM	*Future of ECMO, Where Are Our Challenges? What's New Now and What's on the Horizon?* James R. Beck, MPS, CCP, LP, Director, Clinical Perfusion & Anesthesia Support Services, New York Presbyterian Hospital, Columbia University Irving Medical Center, Morgan Stanley Children's Hospital of New York, MSCHONY
2:40 – 3:00 PM	Panel Discussion
3:00 – 4:00 PM	Fireside Chats Choice #1 – Dealing with Stress Choice #2 – ECMO: Starting, Maintaining, Growing
4:00 – 4:20 PM	*Goal-Directed Perfusion* Steven Sutton, CCP, Wichita Falls Heart Clinic, Wichita Falls, TX
4:20 – 5:00 PM	*Debate: ECPR: What Is It Good For?*

We will be using a platform designed for virtual meetings that functions like Zoom, and we are striving to keep the annual symposium "flavor" as much as possible, including fireside chats?

You will be charged $50 for each session that you select or $300 for the entire meeting (discounted to $250 until January 15, 2021). Clicking on the session link and entering the meeting, while live and in progress, will be your daily sign-in.

On-line registration is available on our website (TheAACP.com). Once you have registered, you will receive the links required to access the sessions that you plan to attend.

Since we will be holding a multi-disciplinary day, can you please share meeting notifications with your ECMO colleagues (Nurses - $75; Respiratory Therapists - $50).

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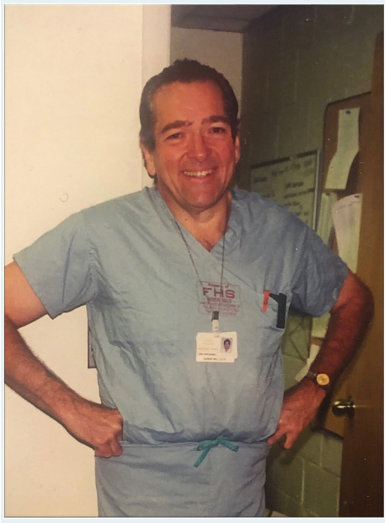
Important Academy Dates

The ACADEMY ANNUAL MEETING DEADLINES

ABSTRACT DEADLINE	**October 15, 2020**
MEMBERSHIP DEADLINE	**December 10, 2020**
PRE-REGISTRATION	**January 15, 2021**
2021 ANNUAL MEETING	**February 6-13, 2021**

Aaron G. Hill Research Grant



Aaron G. Hill was a pioneer in clinical perfusion and heavily involved in the establishment of the profession. He was truly a good friend, colleague and mentor to many of us in the field of Perfusion. A research grant has been established in his name.

If you are interested in applying for a research grant, click on this link.

Aaron G. Hill Research Grant Application

Purpose: To help support perfusion-related research

Requirements: Grant recipients are required to present their research findings at an Academy meeting. This includes submitting an original manuscript that can be sent to the journal *Perfusion* for possible publication.

Name: _____

Address: _____

Phone: _____ Email: _____

Institutional Affiliation: _____

Are you a Perfusionist or a Perfusion Student? _____

Does this investigation involve patients or patient data? YES or NO

If YES, do you have documented institutional IRB approval? YES or NO

IRB Number: _____

Estimated budget for your study: _____ Amount Requested: _____

On a separate sheet, give a short, detailed summary of your study, including the following: (1) title of your study; (2) an assessment of originality and how the study will contribute to the scientific literature; (3) expected start and finish dates for the research project; (3) names of co-investigators or senior advisors including their anticipated roles; (4) specifically, what will the grant award be used for such as laboratory supplies.

(NOTE: travel expenses are not covered by this grant)

I am the principle investigator on this project and I understand that if awarded a grant, I must present my research at an Academy meeting at my own expense and submit a manuscript suitable for potential publication in the journal Perfusion.

_____ _____

Print Name Signature

Donations to this fund can be made by:

- mailing a check to the National Office (AACP, 515A East Main Street, Annville, PA 17003). Please make the check out to the AACP and write AG Hill Fund on the memo line,

- or by going to our website and clicking on the form.

Predictive Risk Factors for Acute Kidney Injury Following Cardiac Surgery

Meghan Baker and Stephanie Canchola

Rush University Medical Center

Chicago, Illinois

Acute kidney injury (AKI) is a common problem faced by patients undergoing cardiac surgery, either with or without cardiopulmonary bypass (CPB). Several widely accepted classification systems exist to define AKI in the adult population, including the AKIN (Acute Kidney Injury Network) criteria, RIFLE (risk, injury, failure, loss, end-stage renal disease) classification, and KDIGO (Kidney Disease: Improving global outcomes) stages.[1] Each of these classification systems agree on three commonalities of AKI: elevated serum creatinine (SCr), decreased glomerular filtration rate (GFR), and decreased urine output, or oliguria.[1] What are less agreed upon are the most predictive risk factors for cardiac surgery-associated AKI.

Research regarding cardiac surgery-associated AKI is ongoing, as new predictive factors and methods of kidney protection are studied and discovered. Several studies agree on some known risk factors of AKI, including female gender, old age, preoperative hypertension, diabetes, and redo operations.[2,3] Other studies suggest some risk factors of AKI that are not as widely studied or accepted, including lowest hematocrit (Hct) during CPB, lowest oxygen delivery (DO2) during CPB, prolonged CPB duration and cross-clamp time, blood product usage, high body mass-index (BMI), non-normal mean arterial pressure during CPB, and low CPB flow or cardiac index.

In a prospective study conducted by Gong et al., out of 198 patients that developed AKI, 52.38% were elderly, and the rate of mortality was also higher (42%) than the non-elderly patients (24%).[7] In a univariate analysis of risk factors for AKI, Palomba et al. concluded that several factors showed an increased risk of developing an AKI, including age > 65 (OR 2.32, 95% CI 1.35 - 3.98), female gender (OR 1.77, 95% CI 0.97 - 3.22), preoperative hypertension (OR 0.9, 95% CI 0.45 - 1.81), and diabetes (OR 1.43, 95% CI 0.81 - 2.52).[2] The same researchers also found that more complicated procedures, such as combined valve and bypass grafting surgeries, caused more frequent AKI than single surgeries (OR 3.19, 95% CI 1.62 - 6.25).[2]

In a 2019 retrospective study of 14,350 critically ill patients with AKI, Zhou et al. investigated the relationship between lowest Hct and mortality and found a significant inverse relationship between the incidence of 90-day mortality and Hct in both genders.[8] According to a 2019 randomized retrospective study by Newland et al., maintaining a DO2 index above 270 ml/min/m2 was associated with reducing the rate of AKI. This study also concluded that there was a 52% increased risk of AKI if the DO2 was below this threshold (OR, 1.52; 95% CI, 1.29 - 1.77; P < .001).[9] The use of blood products, particularly red blood cells, typically attempt to solve the problems of low Hct and low DO2, but there is research showing that the transfusions themselves may also be an independent risk factor. When RBCs are stored there is a decrease in deformality, depletion of ATP, inability to generate nitric oxide, and increase in adhesiveness to vascular endothelium.[10] These factors can lead to an impairment in DO2 and exacerbation of the inflammatory response that can cause kidney.[10]

In a retrospective observational study, Hiew et al. evaluated the outcomes of 1,228 patients that underwent CABG procedures. Using a stepwise multivariate analysis for AKI and AKI-D (patients that required renal replacement therapy), they found that for every one-minute increase in CPB time the odds of patients having AKI increased by 1.01.[11] Temperature and AKI is another studied topic, regarding both hypothermia and hyperthermia. Newland et al.

conducted an observational study relating arterial outlet temperature to AKI for a group of 193 consecutive patients. They found that for every 10 minutes that the arterial outlet read >37 °C, the risk for developing AKI also increased by 34 % (OR 1.03, 95% CI 1.01-1.05, p = 0.01).[12]

Currently, there are no absolute predictive factors of perioperative AKI, though many studies have attempted to identify such factors. While results from many of the studies agree on the same predictors, other studies show differing results. For example, although several systematic reviews have concluded females have an increased risk for developing AKI[1,3], two independent groups of researchers suggested no significant difference between genders and a protective effect from the female gender.[4,5] Similarly, while systematic reviews have concluded that diabetes is a known risk factor of AKI, a study conducted by Mukaida et al. found a p-value of 0.574 when comparing subjects with diabetes who did or did not experience AKI. In fact, the study showed that a higher percentage of the non-AKI group were diabetic, contradicting what much of the other literature had claimed about diabetes and AKI.[6]

Cardiopulmonary bypass can cause physiological changes in patients that can harm the patient's organs, especially the kidneys. Injury to the kidneys may occur in about 30% of all cardiac surgeries, some without recovery. Because of discrepancies in the literature regarding risk factors, it is important to continue researching AKI physiology to reduce the occurrence of AKI in the future, through evidence-based medicine and perfusion. It is clear that the patients who present for surgery with more disease states are the more vulnerable population, it is important to stay vigilant in minimizing any and all risk factors that can be avoided.

References

1. Kramer, R.S., Herron, C.R., Groom, R.C., & Brown, J.R. (2015). Acute kidney injury subsequent to cardiac surgery. *J Extra Corpor Technol*, 47(1):16-28.

2. Palomba, H., de Castro, I., Neto, A.L.C., Lage, S., Yu, L. (2007). Acute kidney injury prediction following elective cardiac surgery: AKICS Score. *Kidney International* 72 (5), 624-631.

3. Kristovic, D., Horvatic, I., Husedzinovic, I., Sutlic, Z., Rudez, I., Baric, D., Unic, D., Blazekovic, rfro-MR., & Crnogorac, M. (2015). Cardiac surgery-associated acute kidney injury: risk factor analyses and comparison of prediction models. *Interactive CardioVascular and Thoracic Surgery*, 21; 366-373. https://doi.org/10.1093/icvts/ivv162

4. Yousif, N., Obeid, S., Binder, R., Denegri, A., Shahin, M., Templin, C., & Luscher, T. F. (2018). Impact of gender on outcomes after transcatheter aortic valve implantation. *Journal of Geriatric Cardiology*, *15*, 394–400.

5. Neugarten J., Golestaneh L., & Kolhe N. V. (2018). Sex differences in acute kidney injury requiring dialysis. *BMC Nephrology*, *19* (1). https://doi.org/10.1186/s12882-018-0937-y

6. Mukaida, H., Matsushita, S., Kuwaki, K., et al. (2019). Time-dose response of oxygen delivery during cardiopulmonary bypass predicts acute kidney injury. *J Thorac Cardiovasc Surg*, 158(2):492-499. Doi: S0022-5223(18)32972-6

7. Gong, Y., Zhang, F., Ding, F., & Gu, Y. (2012). Elderly patients with acute kidney injury (AKI): Clinical features and risk factors for mortality. *Archives of Gerontology and Geriatrics, 54*(2), e47-e51. https://doi.org/10.1016/j.archger.2011.05.011

8. Zhou, Y., Zheng, M.-H., Chen, C.-S., Sun, D.-Q., Chen, X.-X., Sun, M., Zheng, C.-F. (2019). Prognostic value of hematocrit levels among critically ill patients with acute kidney injury. *European Journal of Inflammation*. https://doi.org/10.1177/2058739219846820

9. Newland, R.F., Baker, R.A., Woodman, R.J., Barnes, M.B., Willcox, T.W., Australian and New Zealand Collaborative Perfusion Registry. (2019). Predictive capacity of oxygen delivery during cardiopulmonary bypass on acute kidney injury. *Ann Thorac Surg*, 108 (6):1807-1814. https://doi.org/S0003-4975(19)30881-1.

10. Xie, X., Wan, X., Ji, X., Chen, X., Liu, J., Chen, W., & Cao, C. (2017). Reassessment of Acute Kidney Injury after Cardiac Surgery: A Retrospective Study. *Internal Medicine*, *56*(3), 275–282. https://doi.org/10.2169/internalmedicine.56.7638

11. Hiew, K. C., Sachithanandan, A., Arif, M., Badmanaban, B., Muiz, A., Faisal, I., Evi Diana, O. (2016). Acute kidney injury following coronary artery bypass graft surgery in a tertiary public hospital in malaysia: An analysis of 1228 consecutive cases. *The Medical Journal of Malaysia, 71*(3), 126. https://www.ncbi.nlm.nih.gov/pubmed/27495886

12. Newland, R.F., Tully, P.J., & Baker, R.A. (2013). Hyperthermic perfusion during cardiopulmonary bypass and postoperative temperature are independent predictors of acute kidney injury following cardiac surgery. *Perfusion,* (3):223-31. https://doi.org/10.1177/0267659112472385

Simulation Use in the Education of Perfusion Students: A Review

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Simulation in perfusion education in the United States is underutilized compared to other professions and disciplines which use simulation to train new professionals with success. The risk of death or serious injury during cardiopulmonary bypass (CPB) procedures is 1/2500 per procedure (1). Comparatively, the risk of death from anesthesia is 100 times greater than CPB procedures. This risk indicates the need for a high level of safety, not only in the perfusion profession but also for students beginning a career in the field.

With an emphasis to increase safety for perfusion students, some programs utilize high-fidelity simulation to help develop skills and effective communication in the operating room (OR). Simulation allows students to learn vocational skills in a lower stress environment, increasing comfort and familiarity with equipment and procedures that take place in the OR. Without simulation, students may only rely on exposure in the OR to increase expertise. Simulation also allows instructors to set the clinical agenda, helping each student achieve the same competencies and the program's educational goals and objectives.

Operating Room simulation is a common practice for assessment of cardiac perfusion students, but there are no validated clinical assessment rubrics in use. A group of researchers used a national survey in 2017 to identify the fundamental skills needed by perfusion students to perform adult CPB and the sub-elements that come with a perfusionists skill set (2).

Of the 261 respondents, all supported that there is variation between perfusion practices, but the data highlighted 20 core fundamental skills that are associated with adult CPB. The skills, listed from most important to least based on the results of the survey, included evaluation of patient data and calculations, component circuit selection, circuit assembly and priming, CPB checklist, anticoagulation, verification of arterial cannula placement, initiation of CPB, evaluation and troubleshooting technical aspects of CPB, myocardial protection, evaluation and troubleshooting physiological aspects of CPB, hemodynamic management, CPB circuit volume management, blood gas/electrolyte management during CPB, temperature management, ultrafiltration, weaning and termination of CPB, communication and team interactions, sterile technique, blood conservation, and standard precautions (2).

These skills could be highlighted in the curriculum and competency assessments of perfusion students throughout educational programs. This study emphasizes the lack of a validated clinical assessment rubric for perfusionists and perfusion students and recognizes common goals that perfusionists have. The standards and guidelines of the AC-PE include Intra-Aortic Balloon Pump (IABP), autotransfusion, and laboratory analysis, all of which were not items included in the survey but are expected to be performed by perfusionists and perfusion students (2).

A study in 2011 also noted that a competency assessment should be created to evaluate perfusionists on their communication skills (3). They concluded that without effective communication, harmful sentinel events could occur in the operating room. Four subjects were scored based on their communication during a variety of simulated cases. The researchers proposed that the mean scores could be utilized as the minimum score perfusion students should reach before entering clinical rotations. Per case,

the mean scores were as follows: 96.3% for the CABGx4, 97.5% for the aortic valve repair, 97.8% for the CABGx3 with an aortic valve replacement and mitral valve repair, and 99.3% for the pediatric Norwood procedure (3). Overall, the study did offer a potentially usable rubric, but did not provide adequate data or procedural notes to be used.

In 2011, researchers performed a study at the Medical University of South Carolina (MUSC), who uses an Orpheus high-fidelity simulator to train their perfusion students (1). An OR-like environment is used and footage recorded from a cardiac surgery is displayed to simulate real-time procedures. Students were given case scenarios and acted in roles as the Perfusionist, Cardiac Surgeon, and Anesthesiologist. They were each given four case scenarios including an aortic dissection, poor venous return, heparin resistance, and inadequate cardioplegia delivery. Two versions of each of the four scenarios were performed. The first version consisted of poor communication, inter-professional knowledge and respect, and teamwork. The second version consisted of effective communication, inter-professional knowledge and respect, and teamwork. A peer review tool created by perfusion students at MUSC was utilized to quantify the team members performance in each scenario based on 8 factors: accountability, respect, excellence, adaptability, customer service, teamwork, communication and self-expression. Behavior was scored based on positive words (+1) or negative words (-1) (1).

The team totals, including the surgeon, perfusionist, and anesthesiologist, were -2.57 for negative descriptive words and 4.48 for positive descriptive words (1). The outcomes of this study demonstrated that poor communication and lack of inter-professional knowledge and respect can negatively affect patient outcomes. For perfusion students, this simulation can help promote accountability and communication used in the OR. Further research should focus on teamwork and surgical awareness (1).

Many healthcare disciplines use simulation for educational training throughout their prospective programs. Instead of students role-playing positions other than their own, different disciplines can simulate cardiac surgery together, each playing their own prospective role. A study in 2014 researched the effectiveness of combining simulation technologies and describing the perceptions of the student subjects (4).

Subjects for this study were CRNA students and Perfusion students who were in their first year of graduate school (4th quarter for CRNA and 3rd quarter for perfusion), and who had no clinical experience. Overall, there were 37 students: 22 perfusion students, and 15 CRNA students. Two students from each discipline, along with their faculty members for support, were chosen to perform the uncomplicated coronary revascularization case (4).

The researchers utilized a 12-item survey with possible score ranges from 12-72. The higher scores represent increased agreement with positively worded items and a more positive perception of interdisciplinary education. Subjects' perceptions were measured via the following: 1) competency and autonomy among those in their chosen specialty, 2) perceived need for cooperation between disciplines, and 3) cooperative effects between disciplines as perception of actual cooperation. The researchers found statistically significant differences between pre and post-event scores in the areas of "Competence and Autonomy" ($p= 0.002$) and "Perception of Actual Cooperation" ($p= 0.010$) for perfusion students. There were no statistically significant differences in any of the three subscales in the CRNA group (total $p= 0.115$) (4). This study demonstrated that combined simulation technologies facilitate interdisciplinary educational interactions that can improve interdisciplinary perceptions held by students from multiple professions. Healthcare disciplines that perform simulation scenarios together help promote effective communication, professional respect, and can increase the likelihood of good patient outcomes through mutual inter-professional respect (4).

Some studies have found that using a simulator to perform crisis drills in CPB improves proficiency of perfusionists and perfusion students in emergent situations. It is important for patient safety to have perfusionists and perfusion students become familiar with emergency protocols and frequently perform disaster drills. A study in 2003 (5), used a survey to collect information about morbidity and mortality incidents from practicing perfusionists. The survey collected information on the institutional use of emergency protocols and simulation crisis management drills to prepare perfusionists in the event that an emergency occurs (5).

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Results of the study showed that in 59 open-heart centers, with 312 perfusionists, and 47,227 cases annually, most departments (78%) manifested a written crisis management protocol for oxygenator failure and change-out. Only 10 (17%) of the subjects surveyed practiced emergency drills. Researchers also stated that the use of emergency drills in perfusion practice shortens reaction times in emergencies, allowing for the evaluation of protocols already used in practice, and allowing for the implementation of new procedures and techniques within the surgical team. The researchers concluded that perfusionists and perfusion students may incorporate wet labs into their practice to improve skills in emergency situations and increase patient safety (5).

A marked increase in advanced technology increases potential for equipment failure, and in cardiopulmonary bypass, failure of components can be lethal. Researchers in a study in 2012 noted that oxygenator failure in CPB is very rare with 50 cases in 2009, 101 cases in 2010, and 133 reported cases in 2011 in the United States (6). At the Royal Victoria Hospital in the United Kingdom, researchers developed an emergency oxygenator change-out algorithm to involve all members of a cardiovascular team in order to complete the task in expedient time. The staff were required to perform simulation drills weekly for the management of emergency situations. This practice facilitates an expedient emergency situation management and increases the confidence and skills of the perfusionist. Practice also promotes patient safety by maintaining current proficiency in perfusion skills (6). Perfusion students should be involved in practices similar to this in order to learn and maintain emergency scenario skills.

Various health care professions use simulators for education and to maintain skill proficiency. The use of high-fidelity simulation correlates to an increase in users' confidence, ability, and control of the equipment commonly used by CCP's. Authors have supported simulation use between healthcare disciplines, changing the modality of inter-professional practice. The resulting communication can help increase patient outcomes, solidifying how important inter-professional practice is.

It is important to utilize the newly developed and adopted technologies to train current and future professionals in emergency responses related to CPB. The CAAHEP and AC-PE note that students should be prepared and taught about possible crises and are required to pump a certain number of cases before graduation. However, the AC-PE and CAAHEP do not require any form of simulation to be completed by perfusion students prior to, during, or after clinical experience.

In future research, studies on the amount of simulation needed for perfusion students to become proficient in the skills outlined by Searles, et al. (2019) should be performed. There should also be further research on the use of simulation for emergency CPB pump maneuvers. Competency assessments also need to be developed to test perfusion student's proficiency in said skills.

References

1. Sistino, J., Michaud, N., Sievert, A., & Shackelford, A. (2011). Incorporating high fidelity simulation into perfusion education. *Perfusion*, *26*(5), 390–394. doi: 10.1177/0267659111410901

2. Searles, B., Darling, E., Riley, J., & Wiles, J. R. (2019). Fundamental clinical skills of adult cardiopulmonary bypass: Results of the 2017 national survey. *Perfusion, 34*(4), 290-296. doi:10.1177/0267659118816036

3. Melchior, R., Rosenthal, T., Schiavo, K., Frey, T., Rogers, D., Patel, J., & Holt, D. (2012). A systematic evaluation of the core communication skills expected of a perfusionist. *Perfusion*, *27*(1), 43-48. doi:10.1177/0267659111424641

4. Mendel, S. (2014, July 23). Interdisciplinary simulation using the cardiopulmonary bypass Simulator(CPBS). *Journal of Extracorporeal Technology*, *46*(4), 300-304. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4557474/

5. Ginther, R., Fillingham, R., Searles, B., & Darling, E. (2003). Departmental use of perfusion crisis man agement drills: 2002 survey results. *Perfusion, 18*(5), 299-302. doi:10.1191/0267659103pf680oa

6. Soo, A., Booth, K., & Parissis, H. (2012). Successful management of membrane oxygenator failure during cardiopulmonary bypass--the importance of safety algorithm and simulation drills. *Journal of Extracorporeal Technology*, *44*(2), 78–80.